National Research Council Canada
2022–23
Departmental Results Report

The Honourable Minister François-Philippe Champagne
Minister of Innovation, Science and Industry

National Research Council Canada | Conseil national de recherches Canada

Canada

Departmental Results Report 2022–23

Aussi offert en français sous le titre Rapport sur les résultats ministériels 2022–2023.

This publication is also available online on the National Research Council (NRC) website at https://nrc.canada.ca/en/[i] and on the Government of Canada website at www.publications.gc.ca.[ii]

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From the Minister

It is my pleasure to present the 2022–23 Departmental Results Report for the National Research Council of Canada (NRC).

Over the past year, the various organizations in the Innovation, Science and Economic Development (ISED) Portfolio have worked closely with other Government departments and agencies following the pandemic to build a more resilient, sustainable and inclusive economy that benefits all Canadians.

The NRC plays an important role in advancing research and new technologies to help address Canada's most pressing challenges. The NRC is directly contributing to a more sustainable future for Canada by working with partners and collaborators on strategic initiatives to reduce emissions, develop clean and sustainable solutions for the transportation sector, and advance net-zero emissions and low carbon construction. While supporting Canada's efforts and actions against climate change, the NRC also continued strengthening Canada's biomanufacturing capacity in 2022-23 by operationalizing the Biologics Manufacturing Centre (BMC) and completing the construction of the clinical trial material facility (CTMF).

I invite you to read this report to learn more about how the NRC is working together with Canadians of all backgrounds and in all regions—urban and rural—to position Canada as a leader in the global economy.

The Honourable François-Philippe Champagne
Minister of Innovation, Science and Industry
Minister of Innovation, Science and Industry Mandate Letter[iii]

From the President

The National Research Council of Canada (NRC) has a long history of conducting and supporting high-impact research for Canadians in an evolving context. This means our teams continuously work to address the changing needs of industry and government.

The past several years demonstrate this: the NRC has played an important role in tackling critical issues and opportunities—from the pandemic and growing our national biomanufacturing ecosystem, to climate change and the low carbon economy, to the digital revolution and its new frontiers in artificial intelligence and quantum technology. We help people with their research challenges, we create new ideas and knowledge for Canada and the world and we work with partners to deliver a national platform for commercialization.

In 2022–23, we made progress on a range of strategic goals in exploratory, applied and collaborative research and technical services to bridge the gap between discovery and successful commercialization, with Canadian firms, government, and higher education partners.

- We generated 1,222 peer-reviewed publications, 62 of which were co-authored with other federal government departments, and maintained a portfolio of 1,951 active patents.
- The National Research Council of Canada Industrial Research Assistance Program (NRC IRAP) worked with 9,690 firms, and supported 35% revenue growth and 21% employee growth for their funded clients (from 2019 to 2021).
- NRC laboratories worked with 969 research and development (R&D) clients, of which 89% reported that the NRC helped them achieve positive results, such as increased jobs, sales and R&D capacity.

Notable special initiatives of the past year included:

- Operationalizing the Biologics Manufacturing Centre (BMC) and establishing its not-for-profit governance structure, which helped ensure Canada is now in a better position to protect the health of Canadians. The BMC will produce biologics, such as vaccines, therapeutics and biopharmaceuticals that would not otherwise be available to Canadians, and will be able to pivot in the event of a future public health emergency to produce cell-based vaccines or other drugs to keep Canadians safe.
- Advancing the revitalization of the Canadian Photonics Fabrication Centre (CPFC), which is an important source of high-quality photonics design and fabrication expertise, and a strategic asset for the Canadian photonics supply chain.

- Beginning a $962.2 million revitalization of the NRC collaborative research facilities over 8 years, with $121.1 million in new funding ongoing to renew the NRC's national network of facilities and real property as part of the NRC's modernization efforts to better invent, innovate, and prosper. A dedicated Office of Facilities Renewal Management (OFRM) was established to lead achievement of the recapitalization projects, providing an ongoing national network of public sector research facilities for collaborations with our partners.

2022–23 was also a year marked by news of important changes, including: the transition of NRC IRAP to the new Canada Innovation Corporation (CIC); and proposed amendments to the *NRC Act* to provide increased procurement authorities and other flexibilities to improve the NRC's ability to work at the speed of its partners.

To begin positioning the NRC for the future and ensure it remains a preferred partner with the capabilities needed to work within the innovation ecosystem of tomorrow, we began an extensive 18-month strategic planning process to refocus the organization on scaled-up, impactful initiatives that will support cross-cutting research. Launched in fall 2022, the strategic planning exercise began with staff engagement to ensure voices from all levels of the organization are reflected in the NRC's future direction. Research divisions have been working to identify opportunities to come together on shared priorities to ensure critical mass and impact, and to refocus activities in alignment with government priorities and our own research ambitions.

The NRC has been serving Canadians by pursuing next-level research thanks to generations of dedicated scientists, researchers, engineers and industrial technology advisors. This important work would not be possible without the support of our corporate and enabling branches that continue to ensure research and innovation efforts can move forward. From climate action and health, to quantum, artificial intelligence (AI) and the universe, the work we do is important, with positive impacts for a better tomorrow for Canada and beyond.

Iain Stewart
President, National Research Council Canada

Results at a glance

What funds were used? (2022–23 Actual spending)	Who was involved? (2022–23 Actual full-time equivalents)
$1,470,756,978	4,263.3

The NRC plays an important role in the science, technology and innovation ecosystem by bringing together extensive knowledge, specialized facilities and equipment, and unique opportunities for national and global collaboration, to advance research and support business innovation in areas of importance for Canada and the world. Budget 2022, the 2022 Fall Economic Statement, and Budget 2023 all pointed to the Government of Canada's confidence in the NRC's ability to lead R&D related to Canada's most pressing challenges and opportunities for success.

Scientific and technological knowledge advances

Research, development and innovation are crucial to ensuring Canada is able to access new and emerging technologies to improve its future standard of living. In 2022–23, the NRC advanced work in priority areas such as climate change and sustainability, health and biomanufacturing, and the digital revolution, while also increasing scientific collaboration. This included work in reducing aircraft emissions, advancing sensing capabilities for transportation and agriculture, enabling cell and gene therapy technologies, and developing artificial intelligence (AI) for security and defence, among many other examples.

With research and innovative solutions in passive drone detection, clean energy and fuels, AI modeling and data analytics, measurements standardization, as well as vital contributions to some of the world's leading telescopes and observatories, the NRC continued to advance innovation across a wide range of disciplines. This included generating 1,222 peer-reviewed publications.

Innovative businesses grow

The NRC's scientific expertise and facilities supported Canadian businesses to grow, innovate and commercialize technologies. In 2022-23, NRC IRAP supported 9,690 firms, resulting in new domestic and international market opportunities for Canadian small and medium-sized enterprises (SMEs), generation of new Canadian IP, and expansion of Canada's talent pool. The NRC also continued to build partnerships with industry by leveraging its industrial R&D groups for work in areas such as advanced manufacturing.

Unique in Canada, the Biologics Manufacturing Centre (BMC) was established to fulfill a public-good mandate. With its operationalization in 2022–23, along with its not-for-profit incorporation and governance structure, the BMC is now set up to contribute to capacity development and growth of Canada's biomanufacturing industry and ecosystem. The NRC also completed construction of the clinical trial material facility (CTMF), continued to work with

companies to de-risk and accelerate the development of novel technologies for vaccines and therapeutics, and advanced space-related research for human health to help strengthen Canada's health care sector.

In addition, the NRC continued to revitalize the Canadian Photonics Fabrication Centre, to ensure industry has access to best-in-class technologies so Canada remains a global leader in the compound semiconductor market.

Evidence-based solutions inform decisions in Government priority areas

The NRC aims to connect expertise across Canada that enables ground-breaking solutions to challenges Canadians are facing today or will face in the years to come. In 2022–23, the NRC continued to prioritize collaborative work under its Challenge programs[iv] and Cluster Support programs[v], and began establishing two new Challenge programs aimed at supporting the development of low carbon materials and systems, and the digitization of construction sector practices.

The NRC also continued collaborating with other federal departments to contribute to research toward a more sustainable future in areas such as building and coastal resiliency, carbon-neutral construction, clean energy technologies for transportation, and critical minerals. Key achievements included developing Canada's first national guidance on nature-based infrastructure for coastal risk management, publishing an important study on bridge resiliency, and creating an open online platform to assess the sustainability of clean energy technologies that was adopted by several federal departments.

Internal services

In 2022–23, the NRC introduced new initiatives to support a diverse, talented, healthy, and engaged workforce, and promote respect, civility, and inclusion in the workplace. Building off the Workforce and Workplace Equity, Diversity and Inclusion (EDI) Strategy 2021-2024, the NRC also increased efforts to strengthen representation of equity deserving groups across the organization, and implemented cross-program initiatives to increase participation in the science, technology, engineering and mathematics (STEM) fields. To support the transition to the government's new hybrid work model, the NRC developed new guidance and directives, strengthened its information technology (IT) infrastructure, and enhanced health, safety, and security procedures.

Following the announcement of an investment of $962.2 million over eight years and $121.1 million ongoing by the Government of Canada to modernize the NRC's infrastructure, the NRC created the Office of Facilities Renewal Management (OFRM) to advance the delivery of major capital projects and oversee organizational investment planning.

For more information on the NRC's plans, priorities and results achieved, see the "Results: what we achieved" section of this report.

Results: what we achieved

Core responsibility

Science and Innovation

Description

Grow and enhance the prosperity of Canada through: undertaking, assisting and promoting innovation-driven research and development (R&D); advancing fundamental science and Canada's global research excellence; providing government, business and research communities with access to scientific and technological infrastructure, services and information; and supporting Canada's skilled workforce and capabilities in science and innovation.

The NRC has three departmental results for tracking and reporting against its core responsibility:

1. Scientific and technological knowledge advances;
2. Innovative businesses grow; and
3. Evidence-based solutions inform decisions in government priority areas.

Results

Departmental Result 1: Scientific and technological knowledge advances

By conducting vital research, advancing new technologies and bringing together partners in academia, industry and government, the NRC works with partners and collaborators to find solutions to Canada’s biggest challenges. In 2022–23, the NRC delivered on its commitment to research excellence by exceeding its targets for peer-reviewed publications, patents issued, new licence agreements, and workforce representation of women in STEM. Although slightly below the target, the NRC’s citation score remained above the world average, and efforts will continue to improve this result.

Clean and sustainable transportation solutions

In 2022–23, the NRC continued to develop foundational technologies that will ultimately lead to reductions in greenhouse gas (GHG) emissions in the transportation and aviation sectors.

As part of a multi-year project under the Greening Government Fund to help advance electrification of the Government of Canada’s aircraft fleet, the NRC began prototyping a high-voltage battery propulsion system. The NRC also became a formal member of an international consortium working to increase scientific knowledge of hydrogen combustion in aircraft engines. Membership will help the NRC support Canadian aviation industry partners developing low-emission products.

The NRC continued to advance state-of-the-art research in measuring emissions of black carbon nanoparticles from aircraft and marine engines. In collaboration with international partners, the NRC compared emissions produced by large aircraft engines powered by standard aviation fuel to engines using a more sustainable aviation fuel. This will help reduce the impacts associated with black carbon, improve air quality around airports, and support the aviation industry in meeting its carbon reduction targets.

The NRC completed the first phase of a project with Transport Canada, the University of British Columbia and Southern Railway of British Columbia under the Clean and Energy-efficient Transportation (CEET) program[vi] to assess information gaps associated with deploying locomotives that contain hydrogen fuel cells, known as hydrail. The first phase identified risks and hazards, and the second phase will develop a framework for regulators to oversee hydrail operations proposed by Canadian rail operators. The NRC also undertook a collaborative project with Natural Resources Canada (NRCan) under the CEET program to develop a tool to provide Canadians with information on the carbon footprint of light-duty vehicles over the entire life cycle. This project contributes to the Government of Canada's climate plans and will ultimately help consumers make climate-conscious decisions when purchasing vehicles.

Environmental sensing to promote a healthier and more sustainable future

As climate change continues to disrupt everyday life, research in 2022–23 on environmental sensing technologies remained vital to ensuring the safety and security of Canadian transportation systems and agriculture.

To improve the safety and performance of marine operations in ice and reduce the carbon footprint of Canada's marine fleet, the Canadian Coast Guard sought the NRC's expertise to assess the performance of the *CCGS Henry Larsen* icebreaker. The NRC's study demonstrated that an air bubbler system[1] installed during field trials will contribute to the development of the next generation of Canadian Coast Guard ships and future, more efficient maritime autonomous surface ships in Canada.

The Canadian Coast Guard Ship *Henry Larsen* navigates across a vast expanse of icy waters.

[1] The system forces low-pressure air through nozzles located in the ship's hull, below the waterline. The main advantage provided by this system is a reduction in the hull–ice friction by lubricating the hull surface with water agitated by air bubbles.

A new patented technology from the NRC, developed with expertise from its High-efficiency Mining program[vii], enabled the world's first real-time quantitative mineral analysis in a stream using new online mineralogy. A new sensor system based on this breakthrough technology will play a key role in optimizing mining extraction by reducing the environmental footprint and fostering Canadian ingenuity in the global mining sector. This work also led to the construction of the NRC Mining Sensor Test Facility, a unique, state of-the-art asset for the Canadian mining industry, and the creation of the NRC mining sensors hub[viii] where experts can develop new sensing technologies.

The NRC developed a novel data collection and communication hardware system to monitor train ride quality and passenger comfort, and created a unique algorithm to identify track locations with the highest impact on passenger comfort. Ride quality results were shared with VIA Rail through a secure cloud-based portal to assist the company in prioritizing track maintenance activities and proactively addressing track maintenance issues.

Collaboration with international partners led to the discovery of the algal source and primary toxin responsible for ciguatera poisoning.[ix] Thirty years in the making, the NRC's major breakthrough in the identification of this toxin is critical for establishing testing methods, and will advance seafood safety monitoring methods. With a greater potential for these toxins to spread further north due to climate change, this discovery will reduce future health and safety risks to Canadians.

In collaboration with Agriculture and Agri-Food Canada, the NRC is developing point-source detection of pathogens and generated proposals to provide remote diagnostic tools to detect plant pathogen infections. This work will lead to better food security and safety, and has the potential to reduce the cost of agricultural products. Other work in food security included creating a new R&D platform that can be used to develop prototypes that evaluate crops for indoor agriculture applications.

Taking new and emerging technologies into the digital era

NRC-developed machine learning, data analytics and detection technologies help Canada remain at the forefront of the digital transformation and help industry, the federal government, and other research organizations adopt new technologies as part of their digital journeys.

A major achievement for the NRC in AI-based technologies and imaging for security applications was the development of a new technology for passive drone detection. In collaboration with Defence Research and Development Canada, an innovative proof-of-concept technology was developed, patented and advanced to field testing. This extremely accurate, low-cost and undetectable technology will be highly valuable for testing disruptive drone detection technology in realistic settings for Canadian defence applications.

In 2022–23, three Detect-and-Avoid systems were installed on an NRC research aircraft for assessment during a flight campaign. Performance findings were provided to Transport Canada

to support them in developing safety regulations and granting Special Flight Operations permits for Canadian drone operators that intend to fly their devices beyond the pilot's visual line of sight. This work will provide Canadians with better informed regulations for Remotely Piloted Aircraft Systems, enabling the growth of this high-tech sector in Canada.

Under the Indigenous Languages Technology Project, researchers collaborated with Indigenous partners to add voice generation capabilities (text-to-speech) to existing technologies. This will help Indigenous communities teach, preserve and revitalize their languages, and resulted in a best paper award at the 2022 Association for Computational Linguistics conference in Ireland.

The NRC uses long-term AI models to forecast sea ice freeze-up, break-up and iceberg drift to support safe navigation of Northern routes in a context of increasing Arctic ice hazards and extreme weather events. To support the achievement of this objective, the NRC and the Canadian Hydrographic Service worked together to improve the NRC's Arctic Shipping Risk Assessment System by incorporating non-navigational Arctic data and an NRC-developed ice dynamics forecasting model. In addition, a new online platform was developed to further safeguard Canada's Northern waters.

Enabling a strong and secure Canadian measurement system

To ensure Canadian industries, governments and other organizations trust the mechanisms of measurement and standards that underpin the economy, in 2022–23 the NRC:

- contributed to an international comparison for realizations of the SI[2] (International System of Units), including the kilogram, and achieved the highest accuracy of all participants
- contributed to the framework for the digital transformation of the SI, and influenced resolutions related to the redefinition of the SI second
- provided clients with a secure authenticated source of time directly traceable to the official time for Canada by installing NRC TimeLink service[x] units at Shared Services Canada's Enterprise Data Centre and at Inuvik, Northwest Territories
- provided measurement evidence for regulation development in areas such as transportation emissions, cannabis testing and microplastics

The NRC carried out the first calorimeter measurements of a proton beam in Canada at the TRIUMF facility,[xi] which identified a method for accurate beam calibration that will benefit future clinical sites in Canada. The project with TRIUMF, Canada's particle accelerator centre, tested specialized calorimeter devices to address new radiation treatments such as proton

[2] The establishment of the value and associated uncertainty of a quantity of the same kind as the unit that is consistent with the definition of the unit.

therapy, which has proven effective in treating paediatric cancers. This work contributes to the development of infrastructure needed for the first Canadian proton treatment therapy facility, expected in the next few years.

In addition, the NRC supported the University of Victoria on a student-developed satellite, known as ORCASat (Optical Reference Calibration Satellite), by providing critical light intensity measurements for its two laser light sources. This will allow researchers to calibrate their instruments by comparing light emitted from the satellite of a ground-based telescope or observatory to the NRC's measurements.

Helping Canada be a leader in astronomy

In January 2023, the government announced Canada's intent to become a full member of the SKAO (Square Kilometre Array Observatory), further strengthening Canadian astronomers' international reputation in astronomical discovery and providing opportunities for Canadian industry to work on the observatory components. Full membership will provide Canadian astronomers with access to a next-generation radio-astronomy facility and expand Canada's impact in research and innovation, digital technologies and next-generation communications systems.

The NRC will play a key role on the SKAO radio astronomy project by representing Canada in the governance of the SKAO and will work with domestic and international partners to deliver key observatory systems. Significant progress was made in 2022–23 on building the hardware for the correlator, 'the brain', for the SKA-Mid-Array in South Africa. This work helped build Canadian industry capability in high-speed digital signal processing.

Building on its SKA correlator development, the NRC was awarded the contract to use its TALON signal processing technology to build and install the correlator for ALMA (Atacama Large Millimeter/submillimeter Array), the largest telescope of its kind in the world. The TALON correlator is the baseline design for all three of the largest existing or planned radio telescopes in the world.

The NRC also contributed to the James Webb Space Telescope by filling one of the lead roles on the Canadian team and providing scientific oversight for the design, fabrication and testing of two major instruments, including one with unique capabilities related to studying exoplanets and distant galaxies. NRC researchers were awarded 200 hours of observation on the telescope to study some of the first galaxies ever formed.

Collaborative R&D with partners in academia and industry

The NRC is always looking for new ways to expand its partnerships with like-mind institutions on a broad spectrum of solutions for today's most pressing challenges.

- The NRC's Ideation Fund[xii] encourages, tests and validates transformative research ideas generated by NRC scientists working individually and with small teams with

complementary capabilities. Launched in May 2022, the fourth round of the New Beginnings and Small Teams initiatives of the Ideation Fund resulted in granting $1.3 million for 52 New Beginnings projects and $4 million for two Small Teams projects. One of the Small Teams projects focuses on developing a new speech synthesis capability for Indigenous educators to help preserve and promote the learning of Indigenous languages.

- The NRC fosters close collaboration with partners with shared research interests through its Collaboration centres.[xiii] In 2022–23, infrastructure and commissioning of the device bio-foundry,[xiv] a purpose-built facility for microfluidic device prototyping and small-scale fabrication, was completed at the NRC-University of Toronto Collaborative Centre for Research and Applications in Fluidic Technologies (CRAFT). CRAFT researchers collaborated with the Unity Health hospital network in 2022–23 to demonstrate the potential for rapid triage of patients admitted into emergency rooms. This was done by testing point-of-care diagnostic innovations using NRC microfluidics technology at St. Michael's Hospital in Toronto to classify patients admitted with severe symptoms. This technology has the potential to improve emergency room waiting times.
- The NRC partnered with the British Columbia Cancer Agency on a targeted CAR T[3] clinical trial, and with the Canadian Institutes of Health Research (CIHR) on accelerated development of AAV-based[4] rare disease therapies, which will lead to the development of new models and further innovation in the delivery of more affordable and accessible health care.
- The NRC also contributed resources and expertise to improve print fidelity for an experiment conducted by the University of California, Berkeley on volumetric (3D) printing in micro-gravity. The NASA-funded experiment could lead to improvements in the quality of 3D printed biological samples such as tissue and organs for transplants.
- The NRC and the Waterloo Institute for Nanotechnology launched a joint funding program designed to foster interdisciplinary research for "high risk-high reward" blue-sky discoveries[5] in nanomaterials and nano-enabled sensors. Following a virtual workshop, nine research projects were selected in areas such as 3D imaging and machine learning for nanoplastics, multiplex point-of-care testing, and low-power field-effect transistor-based sensors.

[3] Chimeric antigen receptor (CAR) T-cell therapy is used to treat certain blood cancers and is being studied in the treatment of other types of cancer.
[4] Adeno-associated virus (AAV) is a versatile viral vector technology that can be engineered for gene therapy applications.
[5] Scientific research in domains where "real-world" applications are not immediately apparent.

Celebrating diverse STEM talent in Canada

In 2022–23, the NRC redesigned the National Killam Program to further anchor the funding program in Dorothy Killam's vision for inclusive excellence. To help attract and award a diverse cohort of candidates, key elements of the redesign included:

- new governance that will focus on implementing new advisory and decision-making bodies
- outreach to diverse research communities and scholarly networks
- new measures to combat unconscious bias
- monitoring of self-identification data

The NRC is proud to administer the National Killam Program. The 2023 five Killam Prize and eight fellowship winners selected by the program's Selection Committee have achieved excellence in their fields and are committed to mobilizing their research for the benefit of future generations.

Departmental Result 2: Innovative businesses grow

The NRC's scientific, technical and industrial expertise helps small and medium-sized enterprises (SMEs) take ideas to market, build domestic capacity in priority areas, and access global value chains to grow and expand. Playing a pivotal role in the innovation ecosystem connecting SMEs to the best business and R&D expertise, NRC IRAP stimulates innovation and wealth creation in Canada. In 2022–23, NRC IRAP achieved its goals in revenue and employment growth of supported firms. The NRC also exceeded its target for clients reporting that the organization helped them achieve results, and nearly met its target for revenue from industry clients and collaborators.

Supporting the growth and success of Canadian SMEs

As announced in February 2023, NRC IRAP will be integrated into the new Canada Innovation Corporation and the program will undergo significant changes in the years to come. With the transition expected to take up to 24 months, NRC IRAP continued to deliver its support services to clients in 2022–23 and will continue to do so over the transition period. Playing a crucial role in SME growth in 2022–23, NRC IRAP provided $489.4 million in funding to 3,486 Canadian SMEs, and advisory services to 6,204 additional firms, helping clients support 13,973 new jobs.

One of the ways NRC IRAP is able to play such a significant role in SME success is through its Large Value Contribution program, which provides strategic business and technical advice to support Canadian SMEs in scaling up, reaching new markets, and generating new Canadian intellectual property (IP). The program committed approximately $66 million to 22 new projects

in 2022–23, and increased delivery capacity by launching a new Strategic Investment intake stream that works with companies at earlier stages of development.

NRC IRAP also provided key support to firms by placing 725 post-secondary graduates within some of Canada's most innovative SMEs under the Youth Employment Program. Results show that 86% of graduates that completed their internship were employed or self-employed after their placement, with 94% of them staying with their original placement employer. In addition, 49% of participants identified as women, demonstrating NRC IRAP's strong advocacy for the participation of women in STEM.

NRC IRAP's IP Assist Program[xv] continued to help firms increase intellectual property (IP) competencies, build the IP strategies and execute the IP actions needed to support their commercial growth. In 2022–23, the program significantly increased the number of firms assisted across all levels, including providing advisory services to 2,024 unique firms, supporting 298 firms in developing IP strategies, and assisting 93 firms in actioning their IP strategies. In 2022-23, NRC IRAP established new partnerships with key organizations to deliver IP awareness services and support IP strategy projects to firms through industry IP service providers.

The NRC manages and mobilizes a protected and valuable IP portfolio to attract collaborators, promote IP to broader audiences, and increase the commercialization of Canadian research. Strategic IP protection enables efficient mobilization of NRC research activities to Canadian industry. For example, the NRC's bio-electrochemical anaerobic sewage treatment technology was licensed by a new Canadian start-up company due to its potential for treating sewage in remote and Arctic communities, and reducing reliance on fossil fuels. To further enable these types of opportunities, the NRC implemented an IP Strategy Framework in 2022–23.

Helping Canadian SMEs go global

By expanding internationally, SMEs can access a larger customer base, diversify their revenue streams, and achieve higher sales and profit, contributing to the overall health of the Canadian economy.

In 2022–23, NRC IRAP continued to co-deliver the CanExport SMEs Program with Global Affairs Canada, helping Canadian SMEs to develop new export opportunities and to establish themselves in international markets. The program supported over 1,391 projects with more than $27.5 million in funding. Furthermore, the CanExport Innovation Program supported an additional 95 Canadian SMEs, academia and research organizations in developing collaborative R&D agreements with international partners.

Over the past decade of the NRC's association with Eureka, an intergovernmental network and established platform for international cooperation in market-oriented R&D projects, more than 300 Canadian companies have benefitted from co-innovation partnerships with 34 international economies. With the NRC acting as Canada's National Office for Eureka, Canada attained full

membership in June 2022, setting a precedent of allowing full membership to economies outside Europe. Canada can now take on a stronger role in influencing future directions and programming within this network, and further assist innovative Canadian businesses in accessing international markets through collaboration with partners in over 45 economies.

NRC collaborations have led to international recognition. For example, the NRC, with the Taiwan Textile Research Institute, was awarded an Edison Gold Award and an R&D 100 Award (considered the Oscars of invention in the process/prototyping category) for work on stretchable silver conductive ink. The NRC is building on this technology to develop wearable sensors that can be used in mobile health or security applications. In addition, the NRC worked with Canadian SMEs to advance novel laser technologies for international clients, which will help the Canadian industry gain a competitive edge in the high-performance photonic sensing market.

The NRC also leverages industrial R&D groups for advanced manufacturing solutions to boost productivity and technological edge for Canadian manufacturers to remain competitive in a global ecosystem. In its fourth year, the NRC's Advanced Manufacturing program launched more than100 projects within six industrial R&D groups and achieved the following results:

- significantly reduced the weight and the processing time for a replacement metallic part for a key client by leveraging the rapid and low-cost manufacturing processes developed with ten industrial companies in the ground transportation supply chain as well as research and funding partners. The improved process is also being considered for use in a new line of long-range electric vehicles.
- developed a new capability to simulate the fabrication of hydrogen tanks for vehicles using the blow molding method. This represents a valuable capability for major gasoline tank manufacturers working towards faster development and adoption of hydrogen engine and cell technologies.
- contributed to a more efficient automotive manufacturing process through three major projects with industry partners in the mold and die sector. This includes the optimization of the manufacturing chain for complex structural automotive components, the digitalization and optimization of the structural die casting process used to manufacture automotive parts. It also led to the production of a proof-of-concept prototype for a first-of-its-kind numerical model to optimize the design of cooling channels used in the manufacturing process.

Improving industry access to specialized facilities

The NRC manages and operates a range of large-scale research infrastructure across Canada, providing clients and collaborators with access to its facilities and in-house expertise. Its facilities are unique-in-Canada and are a cornerstone of its high impact R&D. As a key example for 2022–23, an Edmonton-based company was provided a dedicated space within the NRC's nanotechnology cleanroom to use their equipment, which also allowed them to access NRC

expertise and equipment for industrial innovations in nano-enabled technologies. This addresses an action included in the most recent Nanotechnology Program evaluation,[xvi] for the program to work with industry to define models for access and use of their facilities, such as the cleanroom and make space available for companies to bring in equipment dedicated to them.

The NRC's photonics fabrication facilities are a critical element in the Government of Canada's vision to be a global leader in the semiconductor and telecommunications industries. These facilities include the Canadian Photonics Fabrication Centre, the only pure-play compound semiconductor foundry of its kind in North America. In order to meet market demand and remain globally competitive, the NRC's fabrication facilities are undergoing a revitalisation and expansion. Significant milestones were achieved in the second year of this five-year $90M revitalization project announced in Budget 2021, including the purchase and installation of major equipment.

The NRC commissioned the new Frazil Ice[6] Facility in 2022 and successfully completed its first client project with Électricité de France. This project helped build the knowledge and expertise needed for large-scale frazil ice studies to address industry needs at the new facility. A new Frazil Ice Facility Consortium was also established with industry, academia and NRCan to increase access to the facility's capabilities, and ultimately improve safety within and around riverine systems, including for nuclear power generation.

The NRC's Atypical Fermentation Facility (AFF) in Charlottetown, Prince Edward Island was commissioned to enhance capabilities in marine and agricultural biotechnologies by establishing specialized resources in fermentation process development and scale-up. The AFF assists Canadian companies seeking to innovate and commercialize bio-based products for the growing blue and agricultural biotechnology economies.

Strengthening Canada's biomanufacturing and health care industries

The pandemic shed light on Canada's need for increased technological innovation in vaccines and therapeutics, virtual care and distributed diagnostics, and microfluidics and biomedical devices. The NRC is responding to this demand, which is expected to continue increasing in the years to come.

[6] Frazil ice is millimeter-sized ice particles that can form in a turbulent, freezing, water column, such as a river system in winter. The turbulent mixing churns the water and prevents the formation of ice cover, instead forming frazil ice.


Maintenance and calibration work on the water purification system of the BMC to verify parameters and compile data.

In June 2022, the NRC successfully completed the commissioning, qualification and validation process for the Biologics Manufacturing Centre[xvii] (BMC). Shortly thereafter, Health Canada certified the BMC's compliance with good manufacturing practices (GMP) and authorized the facility to produce drugs for human use. Finally, in October 2022, the Centre for Commercialization of Regenerative Medicine was selected as the co-founder and joined the NRC in establishing Biologics Manufacturing Centre (BMC) Inc., which officially assumed responsibility for facility operations as of April 1, 2023. The NRC also completed the construction of the CTMF[xviii] and developed plans to operationalize the facility, a huge step in supporting Canada's domestic biomanufacturing capacity. This new facility is designed to produce the material required to conduct early clinical trials on vaccines and other biologic medicines. These major milestones position Canada to better prepare for and respond to ongoing and future health emergencies.

NRC IRAP continued to support Canadian SMEs to develop novel technologies through its Vaccine and Therapeutics program. This program assisted a total of 18 firms since 2020 with projects related to vaccines to reduce COVID-19 infection rates, and therapies to reduce the severity of COVID-19 and other respiratory illnesses. Fourteen of those projects were active in 2022-23. Total external investments and licensing deals for these firms have the potential to exceed $1 billion. Through the Testing and Diagnostics program, NRC IRAP facilitated an SME pilot to test airport wastewater, which can profile viral or bacterial pathogens on incoming aircraft to detect them prior to broad community infection. This project showcased a number of Canadian technologies and provided three SMEs with a means to pilot products in real-world settings.

The NRC continued to work with Innovative Solutions Canada (ISC) and supported 43 ISC projects with an investment of $13.7 million, of which $8.8 million went towards 25 COVID-19 related projects. Close collaboration with other federal departments in completing ten projects under the Phase 2 ISC challenge helped accelerate the development and delivery of R&D prototypes.

Other work to strengthen the health care industry included the development of 26 prototypes deployed under the simulation and digital health research platform and the bioanalytical micro/nano devices research platform. Significant progress was also made on a large-scale project to deploy the PowerBlade technology, a portable instrument for running tests on microfluidic lab-on-a-chip devices, to the International Space Station. This will help Canada

fulfill its international obligations in space-related human health research and direct research towards distributed healthcare. In addition, the NRC delivered a prototype of the VitalSeer technology for remote digital monitoring of vital signs, which has the potential to optimize emergency room triage and remote clinical trials for therapeutics, and increase accessibility for remote locations.

The NRC completed a pilot for rapid protein production for COVID-19 antigens and improved the scalability of the NRC's CHO[7] manufacturing cell line platform. This work also supported the development of NRC COVID-19 antigen reference standards for R&D use and resulted in licensing of a multifunctional mucosal vaccine candidate to an industrial partner following pre-clinical studies. The NRC's rapid manufacturing platform could potentially help Canadian and global scientists achieve the 100 days mission from the Coalition for Epidemic Preparedness Innovations (CEPI) to develop safe and effective vaccines for future pandemics.

Departmental Result 3: Evidence-based solutions inform decisions in government priority areas

The NRC conducts innovative research and tests new approaches to shape research and technology development through collaboration with key public and private partners. Working with collaborators across the country, the NRC plays an important role in breakthroughs that will help address Canada's greatest challenges and capitalize on emerging opportunities. The NRC achieved positive results in this area by exceeding its targets for peer-reviewed publications co-authored with other government departments (OGDs) and revenue earned from other federal government departments.

Creating conditions for breakthrough technologies that benefit all Canadians

Using its mission-oriented Challenge programs, the NRC partners with private industry, academia and other research organizations to advance transformative research and technological breakthroughs that address top Canadian priorities such as climate change, the aging population and increasing capacity in emerging technologies.

In response to priorities in the construction sector, the NRC created two new Challenge programs: the Construction Sector Digitization and Productivity Challenge program[xix] will support the development of new solutions, through the use of digital technology, to increase innovation potential and productivity in the construction sector; and the Low Carbon Built

[7] Mammalian expression systems employing Chinese hamster ovary (CHO) cells are the workhorse of the biopharma industry, and have become the expression system of choice in an R&D setting, enabling the rapid, large-scale production of hundreds of protein variants for various in vitro and in vivo applications.

Environment Challenge program[xx] will provide support for the development of low carbon construction materials, systems, tools and guidelines, to help de-risk and validate technologies that can reduce GHG emissions in new and existing Canadian homes, buildings and infrastructure.

Key Challenge program results for 2022–23
Materials for Clean Fuels:[xxi] To support Canada's goal to achieve net-zero greenhouse gas emissions by 2050, over 40 projects focused on developing technology, materials and capabilities in areas such as self-driving laboratories,[xxii] biological and electrochemical processes and systems, catalyst materials for carbon dioxide conversion and life cycle analysis models. Through international engagement, the NRC was able to launch four new applied research projects with Canadian SMEs and partners in Germany to focus on the development of hydrogen production technologies.
High-Throughput and Secure Networks:[xxiii] The program approved 15 new projects with external collaborators in the areas of photonics, optical satellite communications, and quantum communications for a total of 59 collaborative agreements with 30 external collaborators since its launch in 2019. Most notably, one collaborative project led to the creation of a start-up company with funding from McGill University to accelerate the technology's development and commercialization.
Disruptive Technology Solutions for Cell and Gene Therapy:[xxiv] All pre-clinical studies of a CAR T therapy (based on two NRC-developed assets) were completed in 2022-23 [xxv]. This will be the first ever CAR T therapy to be fully developed in Canada from discovery to clinical trials. These new modality of therapies will provide Canadians an affordable and accessible therapy for untreatable cancers. In addition, several cell and gene therapy enabling tools have been developed and distributed to academic and industry partners to advance cell therapy development.
Artificial Intelligence for Design:[xxvi] The third wave of projects totaling $1.9 million was launched to support research in the utilization of AI in materials discovery.[xxvii] This will have applications in: human health and batteries for electric vehicles, AI for carbon capture, AI for photonic device design to support higher throughput and secure communications networks and AI for applications in enzyme and vaccine design.
Aging in Place:[xxviii] During its second year, the program launched 37 new collaborative projects for a total of 48 projects with 35 external collaborators, including three projects jointly-funded with the Canadian Institute of Health Research. The program also established its second Aging in Place prototype Living Lab in partnership with NRC IRAP and supported the ethical participation of more than 250 "Experts by Experience" (older adults and their caregivers) at the program, project and community levels to support a more sustainable model for long-term care.
Arctic and Northern:[xxix] The program worked on several projects to address various areas of importance to Indigenous communities in Canada's North, including safer shipping operations in ice-covered waters, reinforced ice roads for a longer operational lifespan, detection and cleaning of oil spills in the Arctic, reduced permafrost degradation, and development of new techniques for sewage treatment in Arctic conditions. The program is committed to prioritizing Northern-led research projects that have a strong focus on Northern capacity building.
Internet of Things: Quantum Sensors:[xxx] 35 collaborative projects were launched in 2022-23, with over 50 collaborative research agreements and $7 million in funding to external collaborators, to help strengthen Canada's position as a global competitor in the development of next generation disruptive

sensing technologies based on quantum science. Quantum sensors can harness the extreme sensitivity of quantum systems to provide enhanced precision and help make improvements in navigation, medical imaging, geological surveying, defence, safety and security, amongst other areas. For example, through a collaboration with McGill University and Université de Sherbrooke, the NRC worked with a Canadian SME to improve the sensitivity of the company's prototype magnetic sensor by a factor of nearly 10.
Applied Quantum Computing:[xxxi] The program was successfully launched and the first four projects were initiated with four distinct partners, totaling $529,000 in annual funding for two years. Using quantum annealing, devices and simulators, these projects will allow the generation of particle data for the Large Hadron Collider[8], and support the design of future quantum bits[9] and circuits. The program is a key element of the National Quantum Strategy, and will provide Canadian research organizations and SMEs with opportunities to advance quantum computing technologies.

In addition to NRC Challenge programs, the NRC manages Cluster Support programs that bring together the NRC's national network of researchers and facilities with collaborators from industry, academia and governments to work on funded collaborative R&D projects. In 2022–23, achievements enabled by Cluster Support programs included:

- Under the Advanced Manufacturing program[xxxii], technologies were developed for human-robot collaborative applications, tracking and safety of humans in industrial environments, and predictive modeling for digital certification of aircrafts.
- A technology that predicts the location, type and severity of toxic bio-plumes close to shellfish harvest areas was developed using meteorological data, predictions, and environmental sampling data under the Digital Health and Geospatial Analytics program.[xxxiii]
- Work with academia under the AI for Logistics program[xxxiv] focused on improvements to freight routing efficiency and digital twinning for rail, which will contribute to Canada's goal of reducing greenhouse gas emissions.
- The Ocean program [xxxv] developed several technologies with commercial applications in addition to supporting ocean health. This includes supporting industry to improve emergency flood barrier designs, working with academia to increase ship autonomy and performance, and helping the seafood industry to extract value from fishing waste streams.

Further to the Government of Canada's release of the National Quantum Strategy (NQS) in January 2023 to support Canada's quantum sector and solidify the country's position among international leaders in this field, the NRC launched in 2023 the Quantum Research and

[8] The Large Hadron Collider is the world's largest and most powerful particle accelerator and consists of a 29-kilometre ring of superconducting magnets with a number of accelerating structures to boost the energy of the particles along the way.
[9] Quantum bits are the smallest units of quantum information in a quantum computer.

Development Initiative (QRDI). This program supports collaborative, federal quantum R&D to grow Government of Canada quantum capabilities and expertise. It will help advance and de-risk quantum technologies in national priorities such as mining, defence and security, communications, natural resources, environmental management, and climate change monitoring; by bringing together government, academic and industrial partners.

Collaborative solutions enable climate resiliency research

National and international collaborative research on climate-resilient infrastructure, clean energy and transportation, and materials discovery enables the sharing of world-leading knowledge related to climate change adaptation and mitigation.

- The NRC and partners from the United Kingdom, United States and Australia published the Global Building Resilience Guidelines[xxxvi] in November 2022, which will support jurisdictions around the world in effectively integrating future-focused climate science into building codes and standards.
- A study on the effectiveness of passive radon stacks with radon barriers[xxxvii] in reducing radon, a naturally occurring radioactive gas that is known to build up in homes, was completed in 11 newly constructed homes in the National Capital Region and Kitigan Zibi Anishinabeg First Nation community. The results demonstrated significant reductions in indoor radon concentration. Data from this and previous studies contributed to revisions of four national standards related to ventilation and radon control, the development of a guide for radon professionals, and a proposed change to a National Building Code.
- With support from the Canadian Safety and Security Program, the NRC led the Nature-Based Infrastructure for Coastal Resilience and Risk Reduction project in collaboration with private and public sector researchers and academia. This project addressed data gaps that limit the use of nature-based infrastructure to reduce the risk of coastal flood and erosion in Canada. The project informed the development of Canada's first national guidance on "Nature-Based Solutions for Coastal and Riverine Flood and Erosion Risk Management" to enable assessment, planning and design for coastal communities.
- The NRC built a new facility to better understand the performance and operations of freight train air brake systems. Using this new facility, the NRC collaborated with Canadian railway companies, air brake manufacturers, and Transport Canada to explore measures aimed at improving air brake performance and enhancing railway safety in cold weather conditions.
- The NRC created an open online platform for organizations looking to assess the sustainability of their clean energy technologies. The platform allows users to benchmark against established and mature technologies, develop high-quality datasets, and identify technology and policy gaps. It has already been validated through numerous case studies in carbon dioxide conversion, electric vehicles, and bioenergy, and was adopted by Environment and Climate Change Canada, NRCan, Transport Canada and Public Services

and Procurement Canada (PSPC) to support the development of clean energy standards, policies and strategies.

- The NRC also developed the Critical Battery Materials Initiative as part of Canada's Critical Minerals Strategy. With $40 million in federal funding over four years, the initiative aims to accelerate new mineral processing and battery materials discovery with the goal of developing a clean, efficient and competitive battery supply chain in Canada for increased electrification.

Gender-based analysis plus

Building a diverse and representative workforce, removing barriers and fostering an inclusive culture are key priorities for the NRC. By actively engaging with its employees, clients and collaborators, and integrating GBA Plus into its operations, programs and policies, the NRC is able to use a GBA Plus lens to make its research more inclusive of equity deserving groups and accessible to all Canadians.

The NRC's workforce representation has increased steadily over the past several years. In 2022-23, the representation of racialized persons reached labour market availability and has continued to exceed it for women. The NRC also continued to integrate GBA Plus into program design and delivery and advance capacity and awareness across the organization through several key efforts:

- **Indigenous engagement:** In 2022–23, the NRC increased its Indigenous engagement capacity and skills to help raise awareness and coordination by appointing an Indigenous Engagement Advisor, growing its internal Indigenous Engagement Network, and formalizing a hub that provides guidance for building intentional Indigenous relationships. This guidance seeks to advance equity for First Nations, Inuit and Métis Peoples, and create greater Indigenous inclusion in research and innovation. In addition to its efforts to increase internal engagement, in its third year as a member of the Interdepartmental Indigenous I-STEM Cluster[10], the NRC collaborated with the First Nations Information Governance Centre to co-develop STEM-specific considerations for First Nations data to increase federal knowledge, skills, and use.
- **Collaborative research and development:** The NRC's challenge programs are co-developed through stakeholder engagement, with GBA Plus considerations factored into program design. All proposal templates request information on GBA Plus considerations and funding recipients report back on progress, including disaggregated results where possible. An anonymized proposal review process is conducted under the NRC's New

[10] The Interdepartmental Indigenous STEM Cluster (I-STEM) is a group of 15 federal departments and agencies working together to increase and expand support for Indigenous priorities in environmental stewardship and research, and to actively participate in international scientific engagement.

Beginnings Initiative and results are disaggregated on the success rate of women and racialized persons.

- **Advancing capacity and awareness:** In 2022-23, the NRC continued its intra-departmental network dedicated to EDI, the group adapted in 2023-24 to become the Inclusive Innovation Community of Practice. The Community of Practice connects NRC employees across the organization so that they can exchange ideas and share best practices on Inclusive innovation. Its objective is to develop an equitable, diverse and inclusive workforce and workplace that understands the organization's impacts on diverse groups so that the NRC can design and deliver inclusive programs that benefit all Canadians.

> **Inclusive innovation**
>
> The NRC initiated the development of its next Strategic Plan for 2024-2029 with inclusive innovation identified as a key underpinning priority. Inclusive innovation goes beyond the creation of an inclusive workforce and workplace. It considers how Canadians with diverse backgrounds are affected by NRC programs and initiatives, and how NRC's work can be improved through diversity, including by leveraging other knowledge systems. Inclusive innovation reflects the NRC's ability to adopt an intersectional lens by looking at how multiple identity factors such as race, ethnicity, religion, gender, age and disability intersect and interact with how the NRC undertakes its work and how people internally and externally experience the NRC's programs and initiatives. To build awareness and understanding, the NRC has engaged with its employees across the organization on this key priority, and will set goals to implement Inclusive innovation for the next five years.

United Nations 2030 Agenda for Sustainable Development and the Sustainable Development Goals

In the final year of the NRC's 2020-2023 Departmental Sustainable Development Strategy[xxxviii] (DSDS), the NRC made significant contributions to six of the UN's Sustainable Development Goals[xxxix] (SDGs) identified in the Federal Sustainable Development Strategy.[xl]

SDG 7 – Affordable and Clean Energy

Goal target: Ensure access to affordable, reliable, sustainable and modern energy for all

- In collaboration with Polar Knowledge Canada, the NRC continued efforts to offset diesel consumption with biogas produced from locally-generated food waste in Cambridge Bay, Nunavut.
- The NRC's Vancouver microgrid facility was used as a testbed to validate the performance of a hybrid power system that integrates renewable energy and energy storage.

- An NRC demonstration plant in Northern Alberta became the first of its kind to successfully implement energy-positive wastewater treatment technology in its operations.

SDG 9 – Industry, Innovation and Infrastructure

Goal target: Build resilient infrastructure, promote sustainable industrialization and foster innovation

- Under the NRC's Climate Resilient Built Environment initiative, a ground-breaking report was published on metal corrosion of bridges in water, which will support informed decision-making on metal material selection and design practices.
- The cloud-based operational tool BRIGITAL, a decision-support tool for bridge monitoring and early detection of bridge displacement based on satellite imaging technology, was upgraded to support its application to larger transportation infrastructure, including airports, marine ports, railways and bridges.
- NRC IRAP contributed approximately $83 million to support 571 projects from Canadian SMEs developing and implementing clean technology projects focused on emissions control, clean energy and smart grids.

SDG 11 – Sustainable Cities and Communities

Goal target: Make cities inclusive, safe, resilient and sustainable

- The "Resilient Responses to Protect Lung Health in Nunavik" project was launched in collaboration with the United Kingdom and Quebec, resulting in the development of a test protocol to assess indoor air quality and ventilation in Arctic and Northern housing.
- An analysis of the NRC's Ketch Harbour site was completed to assess its suitability as an Other Effective Area-based Conservation Measure[11]. This analysis was presented at the UN Convention for Biodiversity, helping to achieve a Government of Canada mandate.
- Sequencing of the Arctic raspberry genome was completed, which establishes resources to assist in the rapid cultivation of the Arctic raspberry and other Northern species to better support food security and sovereignty in Northern communities.
- The NRC collaborated on research projects to support firefighter training, understand health risks to firefighters, and evaluate new technologies for use in firefighting.

SDG 12 – Responsible Consumption and Production

Goal target: Ensure sustainable consumption and production patterns

- The NRC released the National guidelines for whole-building life cycle assessment,[xli] which provides comprehensive instructions for carbon accounting to enable the selection

[11] Areas that are separate from protected areas but are governed and managed in a way to achieve positive long-term positive outcomes in conservation and biodiversity.

of the lowest carbon designs. This is an important step to quantify carbon in federally funded construction projects.
- The NRC adapted its existing Life Cycle Analysis model to include more detailed data for vehicle carbon footprint assessments to meet PSPC needs in measuring the carbon footprint of light-duty vehicles being considered for procurement by the Government of Canada.
- Non-hazardous operational and construction, renovation, and demolition waste management programs were implemented at the NRC, and waste audits were conducted for three NRC sites in Quebec and Saskatoon.

SDG 13 – Climate Action

Goal target: Take urgent action to combat climate change and its impacts

- A study was completed for the NRC's Montreal Road south campus on potential strategies for moving the facility to carbon neutrality.
- To support the transition to a low-carbon economy, the NRC identified a framework and guidance for the procurement of energy efficiency fume hoods and research support equipment such as stand-alone chillers.

Innovation

The Government of Canada is strengthening a culture of innovation through the testing of new forms or methods of policy making, program design and implementation, and service delivery. In this context, high-impact innovation can be described as testing and trying something significantly new or different from the status quo, or making incremental improvements to address persistent problems faced by a large number of Canadians or public servants. In 2022–23, the NRC implemented innovative solutions in several areas:

- Testing of radiation safety equipment under the ISC Testing Stream involved researchers designing and installing engineering safety equipment to improve safety standards for workers and operators. Based on the testing, one company has invested in the technology for its new pulse and oat processing facility and another company is evaluating the technology for use in its pulse processing facility.
- Also under the ISC Testing Stream, the NRC operated and tested a bioreactor for Industrial Plankton Inc., a state-of-the-art system designed to make the production of kelp seedlings easy and reliable for the aquaculture industry. Results from the testing were incorporated into the company's design and marketing materials related to operation and ease of use, which will help increase use of the commercially available bioreactor system.
- The NRC tested various Cloud-based online platforms for virtual hiring exams. User testing of the selected tool showed that the approach provides greater flexibility for candidates in the hiring process.

The NRC will continue to foster innovation through testing new approaches and methods to addressing emerging problems.

Key risks

In 2022–23, risks to the NRC's achievement of results continued to be driven by economic uncertainty, geopolitical instability including the war in Ukraine, threats to cybersecurity, workforce challenges and infrastructure needs. The risk of a large-scale cyber-attack remained top of mind due to the increasing frequency of state-sponsored attacks and global tensions. The escalation of international conflicts such as the Russian invasion of Ukraine and tensions between China and the United States also exposed several research projects and collaborative relationships to risk. The NRC continued to face the threat of talent shortages for highly skilled professionals due to competition from universities and the private sector. Rising operating costs and reduced R&D spending across the Canadian economy increased downward pressure on NRC revenues and activities with clients, while supply chain disruptions made the timely delivery of goods and materials for critical projects less predictable. Finally, the NRC faced risks to the ongoing operations of its facilities and equipment due to aging research infrastructure. In 2022–23, the NRC put several measures in place to address these risks and uncertainties:

- Revenue pressures were effectively managed through a variety of existing controls, including continuous financial forecasting and planning, and the development of two-year financial plans for business units. To mitigate the risk of supply chain disruptions for critical projects, joint monitoring of procurement requirements with Public Services and Procurement Canada increased and emergency procurement contracts were put in place where needed.
- The NRC executed an action plan to mitigate the risks posed by the Russia-Ukraine conflict and continues to monitor the evolving situation of geopolitical risks.
- To mitigate the risk of a cyber-attack, the NRC implemented a program to strengthen its network and reduce vulnerabilities, including the upgrading of NRC devices.
- The risk of a talent shortage was mitigated through the development of a new Talent Attraction Strategy, the hiring of a new Talent Engagement and Outreach Officer, and the implementation of a hybrid work model to provide employees with flexibility.
- The risk of facility and equipment failure was mitigated by securing funding for the NRC's Facilities Renewal Plan, a critical step towards revitalizing research infrastructure.

Results achieved

The following table shows, for the NRC's core responsibility of Science and Innovation, the results achieved, the performance indicators, the targets and the target dates for 2022–23, and the actual results for the three most recent fiscal years for which actual results are available.

Departmental results	Performance indicators	Target	Date to achieve target	2020–21 actual results	2021–22 actual results	2022–23 actual results
Scientific and technological knowledge advances	Citation score of NRC-generated publications relative to the world average[12]	1.40	March 31, 2023	1.38	1.21	1.19
	Number of peer-reviewed publications generated by the NRC	975		1,090	1,187	1,222
	Number of patents issued to the NRC	100		118	99	104
	Number of licence agreements	40		54	30	46
	Ratio of the NRC's workforce made up of underrepresented groups relative to Canadian average labour market availability in Science, Technology, Engineering, and Mathematics (STEM)[13]	1.0		1.02	1.03	1.04
Innovative businesses grow	Percentage of R&D clients who report positive benefits of working with the NRC	86%		87%	93%	89%
	Percentage revenue growth of firms engaged with the NRC (NRC IRAP-engaged firms)[14]	20%		32%	32%	35%
	Percentage growth in Canada's science and technology related jobs through NRC supported firms (NRC IRAP-engaged firms)[14]	10%		20%	18%	21%
	Revenue earned from clients and collaborators	$85M		$65.1M	$86.2M	$84.7M
Evidence-based solutions inform decisions in Government priority areas	Revenue earned from other federal government departments	$75M		$76.4M	$79.6M	$80.4M
	Number of NRC peer-reviewed publications co-authored with other federal government departments	50		62	83	62

Financial, human resources and performance information for the NRC's program inventory is available in GC InfoBase.[xlii]

[12] Field-Weighted Citation Impact Score (FWCI) measured over a period of three calendar years. Based on NRC peer-reviewed publications indexed in Scopus as of April 2023.
[13] The target and results in the table are focused on the workforce representation of women in STEM. Results for overall workforce representation of women were 1.04 in 2022-23, 1.03 in 2021-22, 1.02 in 2020-21 for Indigenous Peoples were 0.63 in 2022–23, 0.61 in 2021–22 and 0.52 in 2020–21. Results for persons with disabilities were 0.57 in 2022–23, 0.45 in 2021–22 and 0.43 in 2020–21. Results for racialized persons were 1.00 in 2022–23, 0.94 in 2021–22 and 0.93 in 2020–21. All results are based on 2016 census data.
[14] Measured over a period of two calendar years and lagging by two years.

Budgetary financial resources (dollars)

The following table shows, for Science and Innovation, budgetary spending for 2022–23, as well as actual spending for that year.

2022–23 Main Estimates	2022–23 planned spending	2022–23 total authorities available for use	2022–23 actual spending (authorities used)	2022–23 difference (actual spending minus planned spending)
1,290,738,548	1,290,738,548	1,563,878,142	1,306,954,477	16,215,929

Financial, human resources and performance information for the NRC's program inventory is available in GC InfoBase.[xliii]

Human resources (full-time equivalents)

The following table shows, in full-time equivalents, the human resources the department needed to fulfill this core responsibility for 2022–23.

2022–23 planned full-time equivalents	2022–23 actual full-time equivalents	2022–23 difference (actual full-time equivalents minus planned full-time equivalents)
3,417.8	3,300.8	-117.0

Financial, human resources and performance information for the NRC's program inventory is available in GC InfoBase. [xlii]

Internal services

Description

Internal services are those groups of related activities and resources that the federal government considers to be services in support of programs or required to meet corporate obligations of an organization. Internal services refer to the activities and resources of the ten distinct service categories that support program delivery in the organization, regardless of the internal services delivery model in a department. The ten service categories are:

- acquisition management services
- communication services
- financial management services
- human resources management services
- information management services

- information technology services
- legal services
- material management services
- management and oversight services
- real property management services

Enabling R&D through NRC corporate service resources

The NRC provides the necessary tools and services to support its research staff and its entire workforce in the achievement of the organization's priorities and goals. In 2022–23, the NRC's corporate services were adapted to not only comply with evolving federal measures and directives, but also to ensure a safe, healthy, productive and harmonious work environment.

The NRC's Human Resources (HR) Branch underwent an extensive review and renewal of its structure and service delivery model to better support NRC strategic and operational priorities. The renewal plan strengthens existing strategies and initiatives in EDI, wellness and mental health, and talent attraction, development and retention.

- EDI: To support implementation of the EDI strategy, new hiring tools and practices were adopted, including an inclusive hiring checklist, prioritization of designated groups in job posters, and partnerships to improve outreach and recruitment opportunities for diverse job seekers. The NRC also continued to update and promote EDI and anti-racism resources, training, learning events and networks, and consulted with stakeholders, including persons with disabilities, on the development of the NRC's Accessibility Plan 2023-2025. In addition, the NRC implemented a monitoring framework for representation and hiring goals, including progress reports to senior management. Indigenous Peoples, persons with disabilities, and racialized persons accounted for 38% of external hiring in 2022–23.
- Wellness and mental health: Training has been a key action of the wellness strategy, and mandatory training was provided for supervisors on managing mental health crisis in the workplace, as well as workplace harassment and violence training for all employees. Other training, webinars, and information sessions were promoted in the areas of resiliency, work-life balance, hybrid work, managing change, and digital well-being.
- Talent attraction, development and retention: In 2022–23, the NRC Student Employment program continued to prioritize students who self-declare as members of equity deserving groups, and a new approach was piloted to recruit Indigenous students. The NRC participated in several job fairs focused on the recruitment of diverse and underrepresented talent, and a new Talent Engagement and Outreach officer was recruited to support NRC efforts in reaching more robust and diverse talent pools. In addition, the Mentoring@theNRC program grew by 12%, and employees from equity deserving groups were prioritized in nomination and selection for leadership development programs.

The NRC continued to strengthen its Values and Ethics policy framework by launching a new Conflict of Interest (COI) declaration system and a mandatory online course to support employees in better understanding and managing COI. A set of directives and a manager's toolkit for the NRC Policy on Workplace Harassment and Violence Prevention and Resolution were developed, and the NRC Research Ethics Board initiated training and awareness on Indigenous research ethics to support the review of protocols for research involving human participants. The NRC's values and ethics program was also strengthened through conflict of interest management, and tools for harassment and violence prevention, conflict resolution, and research ethics.

A flexible and fit-for-purpose approach to providing research IT ensures that partners get the highest possible value from their investment in scalable, sustainable and inclusive IP generation. In 2022–23, the NRC made improvements to its IT infrastructure, tools and systems to better support the work of its employees and partners, and to help create government-wide science capabilities. The NRC continues to leverage data analytics and visualization to streamline its audit and evaluation processes to allow for more timely advisory services to management for decision-making.

- The NRC secured increased contracting delegations for goods from PSPC in March 2023, which is expected to allow more timely procurement below $750,000. This greater flexibility will enable alignment with the unique needs of researchers, which require highly responsive and agile service delivery, as well as the delivery of major projects in support of our new capital funding.
- The NRC developed a cyber security framework, strategy and roadmap to enable faster responses to reduce the overall impact of cyber events. This rigorous, agile and pro-active approach to cybersecurity lowers the likelihood that cyber incidents will disrupt NRC research and services, which strengthens collaborator trust that IP related research generated with the NRC remains secure and protected.
- As part of an action plan for the management of NRC research and licensing agreements, the NRC leveraged updated IT tools for the implementation of a new governance model, a Client Agreements Policy and Directive, and a risk-based framework to better support research and licensing activities.

The NRC continued its efforts to ensure the health, safety and security of its employees and partners in 2022–23, by streamlining security screening processes, and enhancing responses to incidents and major weather events. In addition, guidance and advisory services were provided on workplace modifications related to the COVID-19 restrictions and effectively manage the return to work on-site under a new hybrid work model in clean and safe buildings.

- To strengthen the security of NRC infrastructure, information and assets, the NRC modernized its security processes by integrating a simplified, customizable, digital

screening system, upgrading security camera capabilities and implementing an egress[15] system for better access control to key buildings. The NRC also advanced its travel security program towards becoming a gold standard for security in a science-based organization.

- The NRC's Incident Command Team ensured a timely response to two serious safety incidents in 2022–23. In light of those incidents, the NRC also reviewed its health and safety protocols to ensure that they continue to provide NRC staff with the resources needed to conduct their work in a safe manner.
- The NRC also successfully responded to several weather events, including major ones – Hurricane Fiona, which affected Atlantic Canada and Eastern Quebec in September 2022, and a May 2023 derecho storm that struck Southeastern Ontario and Southwestern Quebec – by assessing damage, completing necessary repairs, and ensuring ongoing communications to researchers for a safe return to NRC scientific facilities and buildings.

The NRC increased social media posts (Twitter, LinkedIn and Instagram) by over 38% from the previous year, to raise the NRC's profile and role in key government priorities such as climate action, life sciences, and digital/quantum, and launched a LinkedIn blog series that appeared in 225,818 newsfeeds and was read 7,243 times. Respecting differences and removing barriers so that everyone can participate with full access and use of information were key factors in the NRC's commitment to champion accessibility for its communications products and in the development of long-term plans to promote accessibility in all NRC digital and print communications products.

In 2022–23, the NRC leveraged its Facilities Review and secured new funding to revitalize its capital assets portfolio of buildings and facilities. Announced in the 2022 Fall Economic Statement,[xliv] the Government of Canada is investing $962.2 million over eight years and $121.1 million ongoing to renew the NRC's facilities and real property as part of the modernization of the NRC to better invent, innovate, and prosper. Leveraging the new funding, the NRC created an Office of Facilities Renewal Management (OFRM) to advance the delivery of major capital projects and oversee organizational investment planning. The OFRM team was rapidly formed to support the selection of the first wave of major capital investment at the NRC, and is leading efforts to establish a process to identify projects in future waves. Revitalizing NRC facilities, real property and assets will strengthen Canada's science, technology and innovation ecosystem and benefit Canadian SMEs by giving them access to R&D services and specialized facilities they otherwise could not afford.

[15] Egress devices are designed to be installed on the secured side of a door to allow quick and easy exit to people on the inside for emergency purposes, while restricting access to outsiders.

Contracts awarded to Indigenous businesses

The NRC is on track to achieve the minimum 5% target by the end of March 31, 2025[16].

Computer equipment acquisitions accounted for the majority of spending directed to Indigenous businesses for 2022–23, however there was a decrease from the previous year. Indigenous Participation Plans were integrated into requests for proposals for construction services at the end of 2022–23, and the NRC anticipates a positive impact and increased spending toward Indigenous businesses for 2023–24.

The NRC continued to identify opportunities and challenges related to the Indigenous Procurement Strategy and identified construction, computer equipment, and office furniture and furnishings as specific commodities for future Indigenous procurement.

Description	2022–23 forecasted % target	2022–23 actual % achieved	2023–24 planned % target
Total percentage of contracts with Indigenous businesses	3%	1.8%	3%

Budgetary financial resources (dollars)

The following table shows, for internal services, budgetary spending for 2022–23, as well as spending for that year.

2022–23 Main Estimates	2022–23 planned spending	2022–23 total authorities available for use	2022–23 actual spending (authorities used)	2022–23 difference (actual spending minus planned spending)
146,649,676	146,649,676	164,944,866	163,802,501	17,152,825

[16] The NRC is a Phase 3 organization and the implementation schedule for Phase 3 departments set by Indigenous Services Canada is: April 1, 2024, to March 31, 2025.

Human resources (full-time equivalents)

The following table shows, in full-time equivalents, the human resources the department needed to carry out its internal services for 2022–23.

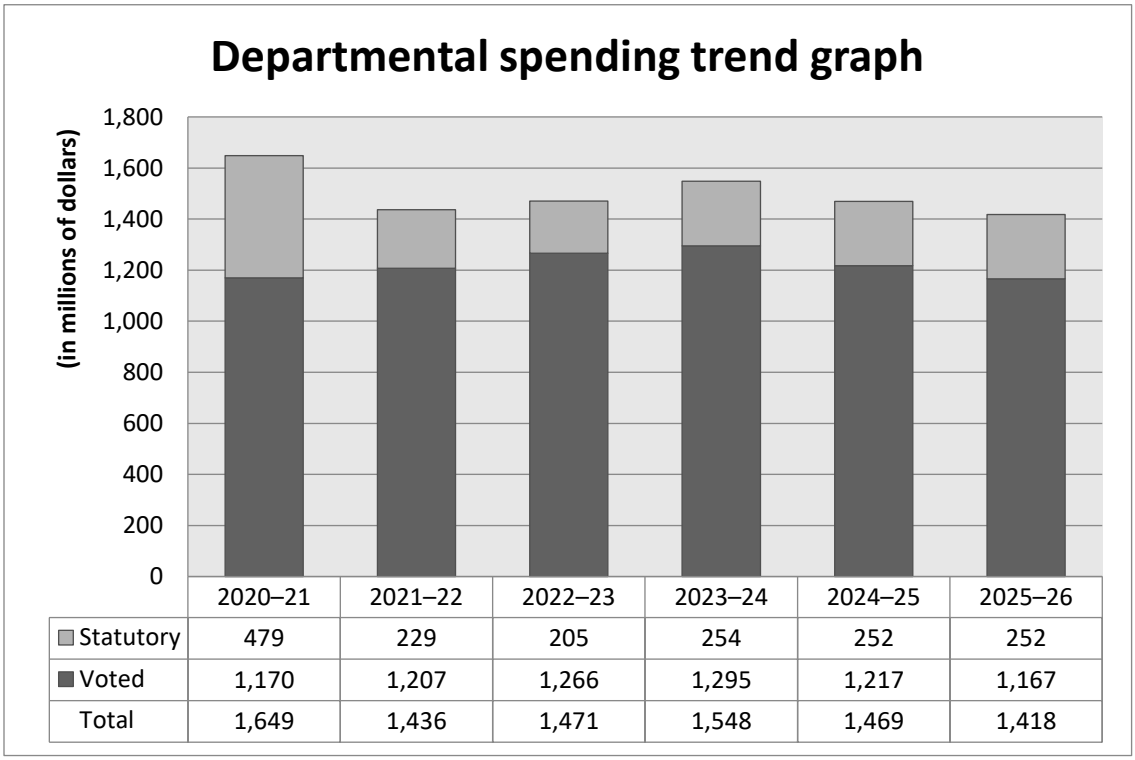
2022–23 planned full-time equivalents	2022–23 actual full-time equivalents	2022–23 difference (actual full-time equivalents minus planned full-time equivalents)
1,009.4	962.5	(46.9)

Spending and human resources

Spending

Spending 2020–21 to 2025–26

The following graph presents planned (voted and statutory spending) over time



	2020–21	2021–22	2022–23	2023–24	2024–25	2025–26
Statutory	479	229	205	254	252	252
Voted	1,170	1,207	1,266	1,295	1,217	1,167
Total	1,649	1,436	1,471	1,548	1,469	1,418

The NRC's actual spending of $1,470.8M in 2022–23 represents an increase of $34.5M from the $1,436.3M spent in 2021–22. This variance is primarily due to increases in grants and contributions and operating costs, partially offset by a decrease in capital spending.

Actual spending of $1,470.8M in 2022–23 in comparison to planned spending of $1,437.4M represents an overall increase of $33.4M (2.3%). The variance is due to additional grants and contributions funding received for NRC IRAP, and incremental funding provided during the year to deliver the NRC's research mandate.

The following table summarizes 2022–23 spending and year-over-year variances.

In millions of dollars	2022–23 Spending	Variance from 2021–22	Variance from 2020–21
NRC IRAP – Firms and Organizations	460.4	65.6	142.5
International Astronomical Observatories Program	26.6	-0.9	1.1
TRIUMF	59.3	-2.9	-0.1
Collaborative Science, Technology and Innovation	34.8	2.9	6.8
NRC IRAP - Youth Employment and Skills Strategy	19.4	-44.1	0.2
NRC IRAP – Innovation Assistance Program	-	-	-375.4
Grants under Innovative Solutions Canada Program	9.6	-0.1	-0.5
NRC IRAP Vaccines & Therapeutics	-	-	-3.3
Other	2.2	1.0	1.0
Grants and Contributions	**612.3**	**21.5**	**-227.7**
COVID-19 initiatives	46.1	-10.2	-9.8
All other	46.8	-7.2	-7.9
Capital	**92.9**	**-17.4**	**-17.7**
Operating	560.7	54.4	66.6
Statutory Revenue	136.2	-27.0	-1.8
Contributions to Employee Benefit Plans (EBP)	68.7	2.9	2.7
Operating/Revenue/EBP	**765.6**	**30.3**	**67.5**
Total Expenditures	**1,470.8**	**34.4**	**-177.9**

Budgetary performance summary for core responsibility and internal services (dollars)

The “Budgetary performance summary for core responsibility and internal services” table presents the budgetary financial resources allocated for the NRC’s core responsibility and for internal services.

Core responsibility and internal services	2022–23 Main Estimates	2022–23 planned spending	2023–24 planned spending	2024–25 planned spending	2022–23 total authorities available for use	2020–21 actual spending (authorities used)	2021–22 actual spending (authorities used)	2022–23 actual spending (authorities used)
Science and Innovation	1,290,738,548	1,290,738,548	1,388,919,204	1,305,366,917	1,563,878,142	1,503,588,404	1,285,688,819	1,306,954,477
Internal services	146,649,676	146,649,676	159,510,996	163,909,564	164,944,866	145,066,909	150,620,495	163,802,501
Total	**1,437,388,224**	**1,437,388,224**	**1,548,430,200**	**1,469,276,481**	**1,728,823,008**	**1,648,655,313**	**1,436,309,314**	**1,470,756,978**

Human resources

The “Human resources summary for core responsibility and internal services” table presents the full-time equivalents (FTEs) allocated to each of the NRC’s core responsibility and to internal services.

Human resources summary for core responsibility and internal services

Core responsibility and internal services	2020–21 actual full-time equivalents	2021–22 actual full-time equivalents	2022–23 planned full-time equivalents	2022–23 actual full-time equivalents	2023–24 planned full-time equivalents	2024–25 planned full-time equivalents
Science and Innovation	3,270.3	3,307.7	3,417.8	3,300.8	3,302.8	3,315.8
Internal services	991.0	978.2	1,009.4	962.5	1,007.6	1,007.6
Total	**4,261.3**	**4,285.9**	**4,427.2**	**4,263.3**	**4,310.4**	**4,323.4**

The NRC's actual 2022–23 FTEs (4,263.3) has decreased by 22.6 FTEs (0.5%) when compared to the 2021–22 FTE level (4,285.9). The decrease is mostly attributable to fewer FTEs within Internal Services and Enabling Services.

Description	2022–23 FTEs	Variance from 2021–22	Variance from 2020–21
R&D FTEs	2,632.4	-3.7	33.9
NRC IRAP FTEs	462.2	9.8	14.7
Internal Services and Enabling Services FTEs	1,168.7	-28.8	-46.7
Total NRC FTEs	**4,263.3**	**24.6**	**176.5**

Expenditures by vote

For information on the NRC's organizational voted and statutory expenditures, consult the Public Accounts of Canada.[xlv]

Government of Canada spending and activities

Information on the alignment of the NRC's spending with Government of Canada's spending and activities is available in GC InfoBase.[xlvi]

Financial statements and financial statements highlights

Financial statements

The NRC's financial statements (audited) for the year ended March 31, 2023, are available on the department's website[xlvii].

Financial statement highlights

Condensed Statement of Operations (audited) for the year ended March 31, 2023 (dollars)

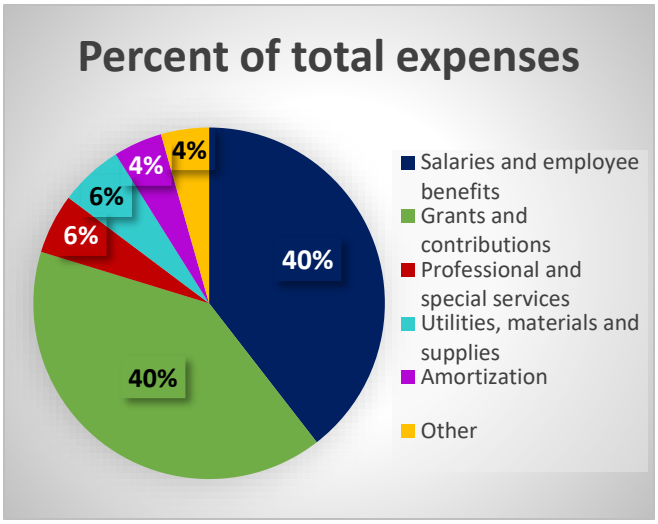
Financial information	2022–23 planned results	2022–23 actual results	2021–22 actual results (restated)	Difference (2022–23 actual results minus 2022–23 planned results)	Difference (2022–23 actual results minus 2021–22 actual results)
Total expenses	1,450,331,000	1,479,917,000	1,402,832,000	29,586,000	77,085,000
Total revenues	187,522,000	189,254,000	168,417,000	1,732,000	20,837,000
Net cost of operations before government funding and transfers	1,262,809,000	1,290,663,000	1,234,415,000	27,854,000	56,248,000

The NRC's consolidated financial statements include both the NRC and its portion of the accounts of the Canada-France-Hawaii Telescope Corporation (CFHT) and TMT International Observatory LLC (TIO). The NRC relationship with CFHT and TIO meets the definition of a government partnership under Canadian public sector accounting standards, which requires that its results be proportionally consolidated within those of the NRC. All inter-organizational balances and transactions are eliminated as part of the consolidation process. CFHT and TIO statements as at December 31, 2022 have been proportionally consolidated with the NRC's March 31 accounts.

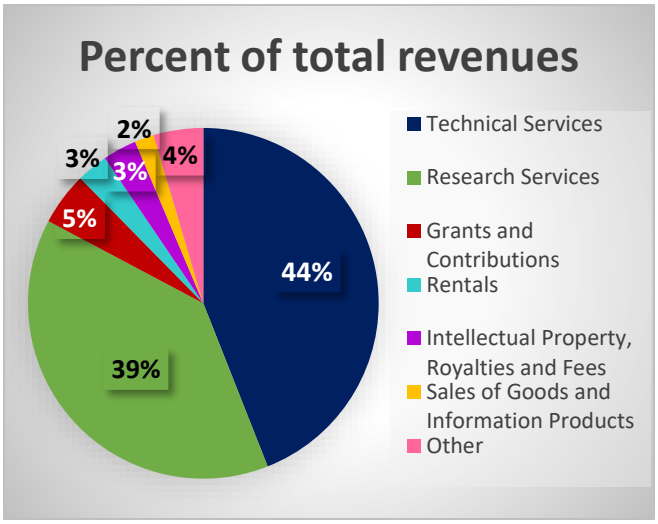
The NRC's consolidated total expenses of $1,480M in 2022–23 represent an increase from $1,403M in 2021–22. The NRC's major expense components are salaries and employee benefits ($585M) and grants and contributions ($595M), representing 80% of total expenses. The $77M increase is primarily due to an increase in grants and contributions of $19M, an increase in salary and employee and benefits of $18M, and an increase of $40M in other operating expenses. The variance in grants and contributions is mainly due to a $59M increase in the NRC IRAP contribution to firms, a $44M decrease in NRC IRAP Youth Employment and Skills Strategy contributions and a $6.7M increase in NRC IRAP contributions to organizations. The salary increase is mainly due to increased rates of pay linked to collective bargaining. Other expense increases are mainly due to a $12.5M increase in professional services, $9.1M increase in amortization, $7.6M increase in transportation and communication and a $5.2M increase in utilities, materials and supplies. The planned expenses, as reported in the NRC's Consolidated Future Oriented Financial Statements in the 2022–23 Departmental Plan were $1,450M. The variance between planned and actual results of $30M is primarily due to increases of $13M in grants and contributions, $12M in other expenses and $5M in salaries.

The NRC generates revenue which can be reinvested in operations. The NRC's consolidated total revenues of $189M in 2022–23 represent an increase from $168M in 2021–22. The NRC's major revenue components were research services ($73M) and technical services ($83M), representing 83% of revenues. The planned revenue, as reported in the NRC's Consolidated Future Oriented Financial Statements in the 2022–23 Departmental Plan was $187M.

Expenses by Type (2022–23)



Revenues by Type (2022–23)



The 2022–23 planned results information is provided in [the NRC's Future-Oriented Statement of Operations and Notes 2022–23](#).[xlviii]

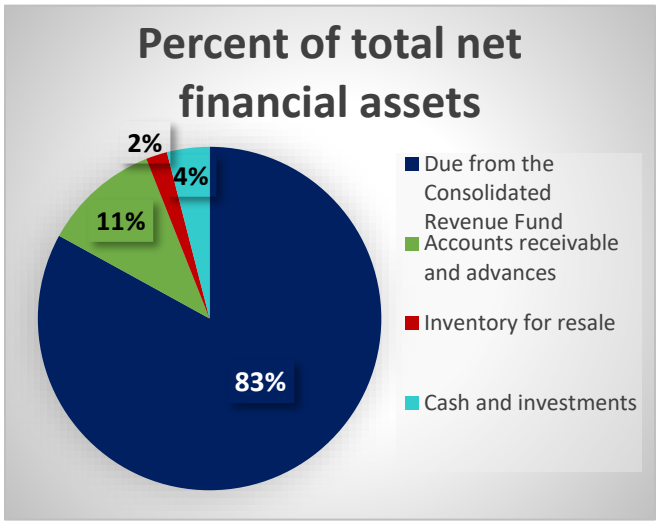
Condensed Statement of Financial Position (unaudited) as of March 31, 2023 (dollars)

Financial information	2022–23	2021–22 (restated)	Difference (2022–23 minus 2021–22)
Total net financial assets	390,809,000	326,495,000	64,314,000
Total net liabilities	334,293,000	306,739,000	27,554,000
Departmental net financial assets	56,516,000	19,756,000	36,760,000
Total non-financial assets	924,656,000	876,798,000	47,858,000
Departmental net financial position	981,172,000	896,554,000	84,618,000

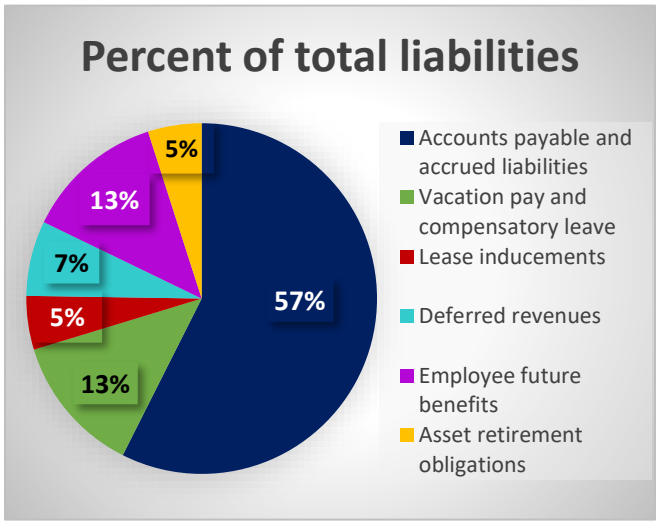
The NRC's consolidated net financial assets totaled $391M as at March 31, 2023, an increase of $65M from the March 31, 2022 balance of $326M. The balance is made up of the Due from the Consolidated Revenue Fund (CRF), accounts receivable, inventory for resale and cash and investments. The increase is primarily due to a $43M increase of the Due from the CRF, a $13M increase in accounts receivable and an $8M increase in cash and investments.

The NRC's consolidated liabilities consist of accounts payable and accrued liabilities, vacation and compensatory leave, lease inducements, deferred revenues, employee future benefits and asset retirement obligations. The balance as at March 31, 2023 of $334M represents a $27M increase from the March 31, 2022 balance of $307M. The increase is primarily due to a $17M increase in accounts payable and accrued liabilities and $9M increase in deferred revenues.

Net Financial Assets as at March 31, 2023



Liabilities as at March 31, 2023



The 2022–23 planned results information is provided in [the NRC's Future-Oriented Statement of Operations and Notes 2022–23.](#)[xlviii]

Corporate information

Organizational profile

Appropriate minister[s]: The Honourable François-Philippe Champagne, P.C., M.P., Minister of Innovation, Science and Industry

Institutional head: Iain Stewart, NRC President

Ministerial portfolio: Innovation, Science and Economic Development

Enabling instrument[s]: *National Research Council Act*,[xlix] R.S.C. 1985, c. N-15

Year of incorporation / commencement: 1916

Other: The NRC is a departmental corporation of the Government of Canada, reporting to Parliament through the Minister of Innovation, Science and Industry. The NRC works in partnership with members of the Innovation, Science and Economic Development Portfolio to leverage complementary resources to promote science and research and integrated innovation, to exploit synergies in key areas of science and technology, to promote the growth of small and medium-sized enterprises and to contribute to Canadian economic growth. The NRC's Council provides independent strategic advice to the NRC President and it reviews organizational performance. The President provides leadership and strategic management and is responsible for the achievement of the NRC's long-range goals and plans in alignment with government

priorities. Each of the NRC's Vice-Presidents is responsible for a number of areas composed of programs and research initiatives, centres, the Industrial Research Assistance Program, and/or a corporate branch. Vice-Presidents and NRC managers are responsible for executing plans and priorities to ensure successful achievement of objectives.

Raison d’être, mandate and role: who we are and what we do

“Raison d’être, mandate and role: who we are and what we do” is available on the NRC’s website corporate page.[l]

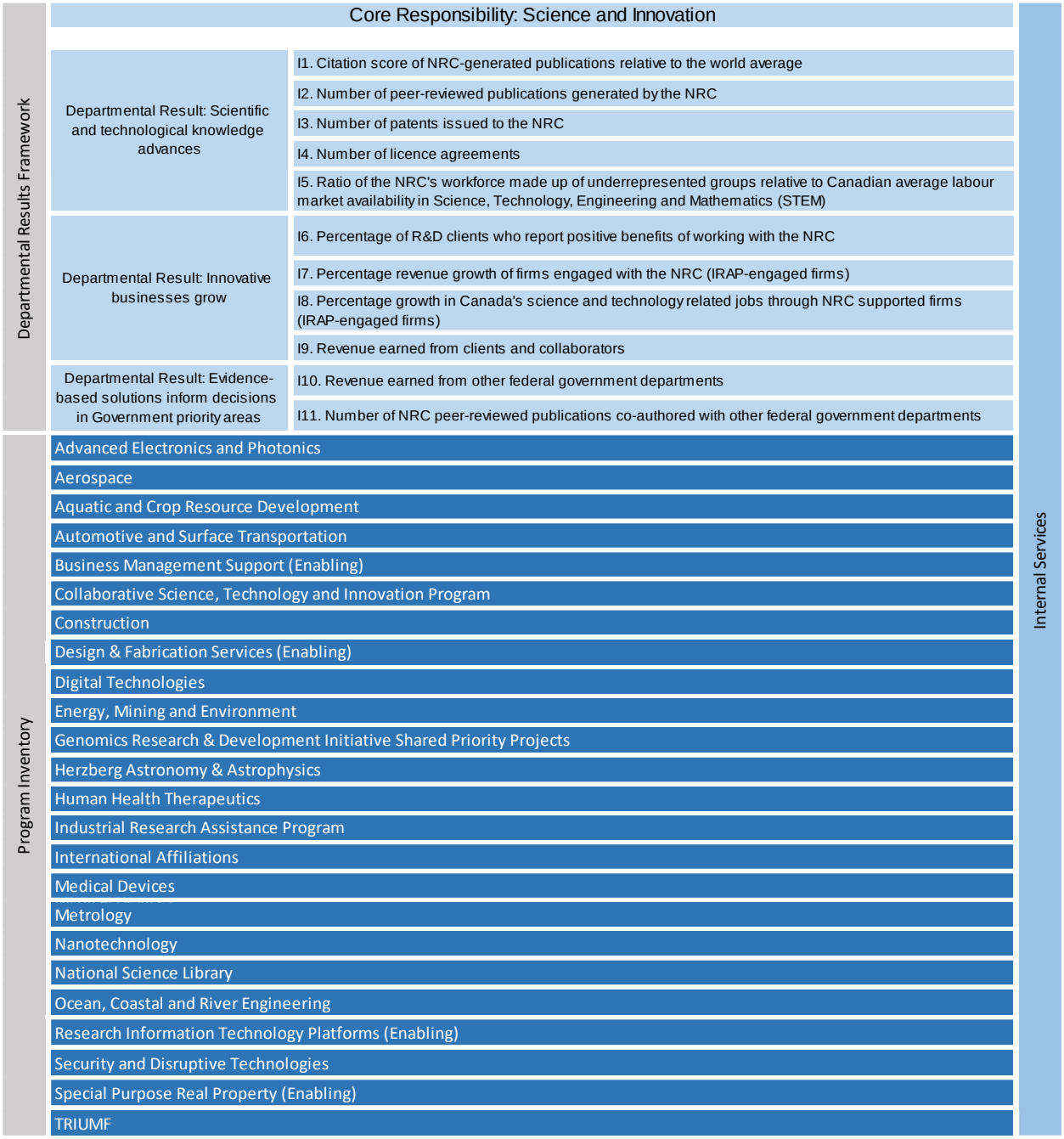
For more information on the department’s organizational mandate letter commitments, see the Minister’s mandate letter.[iii]

Operating context

Information on the operating context is available on the NRC’s website[i].

Reporting framework

The NRC's departmental results framework and program inventory of record for 2022–23 are shown below.



Supporting information on the program inventory

Financial, human resources and performance information for the NRC's program inventory is available in GC InfoBase.[li]

Supplementary information tables

The following supplementary information tables are available on the NRC's 2022–23 Departmental Results Index page[lii]:

- Details on transfer payment programs
- Gender-based analysis plus
- Response to Parliamentary Committees and External Audits

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.[liii] This report also provides detailed background information on tax expenditures, including descriptions, objectives, historical information and references to related federal spending programs as well as evaluations and GBA Plus of tax expenditures.

Organizational contact information

Mailing address: National Research Council Canada
1200 Montreal Road, Bldg. M-58
Ottawa, Ontario, Canada K1A 0R6

Telephone: 613-993-9101 or toll-free 1-877-NRC-CNRC (1-877-672-2672)

TTY: 613-949-3042

Fax: 613-991-9096

Email: info@nrc-cnrc.gc.ca

Website(s): https://nrc.canada.ca/en/[i]

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 3-year period. Departmental Plans are usually tabled in Parliament each spring.

departmental priority *(priorité)*

A plan or project that a department 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 departmental results.

departmental result *(résultat ministériel)*

A consequence or outcome that a department seeks to achieve. 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 quantitative measure of progress on a departmental result.

departmental results framework *(cadre ministériel des résultats)*

A framework that connects the department's core responsibilities to its departmental results and departmental result indicators.

Departmental Results Report *(rapport sur les résultats ministériels)*

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

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. For a particular position, the full-time equivalent figure is the ratio of

number of hours the person actually works divided by the standard number of hours set out in the person's collective agreement.

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

An analytical tool used to support the development of responsive and inclusive policies, programs and other initiatives; and understand how factors such as sex, race, national and ethnic origin, Indigenous origin or identity, age, sexual orientation, socio-economic conditions, geography, culture and disability, impact experiences and outcomes, and can affect access to and experience of government programs.

government-wide priorities *(priorités pangouvernementales)*

For the purpose of the 2022–23 Departmental Results Report, government-wide priorities are the high-level themes outlining the government's agenda in the November 23, 2021, Speech from the Throne: building a healthier today and tomorrow; growing a more resilient economy; bolder climate action; fighter harder for safer communities; standing up for diversity and inclusion; moving faster on the path to reconciliation; and fighting for a secure, just and equitable world.

horizontal initiative *(initiative horizontale)*

An initiative where two or more federal organizations 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 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.

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.

program inventory *(répertoire des programmes)*

Identifies all the department's programs and describes how resources are organized to contribute to the department's core responsibilities and results.

result *(résultat)*

A 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.

Indigenous business ***(enterprise autochtones)***

For the purpose of the *Directive on the Management of Procurement Appendix E: Mandatory Procedures for Contracts Awarded to Indigenous Businesses* and the Government of Canada's commitment that a mandatory minimum target of 5% of the total value of contracts is awarded to Indigenous businesses, an organization that meets the definition and requirements as defined by the Indigenous Business Directory.

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.

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. NRC website, https://nrc.canada.ca/en/
ii Government of Canada publications, http://www.publications.gc.ca/
iii. Minister of Innovation, Science and Industry Mandate Letter, https://pm.gc.ca/en/mandate-letters/2021/12/16/minister-innovation-science-and-industry-mandate-letter
iv. Challenge programs, https://nrc.canada.ca/en/research-development/research-collaboration/programs/challenge-programs
v. Cluster Support programs, https://nrc.canada.ca/en/research-development/research-collaboration/programs/cluster-support-programs
vi. Clean and Energy-efficient Transportation program, https://nrc.canada.ca/en/research-development/research-collaboration/clean-energy-efficient-transportation-program
vii. High-efficiency Mining program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/high-efficiency-mining-program
viii. NRC mining sensors hub, https://nrc.canada.ca/en/research-development/nrc-facilities/mining-sensors-hub
ix. Ciguatera poisoning, https://www.canada.ca/en/public-health/services/diseases/ciguatera.html
x. NRC TimeLink services, https://nrc.canada.ca/en/certifications-evaluations-standards/instrument-calibration-services/frequency-time-calibration-services
xi. Developing new standards for cancer treatments at the TRIUMF, https://nrc.canada.ca/en/stories/developing-new-standards-cancer-treatments
xii. NRC Ideation Fun, https://nrc.canada.ca/en/research-development/research-collaboration/programs/ideation-fund-where-breakthroughs-begin
xiii. Collaboration centres, https://nrc.canada.ca/en/research-development/research-collaboration/collaboration-centres
xiv. CRAFT facilities, https://craftmicrofluidics.ca/facilities/#craftdevicefoundry
xv. IP Assist Program, https://nrc.canada.ca/index.php/en/support-technology-innovation/nrc-irap-support-intellectual-property
xvi. 2022–23 Nanotechnology Program Evaluation, https://nrc.canada.ca/en/corporate/planning-reporting/evaluation-nanotechnology-research-centre
xvii. Biologics Manufacturing Centre, https://nrc.canada.ca/en/research-development/nrc-facilities/biologics-manufacturing-centre
xviii. NRC's Clinical Trial Material Facility, https://nrc.canada.ca/en/research-development/nrc-facilities/clinical-trial-material-facility
xix Construction Sector Digitization and Productivity Challenge program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/construction-digitalization-productivity-challenge-program
xx. Low Carbon Built Environment Challenge program,https://nrc.canada.ca/en/research-development/research-collaboration/programs/low-carbon-built-environment-challenge-program
xxi. Materials for Clean Fuels Challenge program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/materials-clean-fuels-challenge-program
xxii. Self-driving labs for gold-powered electrofuels, https://nrc.canada.ca/en/stories/self-driving-labs-gold-powered-electrofuels
xxiii. High-Throughput and Secure Networks Challenge program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/high-throughput-secure-networks-challenge-program
xxiv. Disruptive Technology Solutions for Cell and Gene Therapy Challenge program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/disruptive-technology-solutions-cell-gene-therapy-challenge-program
[xxv] Made-in-Canada cancer therapy offers patients new hope, https://nrc.canada.ca/en/stories/made-canada-cancer-therapy-offers-patients-new-hope

xxvi. Artificial Intelligence for Design Challenge program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/artificial-intelligence-design-challenge-program
xxvii. Accelerated materials innovation for clean fuels, https://nrc.canada.ca/en/research-development/research-collaboration/programs/accelerated-materials-innovation-clean-fuels-call-proposals
xxviii. Aging in Place Challenge program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/aging-place-challenge-program
xxix. Arctic and Northern Challenge program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/arctic-northern-challenge-program
xxx. Internet of Things: Quantum Sensors Challenge program, https://nrc.canada.ca/en/research-development/research-collaboration/programs/internet-things-quantum-sensors-challenge-program
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Supplementary Information Tables: 2022-23 Departmental Results Report

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Details on transfer payment programs

Assessed Contribution to the Bureau International des Poids et Mesures (BIPM)

Start date: 1907 (Canada signed the Metre Convention and became a member state of the BIPM)

End date: Ongoing

Type of transfer payment: Contribution

Type of appropriation: Estimates

Fiscal year for terms and conditions: 2018–19

Link to departmental result(s): Scientific and technological knowledge advances; Innovative businesses grow; Evidence-based solutions inform decisions in Government priority areas

Link to the department's Program Inventory: Metrology

Purpose and objectives of transfer payment program: The assessed contribution to the BIPM is an obligation accepted by Canada as a signatory to the international treaty known as the Metre Convention. By representing Canada on the international metrology stage through its affiliation with the BIPM and associated regional metrology organization *Sistema Interamericana de Metrologia* (SIM), the NRC can effectively and efficiently respond to its mandated responsibility for maintenance of national measurement standards, as articulated in the *NRC Act* and the *Weights and Measures Act*.

Results achieved: By maintaining international recognition in measurement science through its interactions with other member states of the treaty, the NRC continues to provide metrology research and services that help transform ideas into market-ready technologies that benefit Canadian society, the economy, and the environment.

Findings of audits completed in 2022-23: N/A

Findings of evaluations completed in 2022-23: N/A - Evaluation completed in 2021-22.

Engagement of applicants and recipients in 2022-23: In 2022-23, engagement with the SIM Quality System Task Force (QSTF) resulted in the approval of the NRC's Quality Management System (QMS), supporting its internationally recognized Calibration and Measurement Capabilities in Photometry and Radiometry and Dimensional Metrology. The peer reviews were successfully completed and submitted to SIM for approval of the QMS in May 2023 for the following metrology areas: Acoustics, Ultrasound and Vibration, Biotoxin Metrology and Radioactivity. Other engagement was the addition or improvement of Calibration and Measurement Capabilities in the BIPM key comparison database in the areas of Acoustics, Humidity and Inorganic Chemistry.

Financial information (dollars)

Type of transfer payment	2020-21 Actual spending	2021-22 Actual spending	2022-23 Planned spending	2022-23 Total authorities available for use	2022-23 Actual spending (authorities used)	Variance (2022-23 actual minus 2022-23 planned)
Total grants	-	-	-	-	-	-
Total contributions	650,198	608,795	659,000	628,833	628,833	(30,167)
Total program	**650,198**	**608,795**	**659,000**	**628,833**	**628,833**	**(30,167)**

Explanation of variances

Variance immaterial.

Biologics Manufacturing Centre (BMC)

Start date: April 2023

End date: March 2033

Type of transfer payment: Contribution

Type of appropriation: Estimates

Fiscal year for terms and conditions: 2022-23

Link to departmental result(s): Innovative businesses grow; Evidence-based solutions inform decisions in Government priority areas

Link to the department's Program Inventory: Biologics Manufacturing Centre

Purpose and objectives of transfer payment program: The objective of the contribution program is to support base line not-for-profit operational costs to ensure fulfillment of the following:

- Maintain and operate the BMC facility in a constant Good Manufacturing Practice (GMP)-readiness state to respond to pandemics and other health emergencies, ensuring surety of domestic vaccines and other biologics for Canadians;
- In non-emergency periods, focus on maintaining pandemic and other health emergency preparedness, supporting public interest projects not otherwise available and contributing to the domestic biomanufacturing sector's GMP production knowledge and capacity.
- Serve as a foundational element for a broader system of federal capabilities and assets to respond to future pandemics or other health emergencies.

Results achieved: The NRC oversaw complex processes in parallel in 2022-23: the operationalization of the facility, incorporation of the not-for-profit to operate the facility and establishment of its governance structure. These achievements were accomplished within a very short timeline and within the ongoing pressures of the pandemic.

Operationalizing the facility included completing all the technical steps and activities related to the commissioning, qualification and validation (CQV) process, as well as all related testing and GMP-required documentation. This work included developing and establishing more than 600 standard operating procedures and related documents, critical to establishing, maintaining and operating a GMP-certified facility. All staff and those involved in the operations of the facility were trained on the standard operating procedures and related documents.

In July 2022, Health Canada experts performed the GMP inspection at the BMC, covering all aspects of operating processes. The inspection confirmed that the BMC is complying with good manufacturing practices and the *Food and Drugs Act*. On August 5, 2022, Health Canada issued a drug establishment licence to the NRC, which authorizes the facility to manufacture and test non-sterile biologics and vaccines.

The intent has always been for the BMC to be self-contained and governed through a public-private partnership. To that end, in June 2022, the NRC initiated a nation-wide open call for proposals for a co-founder to jointly set up an independent not-for-profit corporation to operate the BMC. In October 2022, the Centre for Commercialization of Regenerative Medicine (CCRM), a leader in developing and commercializing regenerative medicine-based technologies and cell and gene therapies, was selected as the co-founder. In December 2022, the NRC and CCRM jointly established Biologics Manufacturing Centre (BMC) Inc. which officially assumed responsibility for operating the facility on April 1, 2023.

Working together, the NRC developed and executed a rigorous project plan, transitioning all operations, associated assets and operational documents, as well as establishing contribution and lease agreements, all while maintaining continuity of operations. In parallel, BMC Inc. operational staff were hired as employees by the new not-for-profit organization.

In 2022-23, the NRC completed the facility's operationalization and set up its not-for-profit governance. These achievements successfully conclude the NRC's role in establishing the Biologics Manufacturing Centre and help ensure Canada is well positioned to protect the health of Canadians going forward.

Findings of audits completed in 2022-23: N/A

Findings of evaluations completed in 2022-23: N/A – no evaluations completed yet.

Engagement of applicants and recipients in 2022-23: As part of the call for a co-founder to create a not-for-profit with the NRC, targeted outreach was undertaken with organizations in Canada's biomanufacturing sector, inviting them to submit a business case with their qualifications to co-found the not-for-profit corporation to operate the BMC. The selection process for the co-founder was undertaken by an external evaluation committee made up of representatives from industry, academia and government.

Financial information (dollars)

Type of transfer payment	2020-21 Actual spending	2021-22 Actual spending	2022-23 Planned spending	2022-23 Total authorities available for use	2022-23 Actual spending (authorities used)	Variance (2022-23 actual minus 2022-23 planned)
Total grants	-	-	-	-	-	-
Total contributions	-	-	-	975,300	975,300	975,300
Total program	**-**	**-**	**-**	**975,300**	**975,300**	**975,300**

Explanation of variances

The BMC is a new grants and contributions program that did not yet exist at the time of the 2022-23 Departmental Plan.

Collaborative Science, Technology and Innovation Program (CSTIP)

Start date: April 2018

End date: Ongoing

Type of transfer payment: Grants and contributions

Type of appropriation: Estimates

Fiscal year for terms and conditions: 2018–19

Link to departmental result(s): Scientific and technological knowledge advances; Innovative businesses grow; Evidence-based solutions inform decisions in Government priority areas

Link to the department's Program Inventory: Collaborative Science, Technology and Innovation Program

Purpose and objectives of transfer payment program: Provides grant and contribution funding for external collaborators with complementary capabilities [e.g., small and medium-sized enterprises (SMEs), post-secondary institutions and non-profit research organizations]. The program comprises:

1. NRC Collaborative Research & Development (R&D) initiatives: funding external collaborators working with NRC researchers on projects that make up a series of large-scale collaborative R&D programs in priority areas;
2. Ideation Fund: funding external collaborators working with NRC personnel to encourage, test and validate transformative self-directed, exploratory research ideas; and
3. Outreach Initiative: funding to support conferences, workshops, symposia or other outreach initiatives, in order to promote engagement of Canadians, particularly those in under-represented groups, interested in Science, Technology, Engineering and Mathematics (STEM).

Results achieved:

In 2022-23, 409 active collaborative funding agreements were managed across 11 Challenge programs, 5 Cluster Support programs, the Ideation Fund (New Beginnings and Small Teams), and Outreach.

To date the NRC has funded 775 collaborative research agreements and committed over $159 million in funding through CSTIP.

Numerous Strategic Planning Workshops were conducted in 2022-23 to inform the strategic priorities for the next round of 7-year Challenge programs (Round 3), which are planned to launch in Spring 2025.

The Applied Quantum Computing Challenge program announced through Budget 2021 was launched and the first set of projects commenced.

The creation of four new programs, announced through Budget 2022, was approved by Treasury Board, including two new Construction Challenge programs, a Critical Minerals/Advanced Materials Challenge program, and a top up to the Ocean Cluster support program aimed specifically at microplastics. Significant stakeholder engagement was conducted in the development of these programs, with all programs set to launch in 2023-24. In total, $46.46 million in G&C funding was provided (over 6 years) to the NRC for these 4 programs.

Findings of audits completed in 2022-23: N/A

Findings of evaluations completed in 2022-23: Evaluation underway; completion expected in 2023–24.

Engagement of applicants and recipients in 2022-23: There were 10 open calls for proposals issued across Challenge programs and Cluster Support programs in 2022-23.

Open calls within the NRC resulted in 52 New Beginnings and 2 Small Teams projects being selected for funding with external research collaborators.

In 2022-23, the NRC funded 63 new unique collaborators through the CSTIP, bringing the total number of unique collaborators since the program's inception to 219.

Partnerships with collaborative partners in both private and public sectors, academic and other research organizations both in Canada and internationally were maintained through 8 active Challenge programs and 5 active Cluster Support programs in 2022-23.

Financial information (dollars)

Type of transfer payment	2020-21 Actual spending	2021-22 Actual spending	2022-23 Planned spending	2022-23 Total authorities available for use	2022-23 Actual spending (authorities used)	Variance (2022-23 actual minus 2022-23 planned)
Total grants	18,359,497	24,159,401	28,600,000	29,164,506	28,592,497	(7,503)
Total contributions	9,542,593	7,731,419	8,339,479	7,007,715	6,165,894	(2,173,585)
Total program	**27,902,090**	**31,890,820**	**36,939,479**	**36,172,221**	**34,758,391**	**(2,181,088)**

Explanation of variances

Variance immaterial.

National Research Council Industrial Research Assistance Program (NRC IRAP)

Start date: April 1965 (original program start date)

End date: Ongoing

Type of transfer payment: Contribution

Type of appropriation: Estimates

Fiscal year for terms and conditions: 2019–20

Link to departmental result(s): Scientific and technological knowledge advances; Innovative businesses grow; Evidence-based solutions inform decisions in Government priority areas

Link to the department's Program Inventory: Industrial Research Assistance Program

Purpose and objectives of transfer payment program: The program contributes to the growth and prosperity of Canadian SMEs by stimulating innovation, adoption and/or commercialization of technology-based products, services, or processes in Canada. This is done through: 1) technical and related business advice and networking facilitated by a cross-Canada network of field professional staff; 2) cost-shared merit-based contributions; and 3) contributions supporting employment of post-secondary graduates. (This program has the following streams: Contributions to Firms; Contributions to Organizations; and Youth Employment Program).

NRC IRAP supports the placement of graduates in SMEs through its participation in the delivery of the Youth Employment Program sponsored by Employment and Social Development Canada's Youth Employment and Skills Strategy.

At the onset of the COVID-19 pandemic, NRC IRAP established a suite of ten temporary Subject Expert Teams to coordinate and accelerate support to Canadian SMEs that presented viable solutions to detect, prevent and treat COVID-19. Two Teams continue to support projects to further technology development, capacity building and manufacturing scale-up in response to COVID-19.

The program aims to contain broad flexibilities to reflect the different needs and realities of a variety of recipients from various industry sectors. This includes the possibility of non-repayable contributions under appropriate circumstances where the benefits to Canada would be significant, and in keeping with international obligations.

Results achieved:

- Stimulation of innovation in SMEs in Canada.
- Growth of innovative SMEs
- Creation of wealth for Canada.

Refer to the Main portion of the NRC's Departmental Results Report for additional results pertaining to NRC IRAP.

Findings of audits completed in 2022-23: N/A

Findings of evaluations completed in 2022-23: Evaluation completed in 2022-23.

Key Findings:

- NRC IRAP is reaching high-potential innovative clients as intended. The program has stimulated innovation-driven growth in the economy and supported the creation of wealth in Canada.
- The program funded a higher proportion of SMEs owned by diverse groups of Canadians than the proportion of SMEs owned by diverse Canadians in the overall population.
- NRC IRAP is designed and delivered in a manner that is consistent with comparative international programs and generally meets the needs of intended clients. However, some adjustments could be made to improve overall efficiency and ensure the program meets the specific needs of diverse groups.
- The program has become increasingly relevant as it fills a significant gap in the innovation support ecosystem for SMEs as well as other government departments.

The evaluation made 4 specific recommendations for the program:

1. Explore alternative solutions to tackle current HR challenges
2. Refine project development and approval processes and tools
3. Ensure the existing inclusiveness strategy and initiatives are better communicated to and operationalized by staff
4. Strengthen performance measurement and the use of data analytics

Engagement of applicants and recipients in 2022-23: NRC IRAP is a national program managed on a regional basis with over 260 Industrial Technology Advisors (ITAs) located in 106 points of service across the country, who provide customized advice to growth-oriented technologically innovative SMEs. ITAs engage with firms over a period of time, creating a plan to work with the firm to support their plans for innovation and growth. Support may be in the form of advisory services and/or financial support for innovative projects.

At the end of their funded project, recipients are required to complete an online Post-Project Report. This assessment captures information on the recipient's experience with NRC IRAP and, along with published service standards, is used by the program to develop continuous program improvements.

NRC IRAP has an Advisory Board composed of 10 to 12 members from industry and industry associations. This Board provides advice to NRC IRAP management and brings an external perspective on the strategic direction and management of the program.

Financial information (dollars)

Type of transfer payment	2020-21 Actual spending	2021-22 Actual spending	2022-23 Planned spending	2022-23 Total authorities available for use	2022-23 Actual spending (authorities used)	Variance (2022-23 actual minus 2022-23 planned)
Total grants	-	-	-	-	-	-
Total contributions	715,902,634	458,281,744	469,092,050	494,440,323	479,815,375	10,723,325
Total program	**715,902,634**	**458,281,744**	**469,092,050**	**494,440,323**	**479,815,375**	**10,723,325**

Explanation of variances

Variance due to additional funding available for Vaccine & Therapeutics program.

Innovative Solutions Canada (ISC)

Start date: December 2017

End date: Ongoing

Type of transfer payment: Grant

Type of appropriation: Estimates

Fiscal year for terms and conditions: The NRC received authority for the Innovation, Science and Economic Development (ISED)-led terms & conditions for Innovative Solutions Canada (ISC) grants in 2017–18 (January 2018).

Link to departmental result(s): ISC is an ISED-led program, with the NRC as one of 21 federal departments mandated to participate. Program results will be reported by ISED.

Link to the department's Program Inventory: Within the NRC, this ISED-led program is administered by NRC IRAP.

Purpose and objectives of transfer payment program: ISC is a grant and procurement program that enables participating departments and agencies to support the scale-up of Canadian small and medium-sized businesses through early-stage, pre-commercial R&D. The program allocates a portion of departmental funding to:

- Fuel the development and adoption of technological innovation in Canada.
- Grow Canadian companies through direct funding to support early stage, pre-commercial R&D, late-stage prototypes, and to accelerate commercialization.
- Encourage procurement from companies led by equity deserving groups, such as women, Indigenous Peoples, youth, racialized persons, persons with disabilities, 2SLGBTQ+ and others.

- Foster greater industry-research collaboration through the release of challenges for solutions that address key Government of Canada priorities.
- Provide federal departments and agencies with opportunities to develop new capabilities to meet their R&D needs and thereby advance government priorities.

Results achieved: NRC IRAP provided financial support for near-to-market solutions through ISED's ISC Challenge Program, investing $13.7 million in 2022-23, to support 43 projects with 19 Canadian SMEs. In addition, a total of 11 phase 2 projects were successfully completed. The NRC continues to be the leading ISC department in the number of challenges posted (32 in total), including the number of challenges issued in collaboration with other departments and awarded funded projects.

Findings of audits completed in 2022-23: N/A

Findings of evaluations completed in 2022-23: N/A – this is an ISED-led program.

Engagement of applicants and recipients in 2022-23: Initial engagement with applicants was completed via the ISC website, where all NRC challenges are posted (2 new ISC challenges posted in 2022-2023). This information was also shared on the ISED-ISC LinkedIn account. Internally, the ISC-IRAP team sent out an e-blast to all NRC IRAP ITAs and Client Relationship Leaders (CRLs) each time a new NRC challenge was posted. By doing so, ITAs and CRLs were encouraged to share the information with potential SME applicants.

Financial information (dollars)

Type of transfer payment	2020-21 Actual spending	2021-22 Actual spending	2022-23 Planned spending	2022-23 Total authorities available for use	2022-23 Actual spending (authorities used)	Variance (2022-23 actual minus 2022-23 planned)
Total grants	10,024,930	9,697,295	5,500,000	10,409,330	9,566,552	4,066,552
Total contributions	-	-	-	-	-	-
Total program	**10,024,930**	**9,697,295**	**5,500,000**	**10,409,330**	**9,566,552**	**4,066,552**

Explanation of variances

Variance due to additional grant funding received for the program.

International Affiliations Program

Start date: 1958

End date: Ongoing

Type of transfer payment: Grant

Type of appropriation: Estimates

Fiscal year for terms and conditions: 2011–12

Link to departmental result(s): Scientific and technological knowledge advances

Link to the department's Program Inventory: International Affiliations

Purpose and objectives of transfer payment program: Canada's membership in international science and technology (S&T) organizations promotes international research and innovation, networking, advocacy, leadership opportunities as well as access to benchmarking possibilities, enabling Canadian science, technology, and industry to remain competitive.

Results achieved: Enhanced the NRC's international visibility and Canada's reputation as a global leader in science, technology and innovation (STI), noting in particular that the International Science Council honoured Dr. Françoise Baylis (Professor, Dalhousie University), Dr. Rémi Quirion (Chief Scientist Quebec),

Dr. Gordon McBean (Professor, University of Western Ontario) as inaugural Fellows and Dr. Alan Bernstein, (Professor Emeritus, University of Toronto), Dr. Eliane Ubalijoro (Head, Future Earth Canada Hub), as Fellows.

Strengthened Canadian influence in solidifying interdisciplinary science-based global policy making, including the appointment of Dr. Karly Kehoe (Professor, Saint Mary's University) as Member of Science in Exile Steering Committee and Member, Standing Committee, Freedom and Responsibility in Science for the International Science Council.

Contributed to Canadian STI leader development via International Science Council opportunities for leadership development and leadership opportunities implementing equity, diversity and inclusion (EDI) approaches, including the new membership of the Royal Society of Canada's College of New Scholars, Artists and Scientists as affiliated members.

Increased market-oriented innovation opportunities to Canadian SMEs and export growth via global value chains to ensure Canadian excellence and competitiveness. Canada joined the Eureka network for international co-innovation as a full-member, providing greater future opportunities for Canadian companies to access international networks and expertise to accelerate their innovative products and services to the market.

Findings of audits completed in 2022-23: N/A

Findings of evaluations completed in 2022-23: Evaluation completed in 2020-21.

Engagement of applicants and recipients in 2022-23: Ongoing in-depth engagement continued with representatives of each Canadian National Committee (CNC) to assess evolving priorities, most valued benefits of the program to participants, and perceived needs of each international affiliation's CNC. Dialogue continues with existing CNCs to gauge their desired level of international participation, as well as with other potential applicants.

An advisory committee for the program has now met through 4 full fiscal years, drawing on cross government science departments and agencies, and deploying expertise to leverage Canadian international science objectives. Regular, frequent interaction ensures continuous engagement and coordination. This fiscal year, the committee was expanded to include other government departments with international science memberships.

Engagement with international affiliations management has intensified and will continue to better gauge impact and plans. This will inform the Canadian STI management community of the science diplomacy needs of Canadian practitioners in light of track records of international affiliations and associated level of required support.

Moreover, regular engagement will continue to take place including completion of an annual reporting questionnaire.

Financial information (dollars)

Type of transfer payment	2020-21 Actual spending	2021-22 Actual spending	2022-23 Planned spending	2022-23 Total authorities available for use	2022-23 Actual spending (authorities used)	Variance (2022-23 actual minus 2022-23 planned)
Total grants	608,896	564,958	560,000	610,000	609,608	49,608
Total contributions	-	-	-	-	-	-
Total program	**608,896**	**564,958**	**560,000**	**610,000**	**609,608**	**49,608**

Explanation of variances

Variance immaterial.

International Astronomical Observatories Program

Start date: 1978

End date: Ongoing

Type of transfer payment: Contribution

Type of appropriation: Estimates

Fiscal year for terms and conditions: 2015–16

Link to departmental result(s): Scientific and technological knowledge advances; Innovative businesses grow; Evidence-based solutions inform decisions in Government priority areas

Link to the department's Program Inventory: Herzberg Astronomy & Astrophysics

Purpose and objectives of transfer payment program: Astronomy is a global science. The increasing cost of leading-edge observatories and the scarcity of ideal observation sites have led to a greater focus on international collaboration for large-scale astronomy projects that lead to advances in knowledge and understanding of the universe.

The NRC, in collaboration with other international bodies, provides financial contributions to support the management and operations of offshore ground-based observatories and their related facilities, including the Canada-France-Hawaii Telescope (CFHT), the twin telescopes of the Gemini Observatory and the Atacama Large Millimetre-submillimetre Array (ALMA). The NRC participates in the oversight and direction of these facilities and their research capabilities. The NRC also represented Canada in the Square Kilometre Array (SKA) consortium for the pre-construction phase of the telescope and signed a cooperation agreement in November 2021 to continue Canada's participation in the Square Kilometer Array Observatory (SKOA). In 2015, Canada joined the international partnership to participate in the Thirty Meter Telescope (TMT).

International agreements governing these observatories are long-term commitments that specify contributions to support preconstruction design and development, construction, operation and maintenance, capital improvements (e.g., development of new astronomical instruments and other facility upgrades) and decommissioning of the international ground-based observatories and their related facilities. These agreements also include commitments to support the university-based user communities to ensure a fair and progressive use of these observatories. The NRC participates in the governance of these international facilities on behalf of the Canadian astronomy research community and provides appropriate support, including advanced data management services and instrumentation. Through the NRC's financial and in-kind contributions, the Canadian astronomy community is assured merit-based access to these facilities with appropriate support.

Recipients are not required to repay funds obtained under this transfer payment program.

Results achieved: Demand by Canadian astronomers for international observatories continued to exceed time available, which shows the relevance of the observatories and their instrumentation. 231 scientific papers were published by Canadian astronomy users enabled by the NRC based on data obtained using the CFHT, (Canada France Hawaii Telescope), Gemini Observatory, and ALMA.

With construction of 2 of the world's largest radio telescopes continuing, the NRC extended its 2-year cooperation agreement with the international SKAO to allow Canada's scientific and engineering communities to continue their participation in the project. In January, Canada announced its intent to join the Observatory as a full member with a 6% share. Canada has been involved in the SKA project from its earliest stages, and this commitment ensures Canadian astronomers will have access to one of the world's leading facilities, further strengthening Canada's international reputation in astronomical discovery and increasing opportunity for strong collaboration with industry, academia, government and international partners. The NRC worked with domestic and international partners to develop key observatory systems, including the digital correlator, 'the brain' behind the SKA-Mid telescope in South Africa.

Currently, the largest radio-telescope in the world, ALMA captures millimetric and submillimetric waves that emanate from vast cold clouds in space and from some of the earliest and furthest galaxies in our universe. Using ALMA, scientists made the first-ever detection of gas in a circumplanetary disk, which suggests the presence of a very young exoplanet.

Since 1979, the Canada-France-Hawaii (CFH) Observatory has offered a world-class, 3.6m optical/infrared telescope and provides a versatile, state-of-the-art, astronomical observing facility on one of the highest quality sites for optical astronomy on the planet. Using SPIRou (SPectropolarimètre InfraROUge) and other Canadian instruments, an international team of researchers led by a Ph. D. student at the University of Montréal announced the discovery of an exoplanet orbiting a star in what is called the 'Goldilocks Zone', an area where it is not too hot, and not too cold for liquid water to exist on its surface.

In 2022, the Canadian Astronomy Data Centre (CADC) continued to advance the use of International Virtual Observatory Alliance Standards in the development of Digital Research Platforms for astronomy, which will be key to international collaborations in astronomical research.

Findings of audits completed in 2022-23: N/A

Findings of evaluations completed in 2022-23: Evaluation of Herzberg Astronomy & Astrophysics completed in 2021–22.

Engagement of applicants and recipients in 2022-23: The NRC manages observatories established or maintained by the Government of Canada for the benefit of the Canadian astronomy research community, aligning its contributions to the priorities of the community's Long-Range Plan for Astronomy and Astrophysics. The NRC participates on the boards which oversee the observatories to ensure that the science directions and programs of the facilities reflect Canadian strengths and interests. In addition, the NRC ensures that these activities increase opportunities for Canadian researchers and firms to develop relevant instrumentation for the observatories.

To carry out its roles effectively, the NRC provides current information about each observatory to research community-based committees of scientists, which provide expert advice on observatory operations and development. The NRC provides extensive support to the user community through numerous services extending from administering the time allocation process for Canadian researchers, to delivery of science ready data (through the CADC).

Financial information (dollars)

Type of transfer payment	2020-21 Actual spending	2021-22 Actual spending	2022-23 Planned spending	2022-23 Total authorities available for use	2022-23 Actual spending (authorities used)	Variance (2022-23 actual minus 2022-23 planned)
Total grants	-	-	-	-	-	-
Total contributions	25,495,440	27,537,242	64,704,472	75,730,323	26,647,172	(38,057,300)
Total program	**25,495,440**	**27,537,242**	**64,704,472**	**75,730,323**	**26,647,172**	**(38,057,300)**

Explanation of variances

The significant variance between planned and actual spending is due to ongoing delays associated with Canada's participation in the construction of the Thirty Meter Telescope. These delays are outside of the NRC's control.

TRIUMF

Start date: April 1977

End date: Ongoing

Type of transfer payment: Contribution

Type of appropriation: Estimates

Fiscal year for terms and conditions: 2020–21

Link to departmental result(s): Scientific and technological knowledge advances; Innovative businesses grow; Evidence-based solutions inform decisions in Government priority areas

Link to the department's Program Inventory: TRIUMF

Purpose and objectives of transfer payment program: TRIUMF is Canada's particle accelerator centre. The laboratory is one of Canada's key investments in large-scale research infrastructure. It provides world-class facilities for research in sub-atomic physics, accelerator science, life sciences, and materials science. An incorporated non-profit with charitable status, TRIUMF Inc. is owned and operated by a consortium of Canadian universities, with its core operations funded through 5-year contribution agreements. TRIUMF Inc. has its own governance and management team who operate and manage TRIUMF Inc. The NRC plays an important oversight and stewardship role for TRIUMF Inc. on behalf of the Government of Canada. The NRC, however, is not directly involved in designing and running the organization's operations.

Recipients are not required to repay funds obtained under this transfer payment program.

Results achieved:

- TRIUMF contributed to 247 scientific publications in scientific journals, trained 275 highly qualified personnel, including undergraduate and graduate students as well as post-doctoral researchers, and hosted 624 scientific visitors and users, nearly 300 of which came from international institutions.
- TRIUMF broke production records with the largest amount of a rare cancer-fighting isotope which was shipped to a radiopharmaceutical partner for further testing. The commercialization arm of TRIUMF, TRIUMF Innovations, is the co-lead for a $35 million federal Strategic Innovation Fund proposal to create the Canadian Medical Isotope Ecosystem to accelerate the Canadian medical isotope innovations from researchers and SMEs across Canada.
- TRIUMF reached a very important milestone in the ARIEL project with the completion of the ARIEL-II hot cell #1 facility that represents the largest single capital investment for ARIEL. In addition, TRIUMF commissioned an irradiation target area at the ARIEL electron linear accelerator, reaching world-leading doses of γ-beams for tumor irradiation.
- TRIUMF completed a unique facility for depth profiling of materials in parallel magnetic fields. First pioneering test results show material composition on the Meissner screening, which have been published.
- The TRIUMF DRAGON facility performed the first direct measurement of the 7Be(α,γ)11C reaction using an intense radioactive beam and the DRAGON recoil separator. This reaction is important for nucleosynthesis in the neutrino-driven outflows of core-collapse supernovae.
- Driving world-leading nuclear theory research, TRIUMF performed calculations of the neutron skin of the 208Pb and of the deuteron capture on 4He which will help in understanding neutron stars and the Big Bang Nucleosynthesis of 6Li.
- TRIUMF continued to make significant progress on the Institute for Advanced Medical Isotopes – a new facility that will significantly increase Canada's competitive advantage in leading-edge medical isotope research, development, and production. With substantial construction completed in July 2022, efforts are focused on commissioning the facility and TR24 cyclotron.
- The TRIUMF laboratory was re-organised into seven divisions, and TRIUMF Innovations, with the leads of all divisions forming a collaborative leadership team. This streamlining has supported the new skills-based governance structure by ensuring efficient information flow to the Board, oversight and evaluation groups.
- In June 2022, the Canadian Nuclear Safety Commission announced its decision to award TRIUMF a new 10-year operational license which will allow continued operations up to June 2032.

Findings of audits completed in 2022-23: N/A

Findings of evaluations completed in 2022-23: Evaluation underway; completion expected in 2023–24.

Engagement of applicants and recipients in 2022-23: The NRC chairs the Agency Committee on TRIUMF (ACT), which includes the federal agencies that fund and oversee TRIUMF activities, providing TRIUMF management the opportunity to present progress and discuss future directions for the facility.

The NRC also manages the Advisory Committee on TRIUMF (ACOT), composed of international experts within disciplines that span TRIUMF's research and technology activities. ACOT reports its findings to the NRC and TRIUMF senior management twice annually, making recommendations on programs and management as well as reporting on the scientific and technological achievements of TRIUMF programs and facilities. Observer representatives from the National Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation, the Canadian Institute of Nuclear Physics, the Canadian Institute of Particle Physics, the materials science community and TRIUMF's user community ensure that TRIUMF's directions are well aligned with the research community's needs and that TRIUMF is working with all its constituencies across Canada. The Committee considers all aspects of the TRIUMF program, with a particular emphasis on science and technological issues to ensure the relevance, impact, and world-class standing of TRIUMF's activities. Through NRC activities in ACT and ACOT, the NRC maintains a close relationship with TRIUMF.

TRIUMF has approximately 410 staff and students supported via the NRC's contribution agreement, with roughly 160 additional positions supported through other sources for specific designated purposes, including temporary funds to operate new capital infrastructure. Annually, TRIUMF provides training for more than 220 undergraduates, graduate students, and postdoctoral fellows. TRIUMF has numerous programs aimed at young people, students, teachers, and the general public to ensure that as many as possible share the wonder of discovery and experience the excitement generated by one of Canada's premier laboratories. In addition, TRIUMF offers a suite of programs to aide in the growth and development of professional skills for its graduate students and postdocs.

Financial information (dollars)

Type of transfer payment	2020-21 Actual spending	2021-22 Actual spending	2022-23 Planned spending	2022-23 Total authorities available for use	2022-23 Actual spending (authorities used)	Variance (2022-23 actual minus 2022-23 planned)
Total grants	-	-	-	-	-	-
Total contributions	59,443,659	62,225,000	63,925,183	61,948,555	59,325,000	(4,600,183)
Total program	**59,443,659**	**62,225,000**	**63,925,183**	**61,948,555**	**59,325,000**	**(4,600,183)**

Explanation of variances

Actual spending on TRIUMF was lower than planned due to changes in TRIUMF's cash flow requirements.

Gender-based analysis plus

Section 1: Institutional GBA Plus Capacity

As one of Canada's important research and development organizations, the NRC partners with Canadian industry to take research impacts from the laboratory to the marketplace. To support the achievement of this goal and the advancement of the Government of Canada's equity, diversity and inclusion (EDI) priorities, the NRC is using a GBA Plus lens to help make its research more inclusive and thereby, more impactful.

Governance

Building a diverse and representative workforce, removing barriers, and fostering an inclusive culture are key priorities for the NRC. In support of these priorities, the NRC has engaged its employees, clients and collaborators on GBA Plus (e.g., offering training, sharing information and tools, integrating a GBA Plus lens in program design, delivery and evaluation, etc.).

The NRC's Secretary General fulfills the role of GBA Plus champion for the organization, and within the division is a GBA Plus Focal Point responsible for coordinating organizational efforts. The Secretary General division also represents the NRC on the federal Interdepartmental Working Group for GBA Plus and the GBA Plus Focal Point Network, and develops and provides program guidance for integration of GBA Plus into program design and delivery.

In 2022-23, the NRC continued its cross-NRC network dedicated to EDI, and took the name: the Inclusive Innovation Community of Practice, with the objectives of developing an equitable, diverse and inclusive workforce and workplace, and understanding the impacts on diverse groups to inform program design and delivery. Members include the NRC's EDI Advisor, GBA Plus Focal Point, and an extensive network of employees leading inclusive innovation initiatives across the organization.

Capacity

The NRC continues to build capacity and expand awareness about GBA Plus across the organization. The NRC is also increasing efforts to promote an environment where all individuals can achieve their full potential, and to foster communities, networks, and mentoring that support a diverse organization.

Inclusive Innovation and GBA Plus integration into strategic planning

In 2022-23, the NRC initiated the development of its 2024-2029 Strategic Plan with inclusive innovation identified as a key priority. Inclusive innovation goes beyond the creation of an inclusive workforce and workplace to also examine how the organization impacts diverse communities. GBA Plus is part of a broader set of inclusive innovation priorities, and reflects the NRC's commitment to adopting an intersectional lens to look at how individuals from diverse groups access and may be affected by the organization's research and its programs, as well as how the organization and its outputs can be improved through diversity.

Inclusive innovation has several positive impacts for the NRC. From an internal perspective, it can help the NRC increase the diversity of its workforce, reinforce an anti-racist work environment, and create an open and accessible workplace. From an external perspective, inclusive innovation promotes excellence by fostering new ideas, adapting to changes in the operating context, eliminating barriers to participation and improving the relevance of NRC research. It focuses on using inclusive design approaches during the creation of new research and supporting programs and services, and promotes engagement with and the participation of Indigenous Peoples. Lastly, inclusive innovation helps examine the ways in which the NRC's work affects diverse groups in different ways by using a GBA Plus lens in program performance data collection, analysis, and reporting.

The NRC has engaged with employees across the organization on this key priority to build awareness and understanding, and is setting related goals for the next five years. The new Strategic Plan 2024-2029 is expected to be released in 2024-25.

GBA Plus integration into program implementation

The NRC conducts GBA Plus analysis during the development of Cabinet documents, program design (including the NRC's collaborative R&D programs) and program evaluations.

The NRC also monitors and tracks statistics on workforce representation of designated employment equity groups, supported by a streamlined set of hiring and representation goals. The NRC also reports regularly to senior management on its progress related to EDI.

Building relationships to advance equity for First Nations, Inuit and Métis peoples creates greater Indigenous inclusion in research and opens new pathways to bridging knowledge systems. In bridging knowledge systems, the NRC can tap into different forms of knowledge in examining the critical issues of our time. In 2022-23, the NRC has increased its Indigenous engagement capacity and skills to help raise awareness and improve coordination by appointing an Indigenous Engagement Advisor.

Advancing the NRC's GBA Plus capacity and awareness

The NRC Committee on Recruitment and Retention of Women in STEM continued to meet quarterly to explore the broad range of experiences, challenges and opportunities facing women in STEM, and raised awareness about the importance of integrating GBA Plus into program design and delivery. The NRC also continued to ensure that diversity and inclusive language are reflected in NRC images, posters and materials, and continued inclusive practices such as meaningful land acknowledgements in formal gatherings.

To support employees in applying GBA Plus, the NRC maintains an internal portal for EDI information, tools and resources, as well as Indigenous engagement and anti-racism library guides, and offers training as part of the NRC's EDI Strategy. Training includes mandatory online courses for all staff in EDI fundamentals and unconscious bias, a mandatory course for all supervisors on bias in hiring, antiracism training, and targeted GBA Plus training on demand.

Section 2: Gender and Diversity Impacts, by Program

Core Responsibility: Science and Innovation

Programs:

Advanced Electronics and Photonics

Aerospace

Aquatic and Crop Resource Development

Automotive and Surface Transportation

Construction

Digital Technologies

Energy, Mining and Environment

Herzberg Astronomy & Astrophysics

Human Health Therapeutics

Medical Devices

Metrology

Nanotechnology

Ocean, Coastal and River Engineering

Security and Disruptive Technologies

Genomics Research & Development Initiative Shared Priority Projects

Collaborative Science, Technology and Innovation Program

Industrial Research Assistance Program

International Affiliations

TRIUMF

National Science Library

Business Management Support

Design and Fabrication Services

Research Information and Technology Platforms

Special Purpose Real Property

Program Name: Advanced Electronics and Photonics

Program Goals: The NRC's Advanced Electronics and Photonics (AEP) program aims to develop game-changing sensing and communications technologies that collect and move data, enabling Canada's infrastructure and services to become smarter and more accessible and creating sustainable prosperity. The program has integrated GBA Plus into many aspects of its activities, including through: the design and delivery of a challenge program to improve telecommunications in rural and remote areas; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / Sectors: manufacturing, telecommunications photonics industry, artificial intelligence, automotive, quantum and aerospace, defense & security, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

Through its High-throughput and Secure Networks (HTSN) Challenge program, AEP and other NRC programs are partnering with external collaborators to develop disruptive technologies and technologies that improve the cost and performance of delivering secure, affordable, and high-speed internet services in rural and remote communities across Canada. The HTSN challenge program aims to surpass the Canadian Radio-television and Telecommunications Commission's universal service objective of 50 Mbps download and ten Mbps upload with unlimited data, and to develop technology that can enable service providers to offer affordable one Gbps or better connectivity to users in all rural and remote communities in Canada. This would significantly benefit Indigenous communities in remote areas, providing increased access to economic development, employment, health care, education, and cultural exchanges, and would improve safety and security. New Canadians are being incentivized to settle in rural and remote areas, and connectivity will be a key driver in support of this goal. Affordable, high-speed internet can also lead to improved outcomes for vulnerable populations through better access to education, jobs and health services through distance education, virtual jobs and telehealth.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Number of grants and contributions projects reviewed for GBA Plus	8 projects approved in 2022-23 were reviewed for GBA Plus under the High-throughput and Secure Networks (HTSN) Challenge program led by AEP	Database maintained by the National Program Office that coordinates projects involving grants and contributions.	All the proposal forms for the projects approved in 2022-23 include a section on GBA Plus considerations in research design. In 2023-24, the NRC is developing a process to collect information on specific aspects of the integration of GBA Plus in project implementation for annual reporting.

* 2022-23 or most recent

Other Key Program impacts:

GBA Plus has been integrated into the governance of the HTSN program through the program's external committees involved in design, implementation, and strategic guidance. The members of these committees were selected from across Canada with a view to providing broad technical and geographical representation. The program is working towards ensuring that the composition of these committees is consistent with the representation in Canada of the four employment equity groups. In 2022-23, an external peer review of the HTSN program was conducted by a committee comprised of five members, including two women and one racialized person. In addition, for approved research projects, Principal Investigators (PIs) must explain how they are supporting underrepresented groups and describe the measures undertaken to address systemic barriers. Approximately 40% of the NRC PIs from the HTSN program are racialized persons.

In 2022-23, the AEP program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and highly qualified personnel (HQP). The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The AEP program's ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability (LMA) was 0.5 for women and 2.4 for racialized persons in 2022-23. An action plan was implemented in 2022-23 that includes best practices for succession planning, increasing diverse representation on hiring boards, focused recruitment of equity-deserving groups for new job openings, and awareness training for staff. For the first time, in 2022-23 the hiring process for specific positions was focused on hiring members of equity-deserving groups.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

GBA Plus Data Collection Plan:

The AEP program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the AEP program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. AEP continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the AEP program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program. Data collected by Statistics Canada for 2020 on AEP client enterprises was only sufficient for reporting on gender ownership.

The next evaluation of the work undertaken by the AEP program will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Aerospace

Program Goals: The NRC's Aerospace program focuses on aerospace research and technology development in the core areas of aerodynamics, flight research, gas turbines, structures and materials, and manufacturing. The Aerospace program has integrated GBA Plus into its research activities and operational planning, including: the use of specialized facilities; work on a cluster support program; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / Sectors: aviation, aerospace sector, manufacturing, transportation, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

Innovation, sustainability and workforce development are essential to growing the Canadian aerospace industry. Even before COVID-19, the industry faced a looming shortage of skilled workers, but pandemic-related layoffs and a smaller number of aerospace graduates may further constrain the industry's future growth. The NRC's Aerospace program makes efforts to address the needs of air travel passengers, including Canadians with special needs (e.g., people living with obesity and people who use mobility aids).

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Percentage of client enterprises owned by a woman	In 2020, 16% of client enterprises were owned by a woman	Business Linkable File Environment, Centre for Special Business Projects, Statistics Canada (2023).	Based upon enterprise's most likely primary owner and publicly available data. This secondary data is being used to understand the profile of clients that the research centre is working with.
Percentage of client enterprises owned by an immigrant	In 2020, 13% of client enterprises were owned by an immigrant		
Percentage of client enterprises owned by a person under 50 years old	In 2020, 24% of client enterprises were owned by a person under 50 years old		

* 2022-23 or most recent

Other Key Program impacts:

Using its Centre for Air Travel Research, the Aerospace program investigates opportunities to improve the safety, comfort and productivity of passengers and crew throughout the air travel experience, including Canadians with diverse physical attributes. This work has expanded to include multiple projects investigating barriers to accessibility for various groups and some examples are shown below to demonstrate the program's impact.

NRC and collaborators (Carleton University, University of Ottawa) are identifying barriers that are limiting older adults' ability to travel and connect with their communities. The NRC's Aging in Place Challenge program and collaborators will provide recommendations for evidence-based innovative design, and inform policy and regulations (related to Bill C-81), to reduce or remove travel-related barriers.

NRC mobilized an International Working Group (IWG) to target the current challenges associated with the use of Special Service Request (SSR) codes in the air travel industry. Special Service Requests are used by airlines to respond to the requirements of passengers with special needs. As part of this project, the NRC identified and prioritized seven areas of research to improve SSR code use. With support from the Canadian Transportation Agency and Transport Canada, the NRC created and tested a prototype to address the needs of passengers with mobility aids for information on the size of aircraft cargo doors. Testing demonstrated that this unique dataset and tool will improve accessibility in air travel. The International Air Transport Association (IATA) is currently investigating the possibility of embedding this tool into its database for broader access across stakeholder groups.

Under the AI for Logistics (AI4L) Cluster Support program, the Aerospace program worked on a project which addresses challenges faced by Indigenous communities in remote areas. The Aerospace program's AI-enabled navigation of unmanned aircraft systems focuses on enabling beyond visual line of sight navigation of cargo delivery to remote communities and could contribute to, for example, improved health outcomes for vulnerable populations, including Indigenous communities. Collaborators in this project include the Toronto Metropolitan University (TMU), the universities of Victoria and Ottawa, and Canadian SMEs. This project has contributed to the training of HQP and the development of new machine learning and AI algorithms and methods.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the Aerospace program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The program has made efforts to promote women in positions of leadership and has implemented two grass-roots initiatives on Early Career Network and Employee Experience that help create a more conducive work environment and promote representation from equity-deserving groups. The Aerospace program's ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 1.5 for women, 2.3 for racialized persons and 0.8 for persons with disability.

GBA Plus Data Collection Plan:

The Aerospace program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the Aerospace program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. The Aerospace program continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the Aerospace program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program.

The evaluation of the Aerospace program is tentatively scheduled to begin in 2024-25. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Aquatic and Crop Resource Development

Program Goals: The NRC's Aquatic and Crop Resource Development (ACRD) program aims to make Canada a world leader in sustainable biomass transformation. ACRD works with industry, academia and government partners to develop and transform agricultural and marine bioresources into food, feed and ingredients, and other high value bioproducts. The ACRD program has integrated GBA Plus into many aspects of its activities, including work to support food security and develop sustainable technologies and combat climate change, which can affect diverse groups disproportionally. The ACRD program has also integrated GBA Plus into its operational and research planning with efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports, and to represent diverse views on its research advisory board.

Target Population: All Canadians / Sectors: agricultural, marine, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The ACRD program's activities contribute to improving the lives of all Canadians, regardless of gender, race, socio-economic status, Indigenous identity, geographic location, language, education level, socio-economic status, culture, or religion. However, the program activities naturally focus on specific diverse groups based on the priority sectors and technologies aligned with ACRD's spheres of influence. For example, efforts supporting Northern food production require meaningful engagement with Indigenous organizations, and projects carried out in collaboration with Indigenous communities allow for cross-fertilization of Indigenous and other agricultural knowledges. Similarly, food insecurity is disproportionately felt by equity-deserving groups and these sectors benefit from ACRD’s activities.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Number of grants and contributions projects reviewed for GBA Plus	4 projects approved in 2022-23 were reviewed for GBA Plus under the Sustainable Protein Production Cluster Support program led by ACRD	Database maintained by the National Program Office that coordinates projects involving grants and contributions.	All the proposal forms for the projects approved in 2022-23 include a section on GBA Plus considerations in research design. In 2023-24, the NRC is developing a process to collect information on specific aspects of the integration of GBA Plus in project implementation for annual reporting**.**
Percentage of client enterprises owned by a woman	In 2020, 21% of client enterprises were owned by a woman	Business Linkable File Environment, Centre for Special Business Projects, Statistics Canada (2023).	Based upon enterprise's most likely primary owner and publicly available data. This secondary data is being used to understand the profile of clients that the research centre is working with.
Percentage of client enterprises owned by an immigrant	In 2020, 13% of client enterprises were owned by an immigrant		
Percentage of client enterprises owned by a person under 50 years old	In 2020, 31% of client enterprises were owned by a person under 50 years old		

* 2022-23 or most recent

Other Key Program impacts:

The ACRD program's efforts to integrate GBA Plus into its activities are directed at three levels: program participation in terms of representation of internal teams and external collaborators; priority setting of research projects and activities based on the impacts on various groups; and increased understanding the social, cultural, and economic environment in which the program's outputs are intended to achieve their impact. Based on this approach, in 2023-24, the ACRD program will: develop a hiring strategy to enhance recruitment of Black Canadians, persons with disabilities, and individuals from Indigenous communities; design a process to monitor hiring practices and processes to ensure EDI considerations are at the forefront of recruitment and hiring actions; develop an Indigenous engagement strategy for embedding Indigenous consultation and collaboration into their research projects and initiatives; and enhance the understanding of GBA Plus in program design.

Working with the Arctic Research Foundation, the Canadian Space Agency, Agriculture and Agri-Food Canada, and the community of Gjoa Haven (in Nunavut), the ACRD program is leading the Sustainable Food System (SFS) initiative. The SFS initiative aims to develop a local

food production system in the Arctic that enables year-round production of fresh fruit and vegetables using renewable energy and controlled environment technologies. Through community input, methods for growing Indigenous plant species in the controlled environmental units will also be developed. Through the Arctic Research Foundation, members of the Gjoa Haven community have been hired and trained to help maintain the research pod. While this first collaboration is working on a food production system, the project will also help inform how growth technologies and infrastructure can be delivered in a number of harsh and isolated locations.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the ACRD program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The ACRD program's ratio of women new hires relative to the Canadian average labour market availability was 1.3 in 2022-23.

GBA Plus Data Collection Plan:

The ACRD program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the ACRD program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. ACRD also continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the ACRD program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program.

A recent evaluation of the ACRD program in 2021-22 concluded that the program has contributed to food security by developing different crop varieties and platforms, and is currently working on a project aimed at meeting the dietary needs of environmentally-challenged and remote populations. The next evaluation of the ACRD program has been tentatively scheduled to be initiated in 2026-27. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Automotive and Surface Transportation

Program Goals: The NRC's Automotive and Surface Transportation (AST) program provides technical knowledge and advances product and process technologies for producing more fuel-efficient, affordable, and environmentally-responsible ground vehicles and for delivering engineering solutions to complex technology challenges facing ground transportation industries. The AST program has integrated GBA Plus into many aspects of its activities, including: in its

research facilities; projects that target equity-deserving groups; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / Sectors: manufacturing, transportation, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The overall size of the Canadian automotive workforce is expected to fall through 2026, due to rising automation and higher labour costs relative to countries like Mexico. However, this may also represent an opportunity to upskill the workforce with increasingly valuable technology- and data-related skills, such as those related to artificial intelligence, sensors, geo-sensing and autonomous supply chains. The NRC's AST program is operating in this challenging environment and making efforts to address the specific needs of equity-deserving groups who belong to the group of Vulnerable Road Users (VRUs), including the elderly and users of mobility devices.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Percentage of client enterprises owned by a woman	In 2020, 13% of client enterprises were owned by a woman	Business Linkable File Environment, Centre for Special Business Projects, Statistics Canada (2023).	Based upon enterprise's most likely primary owner and publicly available data. This secondary data is being used to understand the profile of clients that the research centre is working with.
Percentage of client enterprises owned by an immigrant	In 2020, 9% of client enterprises were owned by an immigrant		
Percentage of client enterprises owned by a person under 50 years old	In 2020, 25% of client enterprises were owned by a person under 50 years old		

* 2022-23 or most recent

Other Key Program impacts:

The AST program leads several projects that target equity-deserving groups. The Machine Vision for Smart Road Intersections project is aiming at enhancing VRU Safety. AST worked with Invest Ottawa/Area X.O to lead and deliver a research project on the performance, implementation, and impact of machine vision and vehicle-to-infrastructure (V2I) systems at intersections, including examining how to better protect VRUs. including examining how to better protect VRUs. The data, outcomes, and conclusions of this project will help Transport Canada develop policies that guide the safe and secure implementation and deployment of technology solutions to better protect VRUs, and enhance overall road safety across Canada.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the AST program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. AST also engaged an Indigenous working group to ensure Indigenous representation in staff and student hiring for the new Advanced Manufacturing Research Facility in Winnipeg, Manitoba. The AST program's ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 0.9 for women and 2.1 for racialized persons in 2022-23.

GBA Plus Data Collection Plan:

The AST program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the AST program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. AST continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the AST program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program.

An evaluation of the AST program has been tentatively scheduled to be initiated in 2025-26. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Construction

Program Goals: The NRC's Construction program aims to be the partner of choice for government and the construction industry in advancing innovation for a safe, prosperous, and sustainable Canada. Through a multi-disciplinary approach, the program works with the construction industry for better, safer, energy-efficient, climate-resilient and more affordable construction materials and technology. The Construction program has integrated GBA Plus into many aspects of its activities, including: its research facilities; the development of new codes, guidelines and specifications for the construction industry; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / Sectors: construction, infrastructure, science & technology industry

Distribution of Benefits:

By gender – Predominantly men (e.g., 80% or more men)

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The Construction program's work benefits three primary target groups: its science and technology research workforce; the construction sector; and small- and medium-size enterprises (SMEs). Both the construction sector and SMEs employ men at a higher rate than women, and have room to improve in terms of the representation of other equity-deserving groups. The Construction program continues its efforts in reaching equity-deserving groups, especially Indigenous Peoples, and people with disabilities. The program also works to increase the resilience and sustainability of communities experiencing disproportionate and differential impacts of climate change, including coastal areas prone to flooding and Northern communities experiencing warming at a greater rate than the rest of Canada.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Percentage of client enterprises owned by a woman	In 2020, 14% of client enterprises were owned by a woman	Business Linkable File Environment, Centre for Special Business Projects, Statistics Canada (2023).	Based upon enterprise's most likely primary owner and publicly available data. This secondary data is being used to understand the profile of clients that the research centre is working with.
Percentage of client enterprises owned by an immigrant	In 2020, 8% of client enterprises were owned by an immigrant		
Percentage of client enterprises owned by a person under 50 years old	In 2020, 19% of client enterprises were owned by a person under 50 years old		

* 2022-23 or most recent

Other Key Program impacts:

In 2021, women made up 13.36% of those employed in the Canadian construction industry, compared to 13.28% the year before. Between 2020 and 2029, around 131,000 workers in the residential construction industry are expected to retire, but only about 105,000 new workers are expected to enter the industry. This gap emphasizes the need for the industry to promote the sector among women and other equity-deserving groups.

Accessibility for persons with disabilities is one of the five stated objectives of the National Building Code of Canada. Through Codes Canada (which includes the National Building Code, National Fire Code, National Plumbing Code and National Energy Code), the Construction program continues to improve accessibility for all Canadians. Efforts are made by the Construction program to ensure a representation of the four designated employment equity groups on the external committees involved in developing the Building Codes. Through the NRC's Environmental Research Strategy, the Construction program has put GBA Plus tools in place to inform the design of research projects to increase the impact on diverse groups. In 2022-23, the Construction program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The

program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The Construction program ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 1.1 for women, 2.0 for racialized persons and 0.7 for persons with disability in 2022-23. 52% of external hires in 2022-23 were qualified candidates from the following equity-deserving groups: Indigenous Peoples, persons with disabilities and racialized persons.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

GBA Plus Data Collection Plan:

The Construction program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the Construction program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. The Construction program continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the Construction program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program.

An evaluation of the Construction program has been tentatively scheduled to be initiated in 2024-25. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Digital Technologies

Program Goals: The NRC's Digital Technologies (DT) program aims to foster a smarter, safer, healthier, and more prosperous society through ethical applications of digital technologies. It is at the forefront of digital technologies research, driving innovation with and for Canadian governments, businesses, researchers, and society. The DT program has integrated GBA Plus into many aspects of its activities, including: the design and delivery of research projects; a challenge and cluster support program; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / academia, other government departments (OGDs), science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The NRC's DT program is operating in a rapidly evolving sector and making efforts to address the specific needs of equity-deserving groups it is working with, particularly Indigenous People. Through its Indigenous Languages Technology (ILT) project, DT is actively working with Indigenous collaborators to monitor and ensure that the benefits of the project are in line with the goals of the communities. The revitalization of Indigenous languages has wide ranging impacts on Indigenous Peoples and supports broader community goals of self-determination.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Number of grants and contributions projects reviewed for GBA Plus	7 projects approved in 2022-23 were reviewed for GBA Plus under the Artificial Intelligence (AI) for Design Challenge program led by DT	Database maintained by the National Program Office that coordinates projects involving grants and contributions.	All the proposal forms for the projects approved in 2022-23 include a section on GBA Plus considerations in research design. In 2023-24, the NRC is developing a process to collect information on specific aspects of the integration of GBA Plus in project implementation for annual reporting.
	2 projects approved in 2022-23 were reviewed for GBA Plus under the Artificial Intelligence (AI) for Logistics Cluster Support program led by DT		

* 2022-23 or most recent

Other Key Program impacts:

The DT program has adopted key GBA Plus principles to serve the needs of Indigenous Peoples. In collaboration with Indigenous communities and language experts, DT continued to support the revitalization of Indigenous languages through its Indigenous Languages Technology (ILT) project. Since many of the technologies developed were in response to community needs, the project has resulted in a collection of diverse subprojects. These subprojects include the development of new speech- and text-based resources for Indigenous language students, educators, translators, transcribers and other language professionals, and work to increase the accessibility of audio and video recordings.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the DT program has focused on outreach activities targeting equity-deserving groups continued its efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a

greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The DT program is committed to increasing diversity in its workforce. In 2022-23, the DT program's ratio of new hires from equity-deserving designated groups relative to the Canadian average labour market availability was 1.9 for racialized persons.

GBA Plus Data Collection Plan:

The DT program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the DT program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. DT continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

Under the Artificial Intelligence (AI) for Design Challenge program led by DT, the NRC sponsored the Canadian Council of Academies Leaps and Boundaries report. This report explores the opportunities, challenges, and implications of deploying AI technologies to enable scientific and engineering research design and discovery in Canada, and includes a detailed overview of the legal, ethical, social and policy implications of deploying AI for science. The report was used in 2022-23 to strengthen the GBA Plus approach of the AI for Design program. In addition, the Artificial Intelligence for Logistics (AI4L) Cluster Support program, also led by DT, is planning to measure over the next few years the number of discrete novel capabilities and capacity improvements in the Canadian North to demonstrate that Innovative AI tools are used to optimize and improve logistics operations in Canada, with data collection planned closer to the targeted dates in 2026-27 and 2027-28.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the DT program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program. Data collected by Statistics Canada for 2020 on DT client enterprises ownership was not sufficient for reporting.

An evaluation of the DT program has been tentatively scheduled to be initiated in 2023-24. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Energy, Mining and Environment

Program Goals: The NRC's Energy, Mining and Environment (EME) program aims to create green and sustainable technologies for clean energy, resource extraction and environmental protection. Through research and technology development, the program brings the latest innovations in clean energy, advanced mining technologies and environmental remediation solutions to Canadian industry. The EME program has integrated GBA Plus into many aspects of its activities, including: the design and delivery of a challenge program to create a cleaner, more sustainable Canadian energy and chemical industry through materials innovation; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / Sectors: energy and utilities, mining, oil & gas exploration, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The NRC's EME program is operating in critical sector of the Canadian economy and making efforts to address the specific needs of equity-deserving groups it is working with. EME leads on the Materials for Clean Fuels (MCF) Challenge program, which has far-reaching impacts aimed at improving the lives of all Canadians, regardless of gender, race, socio-economic status, Indigenous identity, geographic location, language, education level, socio-economic or marital status, culture, or religion. First-hand impacts could potentially be experienced by those that currently work in the oil and gas industry and the groups that value environmental stewardship, however the program development process adopted a GBA Plus lens to determine that no major issues with respect to discrimination in the scientific directions have been identified.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Percentage of client enterprises owned by a woman	In 2020, 12% of client enterprises were owned by a woman	Business Linkable File Environment, Centre for Special Business Projects, Statistics Canada (2023).	Based upon enterprise's most likely primary owner and publicly available data. This secondary data is being used to understand the profile of clients that the research centre is working with.
Percentage of client enterprises owned by an immigrant	In 2020, 12% of client enterprises were owned by an immigrant		
Percentage of client enterprises owned by a person under 50 years old	In 2020, 17% of client enterprises were owned by a person under 50 years old		

* 2022-23 or most recent

Other Key Program impacts:

Through the MCF Challenge program, EME is working on creating a cleaner, more sustainable Canadian energy and chemical industry through materials innovation. EME is coordinating a national effort to collaborate with leaders in academia and industry from a diverse range of backgrounds to catalyze the discovery and development of materials for early-stage exploratory technologies to decarbonize Canada's industrial sector. The program adopted a GBA Plus lens to ensure that no major issues related to the scientific directions were identified.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the EME program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The EME program's ratio of women new hires from equity-deserving groups relative to the Canadian average labour market availability (LMA), was 0.7 in 2022-23, and the ratio of new hires who were racialized persons was higher than LMA at 1.4.

GBA Plus Data Collection Plan:

The EME program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the EME program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. EME continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the EME program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program.

An evaluation of the EME program has been tentatively scheduled to be initiated in 2023-24. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Herzberg Astronomy & Astrophysics

Program Goals: The Herzberg Astronomy and Astrophysics (HAA) program fulfills the mandate from the NRC Act to "operate and administer any astronomical observatories established or maintained by the Government of Canada", including Canada's participation in all current and future offshore facilities. The HAA program has integrated GBA Plus into many aspects of its activities, including: a leadership role in the Canadian astronomical community; promoting gender representation in research projects; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / students, researchers, science & technology industry

Distribution of Benefits:

By gender – Second group: 60 per cent - 79 per cent men

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The HAA program serves the Canadian astronomical community of university and government-lab based researchers, which remains male-dominated. A 2019 survey by the Canadian Astronomical Society (CASCA; Spekkens et al. 2019) included an analysis of its membership that revealed 72% of members are male and 28% of members are female. The ratio between

males and females in CASCA notably increases from 1.56 for students to 3.79 for ordinary members (e.g., university faculty).

The CASCA membership can be broadly divided into three income groups, with graduate students earning <$50K annually, postdoctoral fellows (PDFs) earning roughly $50-80K annually, and ordinary members (generally university faculty) earning >$80K. Of these groups, the students, PDFs and ordinary members comprise 34%, 9% and 57% of the membership, respectively.

Canada's participation in leading international observatories like the Square Kilometre Array (SKA) provides employment opportunities for students and post-doctoral fellows and opportunities for the private sector to be involved in design and construction activities. As noted above, researchers who benefit from HAA's activities are predominantly highly educated males. The under-representation of women and minorities in astronomy fields is a major concern which could be attributed to factors such as lack of equity in compensation, funding, hiring, access to telescope time, and sociological issues associated with dependent caregiving and linguistic identity (for example, English is the international language of astronomy which could be considered a barrier to access for Francophones).

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Success rates for observation proposals led by Canadian astronomers that are women compared to proposals led by Canadian astronomers that are men.	Proposals led by Canadian women had a higher rate of success than those led by Canadian men When weighted by gender, women-led proposals were 2% more successful than would be expected in a fair outcome. Over time, the success rates are trending towards gender parity.	2023 proposal cycle	To ensure equitable allocation of the available observing time, the NRC supported the adoption of fully anonymous processes for the assessment of observing proposals for all international observatories supported by the NRC

* 2022-23 or most recent

Other Key Program impacts:

The NRC is committed to listening to and learning from local Indigenous communities, to understand better how the organization can support Indigeneity at both domestic and international observatories, and in the research conducted. As recommended in the Canadian Astronomy Long Range Plan 2020-2030, the NRC is working with the Canadian astronomical community and Indigenous partners through its HAA program to develop a set of guiding principles for the astronomy facilities and infrastructure in which Canada participates.

The NRC undertook a prescription burn (a planned and intentional use of fire for ecological protection) of lands at the Dominion Radio Astrophysical Observatory (DRAO) in Penticton, BC. These lands are on the ancestral territories of the Syilx Peoples. The primary goal of this project

is enhanced stewardship of the lands that has multiple benefits including wildfire risk mitigation, biodiversity benefits and social, economic and cultural benefits to local First Nations. In partnership with the Penticton Indian Band, the project has made great progress and is demonstrating the importance of working with First Nations in supporting strong stewardship of the lands.

HAA is supporting the development of the University led Canadian Hydrogen Observatory and Radio-transient Detector (CHORD), a next-generation radio telescope being constructed over the next three to five years at the DRAO. The project will leverage Canadian technology developments to yield breakthrough measurements of the cosmos in new array of 512 antennas, each six-meters across. HAA has completed the first phase of a new facility that will be used to fabricate the primary reflectors of the antennas and, in doing so, has engaged First Nations companies in environmental, archeological and construction activities. These engagements provide direct economic, social and cultural benefits and represent the NRC's commitment to partnering with First Nations in our scientific endeavours on the ancestral lands of the Syilx peoples.

In 2020, HAA began the Plaskett Scholar program to provide research experiences and STEM mentorship to high-school students, especially those from under-represented groups in the Victoria area. This program was initiated in response to findings in the broader literature showing that the transition from high-school to college/university often results in an important loss of diversity in the student population. In 2022-23, three Plaskett Scholars were mentored by HAA program staff. In all instances, the student worked directly with the mentor on a project related to their research, giving them first-hand experience working in astrophysics and potentially co-authorship of a publication in a peer-reviewed journal. The Plaskett Scholar program is expected to continue in 2023-24.

A recent evaluation of the HAA program in 2021-22 recommended that HAA develop and implement a strategic EDI plan that focusses on research excellence, student engagement, reducing barriers for women to become future leaders, as well as those for minority group populations, and moving from consultation to empowerment for local Indigenous communities.

In 2022-23, HAA's EDI Committee undertook a survey on inclusivity among HAA staff and those who work primarily at HAA sites. The report on the survey was published in November 2022 along with the response from management. The action plan includes specific actions which will be monitored such as confirmed funding for training along with an increased emphasis on the importance of establishing a career-development plan that considers promotion criteria and timelines; identifying other avenues of valuation and career development; more frequent meetings between senior management and individual teams; and, more communication and the solicitation of feedback in a variety of forums.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the HAA program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. Based on the NRC's recommendations for hiring and with input from management and hiring managers, HAA's EDI Committee members created EDI-based hiring guidelines. This document lays out the step-by-step process to enhance fairness,

encourage the creation of well-thought through metrics for assessment and thereby encourage EDI-based hires. In 2022-23, the HAA program's ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability were 2.0 for women, 1.2 for racialized persons and 0.7 for persons with disability.

GBA Plus Data Collection Plan:

The HAA program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the HAA program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. For example, HAA supports the continued collection of demographic data of the Canadian astronomical community by CASCA. Also, anonymous processes for assessment of observing proposals have been adopted for all the international observatories supported by the NRC through its HAA program. As part of the specific actions taken for GBA Plus data collection for 2023-24, the HAA program will continue its annual tracking of the proportion of women-led proposals that are approved to understand better the gender bias in the process and adopt strategies to mitigate this situation. The HAA program also continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

An evaluation of the HAA program has been tentatively scheduled to be initiated in 2025-26. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Human Health Therapeutics

Program Goals: Through research and development of biotherapeutics, vaccines and technology platforms, the NRC's Human Health Therapeutic (HHT) program serves the needs of small and medium enterprises (SMEs) from the Canadian biopharmaceutical industry and is also involved in federal government collaborative research aimed at creating solutions for public health issues affecting the lives of all Canadians. The HHT program has integrated GBA Plus into many aspects of its activities, including: the design and delivery of a challenge program to develop solutions for the treatment and potential cure of chronic diseases and rare genetic disorders affecting Canadians; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / Sectors: manufacturing, health care, social assistance, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The HHT program's work on biotherapeutics, vaccines and technology platforms aim to generate positive health outcomes for all Canadians. Gender and ethnicity play a role in HHT's

specific work on cell therapy and characteristics, and therapies for broad use may have different impacts on diverse populations. While there are gender biases in science that could carry over into the technologies developed and translated into later therapeutic use, the research projects being implemented under the program are generally not expected to have a negative GBA Plus impact. A positive intended outcome of the program is an automated biodevice for the production and remote analysis of cell therapies for clinical use, which is deployable to remote locations. Such a device would be a tremendous benefit to deliver costly designer cell therapies to remote and Northern communities.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Number of grants and contributions projects reviewed for GBA Plus	5 projects approved in 2022-23 were reviewed for GBA Plus under the Disruptive Technology Solutions for Cell and Gene Therapy (CGT) Challenge program led by HHT	Database maintained by the National Program Office that coordinates projects involving grants and contributions.	All the proposal forms for the projects approved in 2022-23 include a section on GBA Plus considerations in research design. In 2023-24, the NRC is developing a process to collect information on specific aspects of the integration of GBA Plus in project implementation for annual reporting.
Percentage of client enterprises owned by a woman	In 2020, 22% of client enterprises were owned by a woman	Business Linkable File Environment, Centre for Special Business Projects, Statistics Canada (2023).	Based upon enterprise's most likely primary owner and publicly available data. This secondary data is being used to understand the profile of clients that the research centre is working with.
Percentage of client enterprises owned by an immigrant	In 2020, 18% of client enterprises were owned by an immigrant		
Percentage of client enterprises owned by a person under 50 years old	In 2020, 31% of client enterprises were owned by a person under 50 years old		

* 2022-23 or most recent

Other Key Program impacts:

The HHT program is designing and developing disruptive technology solutions under the Disruptive Technology Solutions for Cell and Gene Therapy (CGT) Challenge program. The solutions are targeting precision-engineered cell and gene therapies for the treatment and potential cure of chronic diseases and rare genetic disorders affecting Canadians, including diverse Canadians who are disproportionately impacted by these diseases and disorders. The

platform and multi-purpose nature of the outputs of the program are broadly applicable in a variety of disease settings, and should be independent of the social or cultural context in which the eventual products are applied. Most of the work under the program in 2022-23 was in early pre-clinical stages but specific projects are already taking into account GBA Plus considerations. For example, one of the research teams is collecting human amniotic fluid cells from diverse patient sources to allow for the banking and characterization of the cell lines from which experimental outcomes can be linked back to understand the impact of diversity factors on research outcomes. Another example is the clinical trials with one of the CAR T-cell therapies to treat cancer (sdCD22) where accessibility to diverse groups of patients with specific (CD22) malignancies can be ensured through the definition of patient eligibility in the clinical trial design.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the HHT program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The HHT program's ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 1.1 for women, 0.7 for racialized persons and 0.7 for persons with disability in 2022-23. HHT has a specific focus on improving the representation of underrepresented groups in leadership positions and targeting recruitment to increase representation of Indigenous Peoples and persons with disability.

GBA Plus Data Collection Plan:

The HHT program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the HHT program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. The CGT program will collect data on identity factors across internal research teams within the NRC, within collaborator teams applying for funding for contributions to the program, and in the management framework providing governance and oversight of the Challenge program. Consultation will be conducted with the stakeholder community to ensure that the program structure, governance model, and collaborative process is accessible and conducive to equal participation from diverse participants. As part of the specific actions taken for GBA Plus data collection for 2022-23, the HHT program is monitoring participant data to uncover equity-deserving groups over the life of the program, and on a regular frequency, to identify opportunities and strategies to enhance participation more broadly as needed. These monitoring and gap assessment activities will be extended to include highly qualified personnel (students, postdoctoral fellows) working within the NRC, within collaborating centres, or granted funding awards through the program's grants and contributions mechanism. HHT also continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the HHT program to better understand business ownership composition of enterprises

supported and other GBA Plus dimensions, including the diversity in access and participation in the program.

An evaluation of the HHT program has been tentatively scheduled to be initiated in 2023-24. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Medical Devices

Program Goals: The NRC's Medical Device (MD) program's strategic goal is to catalyze Canada's medical device industry, working with Canadian small and medium-sized enterprises (SMEs) and international companies with significant investment in Canada by providing research and technology solutions, as well as working with partner Federal government departments and agencies to address Government priorities. The MD program has integrated GBA Plus into a range of its activities, including: research projects to improve healthcare access to equity-deserving groups; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / Sectors: manufacturing, health care, social assistance, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The MD program collaborates with industry, clinicians, academics and government to develop, translate and implement medical device innovations which can benefit a wide range of vulnerable populations. Some examples include MD's work on latent tuberculosis which has the potential to address an important need within the Indigenous community. Tuberculosis has a disproportionate burden in Indigenous communities, compared to the general population. Likewise, MD's work on Point of Care solutions and interactive remote care can provide benefits to Indigenous populations and/or vulnerable people living in remote areas. MD's work on forefoot deformity orthopedics has implications for people with disabilities. Molecular diagnostics and point-of-care testing done by MD in the In Vitro Diagnostic thrust has implications for the effective and convenient diagnosis of old age diseases. Similarly, MD's work on cognitive care and remediation may have implications for the elderly (e.g., managed care implications and triage).

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Number of grants and contributions projects reviewed for GBA Plus	2 projects approved in 2022-23 were reviewed for GBA Plus under the Digital Health and Geospatial Analytics program led by MD	Database maintained by the National Program Office that coordinates projects involving grants and contributions.	All the proposal forms for the projects approved in 2022-23 include a section on GBA Plus considerations in research design. In 2023-24, the NRC is developing a process to collect information on specific aspects of the integration of GBA Plus in project implementation for annual reporting.

* 2022-23 or most recent

Other Key Program impacts:

The MD program is implementing a number of research projects under the Pandemic Response Challenge Program's (PRCP) Pillar 3 (Digital Care and Analytics) with the goal of improving access to healthcare through contactless diagnostics, mental health tools, and development of standards for accessibility. PRCP projects are also expected to have positive results for vulnerable populations and women significantly impacted by SARS-CoV-2.

The MD program is connecting culture and land-based healing using virtual reality to support Inuvialuit mental health and well-being. Working together with the Inuit land claims corporation, a project workplan has been outlined in 2022-23 which will see the development and transfer of a VR platform to the community for healing individuals who were forced to disconnect from their native communities. Training will be provided on the platform so that individuals in the Northern community can develop their own healing scene/scenarios.

In partnership with local health authorities and Inuit and Innu communities, the MD program has worked to develop a project outline in 2022-23 which aims at integrating mobile digital interventions and wearables to reduce the health gap and improve the quality of mental health care in Labrador. If approved, NRC will develop and provide a contactless vital signs monitoring solution and assess its suitability for Northern populations.

In 2022-23, the MD program signed an agreement to collaborate with UNLIMITED Therapeutics on the development and deployment of an immersive-interactive digital health delivery system. The system is based on the NRC's bConnected remote health platform which is a clinician-monitored digital health software platform which gives physicians and other medical practitioners the ability to remotely deliver virtual reality digital therapeutic experience in support of cognitive behavioral therapy for disabled children.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the MD program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The MD program's ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 1.1 for women and 1.1 for racialized persons in 2022-23.

GBA Plus Data Collection Plan:

The MD program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the MD program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. MD continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the MD program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program. Data collected by Statistics Canada for 2020 on MD client enterprises ownership was not sufficient for reporting.

An evaluation of the MD program has been tentatively scheduled to be initiated in 2024-25. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Metrology

Program Goals: The NRC's Metrology program aims to create a better Canada and world by fostering innovation through high-precision measurement science and advancements in metrology. As Canada's National Measurement Institute (NMI), it collaborates across the global innovation ecosystem to provide metrology research and services that help transform ideas into market-ready technologies that benefit Canadian society, the economy and the environment. The program has integrated GBA Plus into its activities, including: conducting targeted GBA Plus analysis in the design and delivery of its research projects, particularly those working with Northern and Indigenous communities; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / SMEs, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes: Based on Metrology's expanding footprint in quantum-related technologies as an example, a GBA Plus analysis made the observation that

the immediate and short-term benefits from the deployment of new quantum technologies are initially susceptible to have links between gender and socio-economic factors such as wealth, education, occupation and decision-making power. In developing Metrology projects, it is recognized that various aspects of emerging quantum technologies such as areas of application, distribution channels, as well as the above-mentioned socio-economic factors will all have an impact on benefits realization. However, similar to the development of the transistor, medium- and longer-term benefits realization is expected to be improved through economies of scale as quantum technologies become more mainstream and more affordable. In response, projects are being designed with the understanding that as network quantum sensing becomes more pervasive (i.e., from demonstration to a scalable quantum technology), similar to the transistor, this potentially revolutionary technology should contribute to the reduction of current major structural inequities in potential end-user communities and in society.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Not available			

* 2022-23 or most recent

Other Key Program impacts:

The Metrology program’s research staff and experts worked with Northern and Indigenous communities on a number of research projects. The "Plastics and Heavy Metals in Nunatsiavut Foodways and Environments" (NGPlastics) project is part of the Canada-Inuit Nunangat-United Kingdom Arctic Research (CNIUK) and Arctic and Northern Challenge programs. The Metrology program is working closely with community scientists, hunters, and researchers from the Nunatsiavut Government, Memorial University of Newfoundland, and the Natural History Museum. Another research project is in collaboration with other government departments, academia, and research centres, where the Metrology program has been able to broaden their measurement expertise and gain practical experience in micro/nanoplastics research through the Environment and Climate Change Canada (ECCC)-led Zero Plastic Waste initiative. As a result, the team has been working closely with Northern communities to assess plastic ingestion by polar bears across Nunavut and Northwest Territories, using samples collected by hunters. This has allowed for the identification of priority communities for sample sourcing and has helped to strengthen partnerships with the Indigenous research community. The Metrology program is also implementing a project with Northern communities, Canadian OGD’s, academia and international partners on a collaborative remote sensing and ground studies to appraise methane release from warming permafrost in the Mackenzie Delta.

The program has an advisory board, made up of the research centre’s stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the Metrology program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The Metrology program’s ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 0.7 for

women and 1.5 for racialized persons in 2022-23. In 2022-23, the Metrology program completed an in-depth analysis of its HR and publication data between 2014-15 to 2021-22 to identify possible gaps in hiring, promotions and publication rates that may disproportionately affect equity-deserving groups. The management team is using this analysis to develop better tools and processes to create job posters, screen candidates and assess performance and promotion criteria.

GBA Plus Data Collection Plan:

The Metrology program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the Metrology program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. As part of the specific actions taken for GBA Plus data collection for 2023-24, the Metrology program will build on the GBA Plus analysis of Metrology's work in quantum-related technologies to gather more data and draw conclusions about immediate and short-term benefits from its deployment. This information will enable the Metrology program to understand how certain equity-deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts. In the 2023-24, the program has also identified an indicator to monitor the percentage of project proposals that underwent an analysis of impacts on diverse groups which includes all project proposals, whether they were accepted (funded) or not. The Metrology program also continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

An evaluation of the Metrology program has been tentatively scheduled to be initiated in 2026-27. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and potentially GBA Plus case studies.

Program Name: Nanotechnology

Program Goals: The mission of the NRC's Nanotechnology (NANO) program is to transform nanoscience ideas into novel, sustainable nanotechnology solutions with socioeconomic benefits for Canada. The program has integrated GBA Plus into many aspects of its activities, including: leading efforts to provide Indigenous students with valuable research experience; providing training to staff on GBA Plus considerations; efforts to build and expand diverse Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / Sectors: mining, oil & gas exploration, transportation, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes: Nanotechnology is an emerging technology with significant demand across healthcare, energy and pharmaceuticals. The NRC's

Nanotechnology program is operating in a critical sector of the Canadian economy and making efforts to address the specific needs of equity-deserving groups it is working with.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Not available			

* 2022-23 or most recent

Other Key Program impacts:

The Nanotechnology program has engaged in the University of Alberta's iSTEAM pathways program. In 2022-23, this resulted in five Indigenous students working in parts of the NRC on environmental science-based projects and gaining valuable research experience. Management staff in the program and other parts of the NRC undertook the iSTEAM training program, which is tailored to provide tools for supervising and mentoring Indigenous students. The program also promotes, educates and monitors EDI best practices with respect to hiring and seeking out experts, including an advisory board and seminar speakers which facilitates an understanding of barriers to access faced by equity-deserving groups.

The program has an advisory board, made up of the research centre’s stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the Nanotechnology program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The Nanotechnology program’s ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 1.0 for women and 1.5 for racialized persons in 2022-23. The Nanotechnology program organized EDI seminars every quarter in 2022-23 to bring awareness and to create a working and learning environment where everyone is treated with respect to be able to contribute to their fullest. This has contributed to building GBA Plus capacity in the program.

GBA Plus Data Collection Plan:

The Nanotechnology program’s impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the Nanotechnology program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. The Nanotechnology program continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

Future evaluation of the work undertaken will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse

populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Ocean, Coastal and River Engineering

Program Goals: The NRC's Ocean, Coastal and River Engineering (OCRE) program aims to develop novel and adaptive engineering solutions that enable safe and resilient ocean and freshwater infrastructure in Canada. Operating world-class modelling and testing facilities, OCRE strives to be a leader in the Canadian ocean and freshwater sector and works with clients and collaborators in industry, academia, and government to help ensure that Canadian ocean and freshwater industries and communities are safe and thrive in a changing marine environment. The program has integrated GBA Plus into many aspects of its activities, including: the implementation of a challenge program; research projects with Indigenous communities; efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / academia / Sectors: marine transportation, marine & coastal infrastructure, manufacturing, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The OCRE program's work benefits 3 primary target client groups: the science and technology research workforce within the research centre that has acknowledged gaps in the representation of women, racialized persons, Indigenous Peoples and persons with disabilities; the marine sector (marine transportation, oil and gas, renewable energy) and the resilient infrastructure development sector, which employs men at a higher rate than women and other equity-deserving groups; and small and medium-sized enterprises (SMEs), which also employ men at a higher rate than women and other equity-deserving groups.

The OCRE program's work is expected to benefit all Canadians by contributing to economic growth and prosperity in industry sectors implicated in lowering carbon emissions – i.e., increased innovation and resilience in marine operations (including marine transport and renewable energy) and in resilient infrastructure development. There are benefits to overall population health by researching fate and transport of microplastics and other pollutants in the marine/aquatic environment. Other benefits to all Canadians include contributing to safe and efficient marine transport of people and goods, and Canadian sovereignty in the North.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Number of OCRE projects engaging Indigenous organizations or companies that are Indigenous-led or Northern communities led.	5 projects in 2022-23	OCRE performance tracking document	Methodology under review and will be refined in 2023-24.
Number of grants and contributions projects reviewed for GBA Plus	2 projects approved in 2022-23 were reviewed for GBA Plus under the Ocean Cluster Support program led by OCRE	Database maintained by the National Program Office that coordinates projects involving grants and contributions.	All the proposal forms for the projects approved in 2022-23 include a section on GBA Plus considerations in research design. In 2023-24, the NRC is developing a process to collect information on specific aspects of the integration of GBA Plus in project implementation for annual reporting.

* 2022-23 or most recent

Other Key Program impacts:

OCRE specifically benefits populations in coastal and inland flood-land areas, all across Canada. A particular focus of the program is the emphasis on harsh environments characterized by ice, waves and wind (i.e., Canadian north) which will benefit Northern Canadian communities. For example, the OCRE program is involved with several projects with the Canada-Inuit Nunangat-Unite Kingdom Arctic Research Programme (CINUK - CINUK) that directly benefit Inuit communities. The Nuna (Inuvialuktun for ‘land’, ‘country’ and ‘soil’) Project draws together a diverse and interdisciplinary team that will co-produce with communities regionally appropriate new tools and solutions to prevent, mitigate, and adapt to their prioritised impacts. Nuna will equip and train community climate monitors to develop more accurate predictions of future erosion rates to know when to relocate and to assess and monitor ground conditions at potential relocation sites to ensure resilient development strategies.

Gender parity, inclusion of minority groups, and the meaningful participation of Indigenous groups are priorities for the Ocean Cluster Support program, which is led by OCRE. Indigenous representation is particularly important for coastal communities, where fishing and aquaculture are important means of livelihood. In 2022-23, training on GBA Plus principles was provided to the program team, and a draft guidance paper for collaborators was prepared. GBA Plus has been integrated into the governance of the Ocean program through external committees (including the Advisory Board) involved in its design and implementation. Additionally, efforts are being made to link Indigenous traditional knowledge to the NRC's research capacity through several collaborative agreements. These agreements are at the project level within the Coastal

Resilience theme, as well as at the program level in which the Ocean program is working with the University of Toronto to better understand how the NRC can be better allies to Indigenous groups. The program also examines how all collaborators will address GBA Plus considerations throughout the life of a collaborative project.

The program has an advisory board, made up of the research centre's stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

Skills development and job opportunities that are provided to equity-deserving groups can provide positive, lasting impacts on individuals and the overall Canadian economy. In 2022-23, the OCRE program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields These efforts are being guided by OCRE's HR and operational plans which identify strategies to increase recruitment of equity-deserving individuals such as the Engineering Division Indigenous Student Program, creating Indigenous Student Positions, EDI pre-screening/checklist for all hiring actions, and reviewing job posters for gender bias terms. As a result of these efforts, in 2022-23, the ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 0.8 for women, 2.2 for racialized persons and 1.4 for persons with disability. In addition to targeted measures to attract diverse talent, the HR Plan identifies strategies to create an inclusive environment to retain this talent.

With respect to overall program development and execution of specific initiatives, OCRE is focusing on its engagement with Indigenous Peoples and rights holders, which is formalized in the program's communications and engagement strategy. After a long period of COVID-imposed travel restrictions hampering culturally appropriate engagements, the OCRE program has been working hard to reinvigorate and deepen these relationships with focused travel to affected communities.

GBA Plus Data Collection Plan:

The OCRE program's impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the OCRE program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. OCRE continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

Over its seven-year timeframe, the Ocean program will compile available data on identity factors across internal research teams within the NRC, within collaborator teams applying for funding for contributions to the program, and in the management framework providing governance and oversight of the program. Consultation will be conducted with the stakeholder community to ensure that the program structure, governance model, and collaborative process is accessible and conducive to equal participation from diverse participants. As part of specific actions taken for GBA Plus data collection for 2022-23, the OCRE program is monitoring participant data to uncover equity-deserving groups and to identify opportunities and strategies to enhance participation more broadly as needed. These monitoring and gap assessment activities will be extended to include HQP (students, postdoctoral fellows) working within the NRC, within collaborating centres, and recipients of grant funding awards through the Ocean program's grants and contributions mechanism.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the OCRE program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program. Data collected by Statistics Canada for 2020 on OCRE client enterprises ownership was not sufficient for reporting.

An evaluation of the OCRE program has been tentatively scheduled to be initiated in 2027-28. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: Security and Disruptive Technologies

Program Goals: The NRC's Security and Disruptive Technologies (SDT) program aims to play a global leadership role in developing and validating emerging technology platforms that can be applied in a range of industries to sustain Canada's industrial competitiveness by opening new markets and value networks for Canadian industries in tomorrow’s economy. Applications can lead to improvements for environmental and health outcomes, but often focus on addressing national security challenges since security and defence innovation players are amongst the earliest adopters of such technologies from which broader commercial adaptations ultimately evolve, replacing existing technologies. The program has integrated GBA Plus into many aspects of its activities, including: the design and delivery of a challenge program: efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors the program supports; and representation of diverse views on its research advisory board.

Target Population: All Canadians / academia / Sectors: manufacturing science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The SDT program’s benefits can be examined based on the type of emerging technology platforms being developed. Based on a GBA Plus assessment conducted by the SDT program for the Quantum Sensors Challenge program (QSP), there are recognized representation gaps in the field of physics. An observation made in this assessment was that women and black, Indigenous Peoples, and people of colour (BIPOC) researchers are under-represented in physics. As men have historically comprised the majority of physics researchers and academicians, physics departments and research labs may be implicitly designed with their interests in mind. Intersectional gender inequality in STEM fields is a persistent issue as women's rates of representation remain low. Within the physical sciences, computer science, engineering, and mathematics (PCEM) more broadly in Canada, women represent 15% of all faculty. At the high school level in Canada, young women represent 38% of those enrolled in advanced placement physics courses. These insights have helped the SDT program to develop strategies to address these disproportionate impacts on equity-deserving groups.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Number of grants and contributions projects reviewed for GBA Plus	5 projects approved in 2022-23 were reviewed for GBA Plus under the Quantum Sensors Challenge program (QSP) led by SDT	Database maintained by the National Program Office that coordinates projects involving grants and contributions.	All the proposal forms for the projects approved in 2022-23 include a section on GBA Plus considerations in research design. In 2023-24, the NRC is developing a process to collect information on specific aspects of the integration of GBA Plus in project implementation for annual reporting**.**

* 2022-23 or most recent

Other Key Program impacts:

The SDT program is leading the QSP implementation to enable the development of revolutionary sensors that harness the extreme sensitivity of quantum systems to provide enhanced precision, sensitivity, rates, and range of measurable phenomena. The QSP is implementing strategies to address systemic barriers and biases that disadvantage women, gender-diverse, black, Indigenous and people of colour in applying for and participating in research activities. Examples of these strategies include ensuring that advisory panels include academics and industry practitioners from diverse backgrounds, practicing inclusive meeting design and facilitation techniques for consultation events, targeting grants and contribution funds to incentivize the hiring and professional development of diverse researchers. Collaborators through the QSP demonstrated their commitment to EDI (e.g., creating the first “Women in Physics” association at uOttawa) as part of collaborative projects.

The program has an advisory board, made up of the research centre’s stakeholder community who provide independent advice on the overall strategic direction and priorities of the program, while ensuring alignment with the NRC's priorities. The NRC works to ensure that the program's advisory board is balanced and representative of the Canadian population.

In 2022-23, the SDT program continued efforts to integrate GBA Plus into its operations through the hiring and training of students, early career STEM professionals, and HQP. The program has placed a greater emphasis on equity-deserving groups in order to improve the quality of scientific and technical outputs and to increase the representation of these groups within traditionally underrepresented fields. The SDT program’s ratio of new hires from equity-deserving groups relative to the Canadian average labour market availability was 1.4 for women and 2.0 for racialized persons in 2022-23.

GBA Plus Data Collection Plan:

The SDT program’s impacts on gender and diversity are challenging to measure because the program interacts with research clients and collaborators and not directly with the broader Canadian populations that are the ultimate beneficiaries. Despite the challenges, the SDT

program continued efforts to build and adopt strategies to collect GBA Plus data from its different streams of work. SDT continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity in its field and sector.

An evaluation of the SDT program has been initiated in 2022-23. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, surveys, and, potentially, GBA Plus case studies.

Program Name: **Genomics Research & Development Initiative Shared Priority Projects**

Program Goals: Under the Genomics Research and Development Initiative (GRDI), Shared Priority Projects (SPPs) support interdepartmental genomics research at federal government laboratories so that collectively, in collaboration with industry and academia, they can better deliver high impact solutions relevant to issues of importance to Canadians. These include protecting and improving human health, protecting the environment, sustainably managing agricultural and natural resources, and promoting economic growth. GRDI SPP applies a GBA Plus lens in its program activities by analyzing the potential benefits of the GRDI on various stakeholders including equity-deserving groups.

Target Population: All Canadians / OGDs

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

An evaluation of the GRDI in 2019-2020 identified the primary users and potential benefits that can be experienced by them. One of the findings was that the end-users for GRDI-funded projects include both internal and external end-users. Internal end-users are most commonly benefiting from GRDI-funded projects and include people working inside the federal government, such as laboratory scientists, field inspectors, border agents, trade negotiators and resource managers. External end-users are outside the federal government, and may include industry using a patented technology or revising their processes due to a policy change, and international regulatory agencies using and/or adopting the technology.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Not available			

* 2022-23 or most recent

Other Key Program impacts:

The GRDI program collaborates with universities and the private sector, creating economic, environmental and social benefits for Canadians through vital genomics research. The NRC's role in the GRDI is to provide a coordination function, through program coordination,

communication, networking and outreach support. In this role, the NRC aims to promote analysis of the potential benefits of the GRDI on various stakeholders including equity-deserving groups.

The GRDI Shared Priority Projects enable the mobilization of resources and expertise from multiple departments and agencies to focus on common goals. Research results inform government regulatory, policy, and/or resource management decisions, and are used by stakeholders to support innovation in Canada. The two current GRDI Shared Priority Projects harness genomics to: 1) mitigate antimicrobial resistance – a priority public health challenge – through a one health response; and 2) monitor climate-associated change in the genetic diversity of key species, predict future vulnerabilities in tundra, forest, and aquatic, coastal and agricultural ecosystems, and provide science advice for the protection of Canada's ecosystem resiliency.

Given these objectives and the global nature of issues related to antimicrobial resistance and climate change, the projects are not expected to have a direct impact on any specific equity-deserving groups. Nevertheless, genomics-driven advancements could help address inequities including, for example, advancements that enable point of care and on-site testing benefitting individuals in remote geographical locations. The ability to predict wild and domestic animal populations' vulnerabilities to climate change will inform mitigation and adaptation policies that will benefit Canadians across the country.

The two GRDI Shared Priority Projects are interdepartmental in nature, and GRDI funds exclusively research activities within federal government laboratories at Agriculture and Agri-Food Canada, Canadian Food Inspection Agency, Fisheries and Oceans Canada, Environment and Climate Change Canada, Health Canada, Natural Resources Canada, Public Health Agency of Canada and the NRC. Together, they engage 150 employees (about 60 FTEs): research scientists, professional and technicians (about 70%), as well as post-doctoral fellows and students (about 30%). As such, the projects support indeterminate government HQP, but also a significant portion of younger populations that are hired temporarily to deliver GRDI-funded work. While a detailed analysis of HQP profiles was not completed for the previous year, all staffing actions result from HR processes that respect the *Employment Equity Act* and support the broader Government of Canada commitment to gender equality.

GBA Plus Data Collection Plan:

The NRC's role in the GRDI includes conducting studies and analyses to serve as inputs in the determination of GRDI-wide research priorities, providing management and administration support, and supporting performance management, reporting, evaluation, and communications. In this capacity, in 2022-23, the NRC coordinated a review and modification of the annual performance report template for GRDI-funded Shared Priority Projects to collect confidential information on the representation of equity-deserving groups working on the projects. This information should help GRDI in developing a workforce profile and guiding progress in policies, practices and systems to achieve employment fairness and equity, focusing on the 4 designated employment equity groups. The NRC also aims to integrate GBA Plus considerations in future evaluations and analysis of the program. The next evaluation of the GRDI program is tentatively scheduled to be initiated in 2024-25 and will provide insights and data on GBA Plus.

Program Name: Collaborative Science, Technology and Innovation Program

Program Goals: The goal of the NRC's Collaborative Science, Technology and Innovation Program (CSTIP) is to encourage and catalyze collective research excellence, resulting in scientific discoveries and technological breakthroughs. CSTIP achieves this goal through

collaborative R&D initiatives, the NRC Ideation Fund, and outreach initiatives. These three mechanisms employ GBA Plus practices by ensuring that equity-deserving groups have equal opportunities to participate in program initiatives, and are positively impacted by the program's outcomes.

Target Population: All Canadians / academia, SMEs, science & technology industry

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The research community and targeted challenge program sectors in Canada benefit directly from CSTIP funding as well as HQP in specific fields and sectors. Secondary beneficiaries are academics and SMEs that benefit from the intellectual property created through funded projects. One of the main barriers to participation in the program's activities are associated with the need to be trained and employed in the STEM research and development ecosystem, which CSTIP leverages in order to foster scientific and technological advancements. Moreover, since a significant portion of program partnerships is academic, the impact on diverse groups often depends on the demographic make-up of post-secondary students and their chosen fields of study.

In Canada, some demographic groups show lower rates of participation in post-secondary education and representation in the STEM field. This includes Indigenous youth, youth from low-income backgrounds, and youth from rural areas. Additionally, due to the demographic composition of the pipeline in STEM fields, it is likely that there will be more male participants in the program. CSTIP aims to identify these barriers to participation faced by equity-deserving groups and find solutions to remove them.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Success rate for women-led New Beginnings Round 4 proposals	Success rate for women-led proposals was 53% compared to the overall success rate of 46%	Intake form and final results	The proposals are blinded, indicating that potential for bias is eliminated from the process.
Success rate for New Beginnings Round 4 proposals led by racialized persons	Success rate for proposals led by racialized persons was 47% compared to the overall success rate of 46%	Intake form and final results	The proposals are blinded, indicating that potential for bias is eliminated from the process.
Percentage of Ideation Fund recipient enterprises owned by a woman	In 2020, 28% of client enterprises were owned by a woman	Business Linkable File Environment, Centre for Special Business Projects, Statistics Canada (2023).	Based upon enterprise's most likely primary owner and publicly available data. This secondary data is being used to understand the profile of clients that the NRC is working with.
Percentage of Challenge and Cluster support recipient enterprises owned by a woman	In 2020, 28% of client enterprises were owned by a woman		
Percentage of Challenge and Cluster support recipient enterprises owned by an immigrant	In 2020, 15% of client enterprises were owned by an immigrant		
Percentage of Challenge and Cluster support recipient enterprises owned by a person under 50 years old	In 2020, 28% of client enterprises were owned by a person under 50 years old		

* 2022-23 or most recent

Other Key Program impacts:

Through seven active Challenge programs and five active Cluster Support programs, CSTIP continues to integrate GBA Plus in its partnership activities with private, public, academic and other research organizations within and outside Canada. CSTIP provides grant and contribution funding for external collaborators with complementary capabilities (e.g., SMEs, post-secondary institutions and non-profit research organizations). The program has three main components: NRC Collaborative Research & Development (R&D) initiatives, the Ideation Fund, and the Outreach Initiative. As a result of the barriers identified by the NRC in collaboration with Indigenous recipients, CSTIP made changes to its terms and conditions that were officially approved by the Minister of Innovation, Science and Industry in December 2021. CSTIP's terms and conditions were further amended in 2022-23 to allow more flexibility in supporting projects

that specifically involve Indigenous Peoples. This will allow funding options to line up with preferred methods of funding for organizations in the North that may involve Indigenous communities.

In an effort to remove barriers to program participation from equity-deserving groups, the CSTIP's Outreach Initiative, which promotes the engagement of Canadians in STEM, provides funding to support conferences, workshops, symposia, and other outreach efforts that target under-represented groups in STEM. Similarly, the Challenge and Cluster Support programs and Ideation Fund projects have significant flexibility in their terms and conditions, which allows for targeting the participation of equity-deserving groups. Notable examples of this can be seen through the Artic and Northern Challenge program, which targets Northern Indigenous populations, and the Small Teams Indigenous Languages project, which seeks to digitalize endangered Indigenous languages.

In addition, special targeted attention was paid in the calls for proposals launched in 2022-23 to increase Indigenous participation. Examples include ensuring that the timing of the call launch respects time on the land and making templates short and clear to remove application barriers. In addition, for the first time, the external peer review included an entirely Inuit peer review panel paired with a non-Inuit panel. The panel enabled a scientific review that incorporated a distinctions-based approach that factors in regional priorities in the final selection.

Each CSTIP program uses a GBA Plus framework that commits to providing equal opportunities for equity-deserving groups. Some notable examples include:

- The Aging in Place Challenge program aims to support a sustainable model for long-term care by shifting the focus toward preventive home and community-based care. The program's objectives focus on improving the quality of life of older adults and their personal caregivers through technology and innovation that will support safe and healthy aging. The ultimate goal of the program is to increase the proportion of older Canadians who are living in homes and communities of their choice by 20% in the next decade through technologies that support safe, healthy and socially connected living. The Aging in Place program allocates resources to support the ethical participation of "Experts by Experience" (older adults and their caregivers) at the program, project and community levels and ensuring representation from across Canada, including racialized persons, official language groups, indigenous communities, 2SLGBTQ+ and persons with disabilities.
- The Arctic and Northern Challenge program has been working on several projects addressing various areas of importance to Indigenous communities in the North, such as making shipping operations safer in ice-covered waters, reinforcing ice roads for a longer operational lifespan, detecting and cleaning up oil spills in the Arctic, etc. By providing both research funding and scientific expertise, the program aims to support strong and sustainable Northern communities through applied technology and innovation to solve pressing issues confronting Northerners, specifically in the areas of housing, health, food, and water. The program is also committed to prioritizing Northern-led research projects that have a strong focus on Northern capacity building.

All challenge programs under CSTIP have integrated GBA Plus into their operations in order to build and expand diverse Canadian STEM capacity in the scientific field and the industry sectors they support. One of the ways this is accomplished is through training students and HQP to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity-deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian

industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields.

GBA Plus Data Collection Plan:

In 2022-23, CSTIP incorporated GBA Plus data collection plans into several aspects of its planning and reporting activities. All CSTIP challenge programs are co-developed through stakeholder engagement, with GBA Plus considerations factored into program design as well as the composition of external peer review and advisory committees. Furthermore, as part of the specific actions taken for GBA Plus data collection for 2022-23, all CSTIP proposal templates request information on GBA Plus considerations and recipients are asked to report back on their GBA Plus strategies. GBA Plus analyses are also included in Ideation Fund proposals.
GBA Plus data collection and analysis has been done on New Beginnings Initiative (a stream of CSTIP) for NRC applicants, with plans to extend this to other CSTIP programs from 2022-23 onwards.

An evaluation of CSTIP has been initiated in 2022-23. A specific indicator in the evaluation matrix will assess the program's integration of GBA Plus practices. This indicator will measure GBA Plus integration in program processes and tools at all stages of the program life cycle, the extent to which CSTIP encourages partners/collaborators to include GBA Plus considerations in their hiring, stakeholder engagement, and the expected differential impact of the program on diverse groups of Canadians.

The evaluation will also include an examination of EDI populations within the program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, CSTIP is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. The NRC's National Program Office collects representation data on applicants to the New Beginnings Initiative and will collect data on the breakdown of successful applications within the four designated employment equity groups.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the CSTIP program to better understand business ownership composition of recipient enterprises and other GBA Plus dimensions, including the diversity in access and participation in the program.

CSTIP also compiles qualitative evidence of its Challenge and Cluster Support programs' accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of CSTIP's efforts. Data collection on the representation of equity-deserving groups is done internally on an annual basis to inform decision making. The program is collecting data on hires and hiring targets for equity-deserving groups were introduced in 2022-23.

Program Name: Industrial Research Assistance Program

Program Goals: NRC IRAP aims to help small and medium-sized enterprises (SMEs) grow through innovation and stimulate wealth creation for Canada. IRAP achieves this by providing advisory services and financial support to firms and further by contributing to partner

organizations that offer support services to SMEs. NRC IRAP incorporates GBA Plus practices by fostering programs that provide funding and advisory services to SMEs owned or led by persons identifying as being from equity-deserving groups. Equally, IRAP works with SMEs that are looking to develop or improve their firm's EDI strategies and clients that develop products and/or services for diverse markets.

Target Population: All Canadians / SMEs, science & technology industry

Distribution of Benefits:

By gender – Second group: 60% - 79% men

By income level – Third group: No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes: SMEs are the primary beneficiaries of IRAP. According to voluntary and self-reported data from StatsCan, majority ownership (51% or more) rates of SMEs in Canada are as follows: Men (68.9%), Women (16.8%), Indigenous Peoples (1.1%), Racialized Persons (9.3%), and Person(s) with Disabilities (0.6%). NRC IRAP has a voluntary process for self-declaration and uses this information to inform efforts to provide support to firms owned or led by women, Indigenous Peoples, racialized persons and persons with disabilities.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Contributions to Organizations supporting entrepreneurs from equity-deserving groups	116 firms supported for a total of $1.4M in value added services	NRC IRAP MS Dynamics CRM Report	The results are for EDI specific initiatives
Youth Employment Program (YEP) participants that were women	49% of YEP funding went to people identifying as women (342 clients)	NRC IRAP MS Dynamics CRM Report	The results are based on voluntary self declaration by participants
Funded firms who chose to self-declare as having 50% or greater ownership	Women – 18% Visible Minorities – 19% Indigenous Persons – 2% Persons with a Disability – 2%	NRC IRAP MS Dynamics CRM Report	The results are based on voluntary self declaration by firms receiving IRAP funding. These numbers are aggregates of declarations with intersectionality.

* 2022-23 or most recent

Other Key Program impacts:

NRC IRAP has made efforts to diversify participation in its programs and build on work already underway to provide support to firms owned or led by women, Indigenous Peoples, racialized persons and persons with disabilities through a number of agreements with not-for-profit organizations. NRC IRAP uses an EDI lens in its operations when building its programs and policies for clients.

NRC IRAP has taken a number of actions to support these diversification objectives. For example, it established a target of 50% women participants in the Youth Employment Program (YEP), for which post-graduate degree holders between 15 and 30 are eligible, achieving 49% in 2022-23. In the same period, 27% of NRC IRAP YEP participants identified as racialized persons, surpassing the program's target of 15%. Further, 4% of participants identified as Indigenous Peoples, surpassing the program's target of 1%. Lastly, 3% of program participants identified as persons with a disability, surpassing the target of 1%.

NRC IRAP continues to use modern recruiting tools to attract, retain and develop a diverse workforce. Summary statistics of NRC IRAP hires between 2018 and 2021 were obtained and analyzed for new employees. Results indicate that between fiscal years 2018 and 2021, 42% of new NRC IRAP hires self-identified as members of one or more of the four designated employment equity groups, most commonly as women. In the same timeframe, 58% of new managers hired at NRC IRAP self-identified as a member of one or more of the four employment equity groups. IRAP also employed a recruiter to proactively build a pipeline of ITA candidates from various employment equity groups, to improve representation among the workforce and to be more representative of the Canadian landscape.

NRC IRAP specifically incorporates a GBA Plus lens in its program activities as an effort to encourage a more diverse program participation pool. NRC IRAP efforts to increase participation of companies owned and led by members of equity-deserving groups have been positively recognized in the program's 2022 evaluation report. The evaluation found that NRC IRAP funded proportionally more SMEs owned by individuals from historically underrepresented groups than were operating in the Canadian economy.

NRC IRAP continues to participate and be represented on the Women's Entrepreneurship Strategy Assistant Deputy Minister Committee and Working Group collaborating on strategies in support of women entrepreneurs. NRC IRAP is also represented on Taftie, the European Network of leading national innovation agencies' group, which is reviewing best practices on diversity and inclusivity. NRC IRAP collaborates with UK Research and Innovation to support government initiatives including EDI.

In terms of its partnerships and collaborators, in 2022-2023, an EDI budget was put in place to develop a suite of focused Contribution to Organizations (CTOs) and Contribution to Firms (CTFs) to remove barriers to growth for equity-deserving groups. NRC IRAP funded ten CTOs (for a value of $1.4M) that focused on reducing barriers for equity-deserving groups from 116 SMEs, as well as 22 CTFs (for a value of $720,000) for clients owned or led by members of equity-deserving groups or clients developing products and/or services for diverse markets. The equity-deserving groups supported included:

- 97 women and gender-diverse entrepreneurs received $1,042,742 in advisory services and funding in areas such as scaling their business, becoming investor ready and accessing the Global Value Chain;

- 24 Indigenous entrepreneurs received $70,000 in advisory services and funding in areas such as business plan development and growth coaching; and
- 10 racialized entrepreneurs received $100,110 in advisory services and funding in areas such as business acceleration and network development.

It is important to note that these numbers do not account for intersectionality, nor do they capture other advisory services and funding provided through regular IRAP streams.

NRC IRAP also developed and piloted an EDI Literacy program for internal and external facing employees. A CTO was developed with the Diversity Institute of the Toronto Metropolitan University to provide advisory services and tools for clients wishing to develop or improve their EDI plans and value proposition.

Finally, to further celebrate and encourage diversity, the program published two success stories featuring entrepreneurs from equity-deserving groups.

GBA Plus Data Collection Plan:

NRC IRAP has a voluntary data collection process for clients to self-declare Employment Equity information about their business ownership, leadership and board composition. In 2023-24, NRC IRAP will continue collecting and analyzing data to understand how equity-deserving groups are experiencing unintended barriers to NRC IRAP support, and to develop mitigation strategies to address these barriers.

The NRC will continue to engage TBS and Statistics Canada in 2023-24 to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) to enable the IRAP program to better understand business ownership composition of enterprises supported and other GBA Plus dimensions, including the diversity in access and participation in the program.

In 2023-24, NRC IRAP's EDI team will review the data collection and reporting processes to identify improvement opportunities to obtain more accurate results on the diversity of its clients. Moreover, NRC IRAP also plans to update their data collection strategy to ensure that they can report on all companies that self-declare, including those that have less than 50% ownership from equity-deserving groups.

Program Name: International Affiliations

Program Goals: International Affiliations (IA) maintains memberships in international science and technology organizations so that Canada can participate and contribute to international endeavours that promote the exchange and dissemination of knowledge in the most advanced areas of scientific and industrial research. The program has integrated GBA Plus into many aspects of its activities, including analyses of benefits to equity-deserving groups from its initiatives and projects and representation of diverse views in its advisory committee and selection processes.

Target Population: All Canadians / researchers, international organizations or alliances

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

The national and international scientific research community benefits directly from this program. The program itself is broadly gender-balanced and shows no significant distributional impacts, inter-generational impacts, or differences in impacts between youth and seniors. Since one of the program's main goals is to ensure that 100% of funded organizations have programs to support equity, diversity and inclusion, researchers from groups that have historically been underrepresented in the scientific research community, such as women, Indigenous Peoples, racialized person, and/or persons with disabilities may benefit directly from this program.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Percentage of supported international organizations or their respective Canadian National Committees (CNCs) that had initiatives and projects that benefit equity-deserving groups	100% in 2022-23	Program annual performance report	

* 2022-23 or most recent

Other Key Program impacts:

The Grants for International Affiliations (GIA) program has a target of ensuring that 100% of funded organizations have programs to support equity, diversity and inclusion. The GIA program funds a wide variety of scientific discipline based international unions or committees with varying equity, diversity and inclusion goals. It is notable that all organizations are now sensitized to these issues and moving from data tracking to actions that will address EDI issues. The GIA program funds organizations (scientific discipline based international unions or committees) that are committed to transparency and equity and it did not fund any individuals in 2022-23.

The International Affiliations program is responsible for Canada's membership in international science and technology (S&T) organizations that promote international research and innovation, networking, advocacy, leadership opportunities, as well as access to benchmarking possibilities, enabling Canadian science, technology, and industry to remain competitive. The program has integrated GBA Plus into many aspects of its activities, including analyses of benefits to equity-deserving groups from its initiatives and projects, and the representation of diverse views in its advisory committee and selection process.

The program engages with representatives of each Canadian National Committee (CNC) responsible for specific international affiliations to assess evolving priorities, most valued benefits of the program to participants and to understand the needs of each CNC. GBA Plus has been integrated into the annual performance review process to track the initiatives and projects of the CNCs that benefit equity-deserving groups.

In addition, the International Affiliations program has integrated GBA Plus into its governance structure. An advisory committee for the program has now met through four full fiscal years, drawing on cross government science departments and agencies and deploying diverse expertise to leverage Canadian international science objectives. In 2021, the program piloted an EDI Subcommittee to provide input for any nominations, awards or positions to support diversity

and inclusion and address under-representation of certain groups, and this Subcommittee became permanent in 2022.

GBA Plus Data Collection Plan:

The International Affiliations program has incorporated GBA Plus data collection in its planning and reporting activities to ensure participation of equity-deserving groups and understand the benefits to diverse groups. The program continues to engage with the CNCs managing international affiliations to better gauge impacts and plans, and ensure continued recipient engagement in the program. This will inform the Canadian STI management community of the science diplomacy needs of Canadian practitioners in light of track records of international affiliations, and the associated level of required support. Moreover, as part of the GBA Plus data collection plan, regular engagement continues to take place in 2023, including completion of a reporting questionnaire and short interviews to assess performance and program direction.

The International Affiliations program will continue to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity.

Program Name: TRIUMF

Program Goals: TRIUMF is a national laboratory that seeks to transfer knowledge, train highly skilled personnel, and commercialize research for the economic, social, environmental, and health benefit of all Canadians. The NRC plays an important oversight and stewardship role for TRIUMF Inc. on behalf of the Government of Canada, but is not directly involved in designing and running the organization's operations.

Target Population: All Canadians / academia, students, researchers

Distribution of Benefits: N/A

Specific Demographic Group Outcomes:

TRIUMF Inc. directly benefits the academic community, specifically students and researchers in the STEM field. Since the program directly benefits students and STEM researchers, the impact on diverse groups often depends on the demographic make-up of post-secondary students and their chosen fields of study.

In Canada, some demographic groups show lower rates of participation in post-secondary education and representation in the STEM field. This includes Indigenous youth, youth from low-income backgrounds, and youth from rural areas. Additionally, due to the demographic composition of the pipeline in STEM fields, it is likely that there will be more male participants. TRIUMF Inc. aims to identify the barriers to participation faced by equity-deserving groups and find solutions to remove them. In addition to campaigns to raise awareness about its activities among youth and equity-deserving groups, TRIUMF Inc. has put in place an undergraduate fellowship (Richard E. Azuma Summer Fellowships) that actively recruits members of equity-deserving groups, and has actively hired students from traditionally underrepresented groups in STEM.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Not available			

* 2022-23 or most recent

Other Key Program impacts:

A consortium of Canadian universities owns TRIUMF Inc., which receives funding from several federal government organizations, including operational funding through a contribution agreement with the NRC. TRIUMF Inc. has its own governance and management team that operates and manages TRIUMF Inc. As part of its oversight and stewardship role, the NRC serves on the governance committees of TRIUMF Inc. and provides advice on its implementation of GBA Plus data collection activities.

A recent evaluation of the TRIUMF program in 2022-23 concluded that TRIUMF Inc. was taking steps to improve diversity in hiring through workshops on implicit bias and preferential hiring, and creating HR targets for gender equity in hiring. It also indicated that TRIUMF Inc was allocating the use of its facilities in a fair and equitable manner through Experiments Evaluation Committees. These committees are gender-balanced and have demonstrated a lack of bias in gender bias reviews.

In 2022-23 TRIUMF Inc. implemented GBA Plus activities which included the release of its inaugural 20-year vision. The 20-year vision positions EDI as a core pillar in the organization's approach to ensuring TRIUMF Inc is a world-class research facility. In 2022-23, TRIUMF Inc. targeted undergraduate recruitment via the Richard E. Azuma Summer Fellowship, which actively recruits members of designated groups. TRIUMF Inc. also provided continued support and resources for the its ombudsperson for students and postdoctoral fellows, and hosted two sets of focus groups related to equity-deserving groups. The first focus group was specifically for women (in 2022) and the second was for 2SLGBTQIA+ people (in 2023) at TRIUMF. These focus groups provided a platform for TRIUMF employees to share experiences, voice concerns, and collaborate on solutions. The outcomes of both focus groups helped guide the development of objectives within TRIUMF's EDI Action Plan. TRIUMF also hired a full-time EDI Officer to oversee and manage activity in this space, including the development of an EDI Action Plan that will follow next year and include the collection of updated data from across the organization.

GBA Plus Data Collection Plan:

The NRC supports requirements related to monitoring the advancement of equity across gender and other dimensions through its oversight and stewardship role in TRIUMF's governance structure. However, TRIUMF's current process does not allow for data collection on an ongoing basis. A comprehensive survey and data collection exercise is identified as a priority within the organization's EDI Action Plan and is expected to take place in 2023-24.

Program Name: National Science Library

Program Goals: The goal of the National Science Library (NSL) is to support the advancement of knowledge through a range of information-related services to the public and other libraries. The NSL program incorporates GBA Plus in its activities by ensuring that content is easily accessible to all Canadians, and that a NSL catalogues contain resources that support and represent EDI.

Target Population: All Canadians / OGDs

Distribution of Benefits:

By gender – Broadly gender-balanced

By income level – No significant distributional impacts

By age group – No significant inter-generational impacts or impacts between youth and seniors

Specific Demographic Group Outcomes:

All Canadians directly benefit from the NSL since it is a public platform that seeks to support and encourage the advancement of knowledge through a range of public information-related services. The program is working to actively digitalize content in order to improve accessibility for those that are unable to access physical repositories. However, it is important to note that individuals living in remote regions and rural areas with limited access to the internet or NSL resources may continue to face barriers to participating and accessing NSL services.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Anti-racist and Indigenous engagement resource guides unique page views	1,173 unique page views in 2022-23	Google analytics	Resource guides available on the library website are developed and curated by library staff.
NRC Publications Archive (NPARC) downloads	1,711,677 items downloaded in 2022-23	Google analytics	NRC's "open" repository for the storing, managing and sharing of NRC-authored technical reports, conference publications, articles, (and other similar works).
Open access article downloads covered by transformative agreements	89,067 worldwide articles downloaded in 2022-23 (43% from developing countries in Asia, Latin America and Africa)	Publisher platform	Transformative agreements are negotiated between institutions (libraries, national and regional consortia) and publishers to enable subscription costs to support open access publishing by NRC's authors. The goal is to transform the business model underlying scholarly journal publishing from one based on subscriptions to one in which publishers are remunerated a fair price for their open access publishing services.

* 2022-23 or most recent

Other Key Program impacts:

The NRC National Science Library (NSL) offers a range of information-related services to the public and other libraries. Services include online access to digital content through NRC's publicly available repositories (NRC Publications Archive and the Digital Repository), a searchable catalogue and information discovery platform, and reference/interlibrary loan

services with other libraries. The NSL is a member of the Federal Science Libraries Network (FSLN), a partnership of seven federal science libraries that have joined together to establish a one-stop, self-serve portal where you can access library services and search the print collections and repositories of all the libraries from a single place.

The NSL is committed to open science and open government principles in making its research outputs accessible through its repositories. The program established operations for the Federal Open Science Repository of Canada, a portal that will provide public, web-based access to federally authored scientific articles and publications, which will launch in 2023. Through the NSL program, the NRC also provided transformative agreements that facilitated free open access to 100 federal authored peer-reviewed scientific articles that would have otherwise been published behind a paywall. To improve accessibility and transparency, the NRC-NSL completed the digitization of NRCs annual reports dating back to volume one issue one (88 reports), making this high demand collection publicly available in 2023.

With the impact of COVID-19 on in-person and telephone services, the NRC has been increasing digitization of its historical research products to reduce barriers in accessing federal research efforts and increasing accessibility to all Canadians, including those facing financial barriers. The NSL continues to support information-related services in a variety of ways to diverse user groups. This includes providing NRC-related historical research services to other libraires as well as serving NRC and non-NRC clients through in-person, telephone, and online means. The FSLN public site, the NRC Publications Archive, and the Digital Repository provide access to Government of Canada scientific information and research whilst following all requirements under the Web Content Accessibility Guidelines. The NRC is also making improvements to NSL and FSLN services through the development and promotion of a service catalogue to increase access to services for internal clients and expanded access to global library collections through inter-library loans.

The NRC made efforts to increase anti-racism resources for NRC employees, and content specific to equity-deserving groups such as women in STEM and Indigenous Peoples. Through the NSL, the NRC purchased library resources related to anti-racist and Indigenous engagement practices, developed resource guides related to anti-racist and Indigenous engagement practices in research and the workplace, including books, reports, statistics and academic articles, and replaced library of Congress and Canadian subject headings in the FSLN catalog related to Indigenous Peoples with more current terminology to support reconciliation (e.g. replacing the term "Indians of North America" with Indigenous Peoples). The NRC also curated archival collections about NRC female scientists to support women in STEM and facilitated discovery by participating in the University of Ottawa's Canadian Archive of Women in STEM portal and supported national print preservation efforts to ensure access to federal STEM materials.

GBA Plus Data Collection Plan:

The NSL has a GBA Plus data collection plan to ensure participation of equity-deserving groups and to understand the benefits to diverse groups. Data is collected on specific GBA Plus initiatives in the form of qualitative evidence of NSL's accomplishments and impacts on diverse groups. This includes an initiative to digitize the NRC's annual reports since 1917 to reduce barriers in accessing information on NRC's historical activities and increase accessibility to all Canadians. The program is collecting data on the number of reports that are converted to a digital format by the end of 2023-24. The NSL will release digitized copies of the NRC's annual reports since 1917 on the NRC website in 2023 to reduce barriers in accessing information on the NRC's historical activities and increase accessibility to all Canadians. The program is also

collecting data on the number of downloads/views of the content on the platform in order to better gauge the success of the digitization initiatives. Furthermore, data will continue to be collected in 2023-24 on the progress made under other initiatives such as the development and promotion of the service catalogue for NSL and FSLN and increasing library resources related to GBA Plus.

The NSL program continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity.

Another initiative is the launch of the Federal Open Science Repository of Canada in 2023. The repository provides equal access to federally authored scientific articles and publications from eight science departments and agencies to users worldwide regardless of location, nationality, race, gender, income, religion, disability, or ethnicity. The program plans to implement advanced reporting that will capture country views from where the visits originate to understand the benefits of access for different populations. Finally, the program will continue to monitor federal open access publishing as a result of transformative agreements, as well as the global usage, citations, and altmetrics.

Program Name: Business Management Support

Program Goals: The goal of the Business Management Support program is to provide critical client engagement, technology transfer, and commercialization support to NRC research programs. The Business Management Support program applies GBA Plus to its activities by ensuring that its hiring practices reflect an EDI lens that facilitates candidates from diverse backgrounds applying to the program's job openings.

Target Population: NRC Employees (internal programs)

Distribution of Benefits: N/A

Specific Demographic Group Outcomes:

Since the primary beneficiaries of the program are internal NRC employees, this program supports government operations that benefit all Canadians. Some NRC employees who require special accessibility requirements may face barriers in accessing the program's services. Business Management Support is committed to identifying these barriers and adjusting the program to fit the accessibility needs of all employees.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Not available			

* 2022-23 or most recent

Other Key Program impacts:

The Business Management Support program provides critical client engagement, technology transfer and commercialization support to NRC by: identifying and developing a pipeline of opportunities that enable the research programs to meet their objectives (impact and revenue); negotiating agreements with third parties for research and testing-related activities and ensuring that these agreements do not expose the NRC or the Government of Canada to undue risk; managing, and administrating the NRC's intellectual property assets; and providing technical business intelligence to our internal clients. For 2022-2023, the Business Management Support Program used a GBA Plus lens in its hiring practices. Specifically, two new positions were

created in the directorate and preference was given to under represented groups. Both positions were filled by women.

GBA Plus Data Collection Plan:

The enabling programs are internal programs providing client engagement, technology transfer and commercialization support to NRC employees, enabling the delivery of other NRC programs. The NRC branch under which the BMS program is located continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity.

Program Name: Design and Fabrication Services

Program Goals: Design and Fabrication Services (DFS) includes a comprehensive and national set of services to all NRC programs and Science and Technology (S&T) initiatives in custom and innovative computer-aided design, high-precision mechanical engineering, expert fabrication and advice on quality. DFS applies GBA Plus in its program activities by ensuring that the services it provides do not pose any accessibility barriers for any equity-deserving groups.

Target Population: NRC Employees (internal programs)

Distribution of Benefits: N/A

Specific Demographic Group Outcomes:

Since the primary beneficiaries of the program are internal NRC employees, DFS supports government operations for all Canadians. Some NRC employees who require special accessibility requirements may face barriers in accessing the program's services. DFS is committed to identifying these barriers and adjusting the program to fit the accessibility needs of all employees.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Not available			

* 2022-23 or most recent

Other Key Program impacts:

Design and Fabrication Services (DFS) delivers a comprehensive and national set of services to all NRC programs and their Science and Technology (S&T) initiatives in custom and innovative computer-aided design, high-precision mechanical engineering, expert fabrication and advice on quality. These services directly enable the creation of experimental and client deliverable prototypes (both virtual and physical), highly precise and calibrated test instrumentation and new national facility designs using the practice of professional engineering to assure performance, quality and the reduction of risks in health and safety and environmental stewardship for the NRC. The outputs of DFS directly contribute to the success of research, technology development and the advancement of knowledge for the NRC. Furthermore, efficiencies are generated through a managed work environment across 13 DFS locations to maximize utilization of its people and resources.

As a support group, the impact of DFS' work on GBA Plus can be seen in the results of the Research Centre projects to which the program has contributed.

GBA Plus Data Collection Plan:

The enabling programs are internal programs providing client engagement, technology transfer and commercialization support to NRC employees, enabling the delivery of other NRC programs. The DFS program continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity.

Program Name: Research Information and Technology Platforms

Program Goals: Research Information and Technology Platforms (RITP) ensures that researchers at the NRC have access to a multitude of IT tools and support services that are critical to delivering research outcomes. The program integrates GBA Plus in its activities by following the NRC's 2023-2025 Accessibility Plan to ensure that services are fully accessible to all end-users.

Target Population: NRC Employees (internal programs)

Distribution of Benefits: N/A

Specific Demographic Group Outcomes:

Since the primary beneficiaries of the program are internal NRC employees, RITP supports government operations that serve all Canadians. Some NRC employees who require special accessibility requirements may face barriers in accessing the program's services. RITP follows the NRC's 2023-2025 Accessibility Plan and is committed to identifying these barriers and adjusting the program to fit the accessibility needs of all employees.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Not available			

* 2022-23 or most recent

Other Key Program impacts:

RITP oversees and delivers on three research platforms: specialized research equipment, high performance computing, and research-relevant infrastructure. Specialized research equipment (IT equipment embedded within or linked to non-IT laboratory equipment) is used to provide control in the formation and gathering, storing and analyzing of research data. High performance computing is a primary research tool in a wide range of research areas, such as gene sequencing and astronomy. Research-relevant infrastructure ensures that researchers have access to a multitude of IT tools and support services, such as end user devices, research development environments, and source code repositories. All of these services are critical for delivering research outcomes.

The NRC finalized its 2023-2025 Accessibility Plan that outlines concrete actions and priority areas for the program to create a respectful and inclusive workplace and culture, and to better serve the Canadians accessing its services. The Accessibility Plan assigned action items for the Knowledge, Information and Technology Services (KITS) Branch, which RITP is under, to improve the NRC's overall digital accessibility. KITS is assigned to lead or work with other branches to improve the necessary tools, processes and resources to support technology-related accommodation requests, make all internal and external communications products (print and online) fully and consistently accessible, ensure that procurement documentation is

consistently available in accessible formats. RITP intends to continue implementing the NRC's 2023-2025 Accessibility Plan to ensure that all end-users are able to fully access its services.

GBA Plus Data Collection Plan:

The enabling programs are internal programs providing client engagement, technology transfer and commercialization support to NRC employees, enabling the delivery of other NRC programs. The NRC branch under which the RITP program is located continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity.

Additionally, in 2022-2023, RITP identified key areas for improvement in its utilization of GBA Plus strategies. These areas include developing training requirements for IT professionals on end-user accessibility and creating an inventory of digital resources in 2024, and commencing regular accessibility assessments in 2025.

Program Name: Special Purpose Real Property

Program Goals: NRC's Special Purpose Real Property (SPRP) program engages in a wide range of activities in support of its real property portfolio. Those activities may be broadly grouped into three general classes: routine maintenance of existing real property assets; capital improvements and major modifications to existing real property assets; and changes to the NRC real property portfolio though purchase, sale, lease or license. SPRP incorporates GBA Plus in its activities by leading initiatives that improve the accessibility of NRC's real property (buildings, parking facilities and designated drop-off zones) as per the NRC's 2023-2025 Accessibility Plan.

Target Population: NRC Employees (internal programs)

Distribution of Benefits: N/A

Specific Demographic Group Outcomes:

Since the primary beneficiaries of the program are internal NRC employees, this program supports government operations that serve all Canadians. Some NRC employees who require special accessibility requirements may face barriers in accessing the program's services. SPRP is committed to identifying these barriers and adjusting the program to fit the accessibility needs of all employees.

Key Program impacts* on Gender and diversity:

Key Program Impacts Statistics:

Statistics	Observed Results*	Data Source	Comment
Not available			

* 2022-23 or most recent

Other Key Program impacts:

The NRC recently launched its Accessibility Plan for 2023-2025. The plan outlines concrete actions and priority areas for the NRC to promote a respectful and inclusive workplace and culture, and to better serve Canadians accessing its services. The Real Property Planning and Management (RPPM) Branch, where the SPRP is located, leads various initiatives of the NRC Accessibility Plan. The Accessibility Plan noted that not all of the NRC's parking facilities and designated drop-off zones are fully accessible. As such, RPPM was tasked with action items to remove these barriers. Action items for 2023 include, completing the remaining three accessibility assessments for NRC buildings. For 2024, action items include: establishing the

process to engage with persons with disabilities for the planning, implementation and post-implementation stages of new builds and retrofits to existing buildings, utilizing tools to help identify deficiencies with respect to accessibility issues in the management of real property assets (buildings), and engaging with building owners for all NRC-leased facilities to develop strategies to address accessibility deficiencies.

GBA Plus Data Collection Plan:

The enabling programs are internal programs providing client engagement, technology transfer and commercialization support to NRC employees, enabling the delivery of other NRC programs. The NRC branch under which the SPRP program is located continued to set targets and collect data (where possible) on its work to build and expand diverse Canadian STEM capacity.

In 2023-24, RPPM will also track progress based on specific indicators against action items included in the NRC's Accessibility Plan, including the number of projects completed that have a defined GBA Plus implication that can be measured and reported.

Response to Parliamentary Committees and External Audits

Response to parliamentary committees

Economic Recovery in Canada's Forestry Sector: Green and Inclusive

- The House of Commons Standing Committee on Natural Resources undertook a study on the Economic Recovery in the Forestry Sector. Forests are a key part of the Canadian economy, both for their recreational use and as the source of numerous products. The forest industry generates significant revenues for Canada's economy and supports thousands of jobs on which many rural and Indigenous communities depend. Many of these communities are also closely connected to forests as a form of natural and cultural heritage. Sustainable and effective management of forests is critical to ensuring the future of the forestry sector and for reaping all the benefits that wood products have to offer.
- Committee Report No. 2 - RNNR (44-1) - House of Commons of Canada (ourcommons.ca)
- Government Response - 8512-441-07 - House of Commons of Canada (ourcommons.ca)
- The NRC was not named in the report's recommendations, but was named by witnesses for its role in coordinating the National Building Code and its advice on the use of laminated timber in high-rise construction.
- Similarly, the NRC was not named in response to the recommendation. However, it was named in the government's response with respect to its published Wildland Urban Interface Guide, which is intended to enhance life safety, property protection and community resilience to fires by providing guidance on hazard and exposure assessment, construction measures, vegetation management and community planning.

Development and Support of the Aerospace Industry

- The House of Commons Standing Committee on Industry and Technology (the Committee) agreed to undertake a study on issues related to the development and support of the aerospace industry.
- Committee Report No. 5 - INDU (44-1) - House of Commons of Canada (ourcommons.ca)
- Government Response - 8512-441-105 - House of Commons of Canada (ourcommons.ca)
- The NRC was not specifically named in the report, however, it was featured in Part D of the government response to the report, accounting for its contributions in support of the aerospace sector.

How can Canada Remain a Leader in the Global Quantum Marathon

- The House of Commons Standing Committee on Industry and Technology undertook a study of the Canadian quantum computing landscape to assess

Canada's current capabilities and efforts to ensure the correct policy tools and investment vehicles are in place to keep Canada globally competitive.

- Committee Report No. 6 - INDU (44-1) - House of Commons of Canada (ourcommons.ca)
- Government Response - 8512-441-128 - House of Commons of Canada (ourcommons.ca)
- The NRC was named in the report and in the government's response with respect to several recommendations:
    - Funding for technology development and commercialization (Response to Recommendations 1, 2, 3, 5, 8 and 9).
    - Supporting talent development and retention (Response to Recommendation 6).
    - Creating a cohesive and coordinated National Quantum Strategy (Response to Recommendations 3, 7, 10 and 11).
    - Protecting encryption systems (Response to Recommendation 4).

Successes, Challenges and Opportunities for Science in Canada

- The new House of Commons Standing Committee on Science and Research decided to begin its work with a study of successes, challenges and opportunities for science in Canada, with a special focus on government science, research during the pandemic, big science, and emerging opportunities.
- Committee Report No. 1 - SRSR (44-1) - House of Commons of Canada (ourcommons.ca)
- Government Response - 8512-441-90 - House of Commons of Canada (ourcommons.ca)
- There were no recommendations for the NRC, however, it was named in the government response addressing recommendations:
    - Optimizing the Research Ecosystem (Response to Recommendations 2, 3, 4).
    - Supporting Research in Colleges, CEGEPs and Institutes (Response to Recommendations 10, and 11).

Response to audits conducted by the Office of the Auditor General of Canada (including audits conducted by the Commissioner of the Environment and Sustainable Development)

The NRC was scoped into the OAG Audit of COVID-19 Vaccines (Report 9, 2022) but there were no recommendations for the NRC.

Response to audits conducted by the Public Service Commission of Canada or the Office of the Commissioner of Official Languages

There were no audits in 2022-23 requiring a response.