

2020–21
Departmental Results Report

National Research Council Canada

The Honourable François-Philippe
Champagne, P.C., M.P.
Minister of Innovation, Science and Industry

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Departmental Results Report 2020–21
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From the Minister

It is my pleasure to present the 2020–21 Departmental Results Report for the National Research Council of Canada (NRC).

In a year that was characterized by uncertainty and rapidly shifting priorities as a result of the global COVID-19 pandemic, Innovation, Science and Economic Development Canada (ISED) and its Portfolio partners remained committed in their continued efforts to meet the evolving needs of Canadians and the Canadian economy. The ISED and Portfolio Departmental Results Reports describe a number of immediate and remarkable contributions over the past year, including those that were part of Canada’s COVID-19 Economic Response Plan.



The NRC played an important role in Canada’s response to the COVID-19 pandemic, contributing its expertise and leveraging its partnerships to support Canada’s vaccine strategy, strengthen the domestic supply chain for personal protective equipment (PPE) and testing, and assist small and medium-sized businesses across the country as they adapted over the past year. As we move forward, the NRC is focused on continuing to contribute to increasing Canada’s biomanufacturing capacity and – perhaps our greatest challenge of today – enabling a more sustainable future.

Through all these initiatives and more, we continued to deliver on our commitment to foster a dynamic and growing economy that creates jobs, opportunities and a better quality of life for all Canadians, including those from diverse backgrounds, such as women, Indigenous peoples, racialized Canadians, persons with disabilities and LGBTQ+ groups.

We invite you to read this report to learn more about how the NRC, like ISED and its Portfolio partners, is building a strong culture of innovation 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 Letterⁱ](#)

From the President

The NRC is uniquely positioned to advance research and innovation focused on Canada’s challenges and opportunities. In 2020–21, despite an unexpected and rapid transition to deliver new initiatives in support of the Government of Canada’s COVID-19 response, work to support core research operations continued in pursuit of our strategic goals. In a year like no other, we were able to fulfill our commitments related to research excellence, innovation, business support, collaboration and workforce development.

Protecting Canadians: Beyond carrying on with critical work across the NRC during the pandemic, we assisted in establishing new testing protocols for PPE, helping Canadian companies meet important needs to protect our frontline workers and securing the domestic supply chain for testing. The NRC was called on to contribute to the government’s efforts to increase Canada’s domestic biomanufacturing capacity. We began construction of the new Biologics Manufacturing Centre at the Royalmount site in Montréal to produce vaccines and other biologics to respond to the current and future pandemics, and completed construction of the facility ahead of schedule. The NRC also supported federal departments, vaccine and immunology experts, and industry leaders working at the forefront of Canada’s COVID-19 vaccine strategy, including the Vaccine Task Force (VTF). Supported by a secretariat hosted at the NRC, the VTF provided invaluable advice to support evidence-based decisions to protect the health and safety of Canadians during the pandemic.

At the onset of the pandemic, we made donations of urgently needed personal protective equipment (PPE) for frontline workers, with 10 palletes of our own PPE comprising N95 masks, sterile nitrile gloves and coveralls, shipped out to health care workers across Canada. To respond to the needs of Canadian organizations looking for research and technical support in advancing COVID-19 solutions, we created the Community Support Initiative and by September 2020, triaged over 900 requests spanning various sectors.

In addition to fighting COVID-19 through health innovation, the NRC leveraged increased digitization and environmental technologies to advance our goals in climate change and adaptation, recognizing the importance of achieving a sustainable, low-carbon economy. We remain committed to strengthening research efforts to help reduce carbon emissions, advance clean energy solutions and mitigate impacts of climate change. We also dedicated research to the advancement of digital technologies and artificial intelligence (AI) in areas such as advanced manufacturing, intelligent transportation systems, telecommunications, quantum technologies and Indigenous languages applications.



Supporting our clients: The National Research Council of Canada Industrial Research Assistance Program (NRC IRAP) expanded support to Canadian small and medium-sized businesses by nearly doubling its programming in 2020–21. NRC IRAP provided support to more than 2,200 businesses to retain their staff and continue momentum through the Innovation Assistance Program (IAP). NRC IRAP also collaborated with industry and partners to help companies advance their research & development (R&D) efforts in support of COVID-19 priorities through the Innovative Solutions Canada (ISC) COVID-19 Challenge program and worked with promising Canadian vaccine and therapeutics firms to advance their research. In 2020–21, NRC research and technical staff found new ways of safely operating facilities to meet the needs of its R&D clients and enable Canadian companies to continue to deliver their products and services.

Protecting our people: The collaborative work of our employees, their commitment and their achievements are our greatest assets. That is why we embrace a diverse and inclusive workplace. The variety of expertise and capabilities throughout the NRC reflects our multidisciplinary approach to problem solving and attention to building an environment that fuels creativity. To protect the health and safety of employees during the pandemic, the NRC quickly enabled the transition of employees to off-site work. We continued to deliver initiatives under our Strategic Human Resources (HR) Plan, with an emphasis on mental health and wellness, and on equity, diversity and inclusion.

I want to recognize the commitment and innovation demonstrated by NRC employees during a challenging and unprecedented year. Our work alongside colleagues from government, industry and academia, has shown that working together we can face our greatest challenges and deliver solutions that keep Canada moving forward.

Mitch Davies
President
National Research Council Canada
[Mandate Letter for the NRC President](#)ⁱⁱ

Results at a glance and operating context

What funds were used? (2020–21 Actual spending)	Who was involved? (2020–21 Actual full-time equivalents)
\$1,648,655,313	4,261.3

The NRC strives for excellence in research and innovation for a better Canada and world by advancing knowledge, applying leading-edge technologies, supporting business innovation and providing technological solutions to public policy challenges.

In its second year of implementation, the NRC’s Five-Year Strategic Plan continued to guide the organization. To solidify and strengthen its role in Canada’s research and innovation system, the NRC maintained focus on its strategic direction and five areas of focus: enabling a more sustainable economy, supporting a healthier future, innovating the everyday, creating Canadian wealth through innovation, and understanding our world. In 2020–21, the Government of Canada’s COVID-19 response put an emphasis on the goal of supporting a healthier future. The NRC played a key role in the immediate pandemic response, while also preparing the country for possible future health crises.

Scientific and technological knowledge advances

The NRC translates scientific excellence into innovations that improve the quality of life for Canadians and people around the world. Bringing together industry, academia, and government with the NRC’s national network of researchers and facilities enables scientific and technological breakthroughs, and in 2020–21, the NRC increased collaborative R&D through its [Collaboration Centres](#),ⁱⁱⁱ [Ideation Fund](#)^{iv} projects and strategic partnerships. The NRC’s research expertise contributed to solutions for a healthier, more sustainable future and digital economy, including: clean energy solutions and resiliency of infrastructure; AI and machine learning for intelligent transportation systems, advanced manufacturing and coastal infrastructure; reliable telecommunications networks; quantum science and technologies; and increased biomanufacturing capacity for Canada.

Innovative businesses grow

By balancing the advancement of emerging science and technology required for tomorrow’s economy with innovation support that Canadian companies need to grow and succeed, the NRC expanded its business support and advice through NRC IRAP. In 2020–21, NRC IRAP received new funding to: support businesses struggling in the pandemic through the Innovation Assistance Program; catalyze innovative solutions for challenges resulting from the COVID-19 pandemic through the Innovative Solutions Canada COVID-19 Challenge program; and provide its expertise to build back a stronger, more resilient economy. With limitations to in-person attendance, the NRC took advantage of virtual tools to stay engaged on the international scale and ensure continued global visibility and relevance for international expansion of small and medium-sized enterprises (SMEs).

Evidence-based solutions inform decisions in government priority areas

The importance of working with partners to achieve shared outcomes for the benefit of Canadians has never been as evident as it was in 2020–21, when government collaboration was so critical for an effective response to COVID-19. In addition to the NRC's efforts in the pandemic response, such as helping to build a domestic supply chain for PPE and increase testing capacity, the NRC also contributed to ongoing key government initiatives. Specifically, the NRC continued to support the [Innovation Superclusters Initiative](#),^v through its [Supercluster support programs](#)^{vi} and expanded its mission-driven [Challenge programs](#),^{vii} with the addition of a [Pandemic Response Challenge program](#)^{viii} to accelerate the development of diagnostics tools and medical countermeasures for a rapid front-line response to protect and treat Canadians affected by the pandemic. Aligned with the goal of a healthier future, the NRC also contributed to initiatives in food production and security, safety in the cannabis market, genomics research, detection of bacterial toxins, and carbon-neutral construction.

Internal services

The work of the NRC's corporate and business services was key in supporting critical work throughout the pandemic and ensuring that NRC staff felt safe, engaged, and supported during a year of completely different workplace conditions. Essential components to equip personnel with the needed tools included: rapid and extensive enhancements to the IT (information technology) infrastructure; expedited implementation of new health and safety protocols for those returning to limited work on-site and those within a telework environment; and streamlined business management and administrative processes to increase productivity. To support NRC employees through a tumultuous year, the NRC provided them with open and clear communication and guidance on the constantly changing work landscape; increased support for mental health and wellness; and continued delivery of HR initiatives to promote equity, diversity and inclusion, leadership development and a strong, talented science, technology, engineering and mathematics (STEM) workforce.

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:

- scientific and technological knowledge advances;
- innovative businesses grow; and
- evidence-based solutions inform decisions in government priority areas.

Results:

Departmental Result 1: Scientific and technological knowledge advances

Protecting Canadians and supporting clients through research excellence and innovation

NRC research spans a broad spectrum of activities to enable partners and collaborators to advance research leading to scientific breakthroughs and innovation. Despite the impact the COVID-19 pandemic had on the NRC's ability to access labs and facilities, the organization was able to conduct research, and support innovation and the work of its clients in ways that made a significant difference in the lives of Canadians.

Support for the COVID-19 Response

Notably, the NRC published a highly consulted [article on the impact that the COVID-19 viral infection has on the central nervous system](#).^{ix} The paper, featured in the official journal of the European Academy of Neurology, had a significant impact in the scientific community worldwide and is helping pave the way for future research in the area.

The NRC applied its full range of research capabilities in digital and data analytics to respond to the needs of the pandemic. NRC data analytics experts participated in study groups led by Health Canada (HC) and the Public Health Agency of Canada (PHAC) to model the spread of infection and the supply chain for PPE and partnered with several labs to identify new biological indicators of COVID-19 and co-morbidity effects. In collaboration with the University of Waterloo, NRC researchers developed AI-enabled COVID-19 diagnosis from medical images: x-ray, CT scan, and ultrasound; and the NRC-Fields Collaboration Centre partnered with a leading researcher from York University to model virus life cycle and immunity after vaccination.

Spotlight: Biologics Manufacturing Centre

In 2020–21, the government announced funding of \$126M for the NRC to establish a new biomanufacturing facility – the Biologics Manufacturing Centre (BMC) – adjacent to the existing Royalmount facility in Montréal. The BMC’s mandate is to respond to pandemic emergencies and preparedness through Good Manufacturing Practices (GMP) compliant production of vaccines and other biologics, and support the growth of domestic biomanufacturing capacity. Key milestones included:

- Completion of facility design and construction of the exterior shell by the end of the fiscal year, and interior fit-up and construction completed on budget and ahead of schedule in June 2021.
- Consultations with preliminary stakeholder in fall 2020 and establishment of a Project Advisory Board composed of members of the Canadian biomanufacturing sector to inform considerations around future public-private partnerships for the BMC.
- The NRC and Novavax signed a collaboration and technology transfer agreement in March 2021 defining the scope of work and terms and conditions for technology transfer activities, up to and including the engineering runs for Novavax’s COVID-19 vaccine candidate.

Advancing scientific and technological knowledge beyond COVID-19

While also supporting Canada’s pandemic response, the NRC delivered results for the advancement of science and technology by increasing its ratio of women in STEM to 1.02¹ (exceeding Canada’s labour market availability), maintaining its citation score of 1.38² (slightly below the target of 1.50), and generating 54 license agreements (35 percent above the target) and 1,090 peer-reviewed publications (6 percent higher than the 5-year average). The number of patents issued dropped to 118, which was below the NRC target of 160; however, this was impacted by increased processing time from global patent offices due to disruptions caused by the pandemic.

The NRC’s relationship with academia allows the organization to lever its internal capabilities with the best expertise and deliver a bigger impact together. As a result, in 2020–21, the NRC continued to partner with academic institutions on [Collaboration Centres](#)ⁱⁱⁱ that bring together resources and expertise to advance knowledge in key areas of research. The NRC’s nine established Collaboration Centres were expanded to include a 10th with the NRC’s newly negotiated agreement with the University of British Columbia for the Clean Energy Transitions Collaboration Centre.

The NRC [Ideation Fund](#)^{iv} enables NRC researchers to pursue research excellence in collaboration with external partners on exploratory projects. In 2020–21, the NRC launched its third round of the New Beginnings Initiative with 42 projects selected to support small-scale exploratory research totaling \$878K in funding. An additional 42 agreements from the second

¹ The ratio is based on percentage of the NRC workforce that is made up of the designated group (defined by the *Employment Equity Act*) divided by the average labour market percentage availability of that group in Canada. The result focuses on the workforce representation of women up to fiscal year-end 2020–21.

² Citation score is based on the field-weight citation impact (FWCI) of publications related to NRC research calculated as a three-year average to better reflect impact. The FWCI is a standardized measure of citations used internationally that is calculated for every country in a particular field and then normalized to 1.0. An FWCI value above 1.0 for a country means that, on average, the country's publications in that field are cited more often than the world average.

round were extended to accommodate delays due to the pandemic and \$195K was provided in additional support. Similarly, under the Small Teams Initiative, the NRC signed 10 multi-year agreements providing \$2.6M in funding for 3 projects selected through the program's first round and an additional 3 projects selected for funding in 2020-21.

The NRC continued its long-standing nanotechnology research partnership with the University of Alberta through the Nanotechnology Initiative. The initiative – which has provided \$10M over three years for crucial research in nanotechnology – launched a second call for proposals in 2020–21. Eight new collaborative projects focused on the development of biomedical nanotechnologies, nano-enabled sensors and advanced microscopy technologies, were selected by a committee.

The NRC launched the Cognitive Care Network, partnering with the Montréal Geriatric Institute for research on cognitive decline in elderly populations; with the University of British Columbia to look at cognitive function related to depression in working populations; with the Centre for Addiction and Mental Health to focus on addiction and schizophrenia; and with SickKids to address executive function in pediatric populations.

The NRC continued to focus on vital work to address the long-term challenge of climate change adaptation and mitigation to help create a safe, prosperous and sustainable Canada of tomorrow. In 2020–21, research focused on resiliency of infrastructure, clean energy technologies, and reducing the environmental footprint in the mining, energy and transportation sectors.

- Under the Environmental Advances Mining program, the NRC's work on modelling of acid rock drainage played a key role in approval of Nouveau Monde's Matawinie Graphite Mine Project. The program also collaborated with a Québec company, Nemaska Lithium, to assess the use of lithium as an alternative material in concrete formulations, which could lead to a seven percent reduction of global greenhouse gas emissions.
- The NRC developed several innovations in electric vehicles, including a safe, high performance battery pack for a heavy-duty electric mining vehicle; electric motor manufacturing technologies; and design of high efficiency/high power density eMotors.
- Following NRC work to convert a Cessna 337 to hybrid electric power, a multi-disciplinary team of more than 40 researchers across Canada collaborated to replace the aircraft's rear engine with a fully electric propulsion system. The team designed and validated an electric aircraft Lithium-ion battery safety strategy and demonstrated a ground test of the full electric propulsion system, the results of which were shared with Transport Canada Civil Aviation and Environment and Climate Change Canada.

NRC Cold Spray Additive Manufacturing

The NRC Cold Spray surface engineering and metal additive manufacturing research facility has become the anchor of a unique technology ecosystem and one of the top three venues for related scientific publications in the world. Through exceptional dedication, \$12M in external funding was secured through innovative multi-sector partnerships to ensure the facility's future for Canadian science and innovation.

- To advance knowledge of coastal infrastructure, the NRC developed a climate risk information system detailing the expected impacts of climate change on storm surges and wave conditions along the British Columbian coast; created an online digital atlas of tidal energy resources near remote northern communities; and assessed the design of new infrastructure to stabilize eroding shorelines and prevent flooding near the Hamlet of Tuktoyaktuk, Nunavut.

AI, digital, and quantum technologies hold the power to help Canada stay on the leading edge of the world's most advanced technologies and solve some of the most challenging problems. The NRC's research in data analytics, AI, machine learning, and digital innovation contributed to smart solutions for advanced manufacturing, Indigenous language tools; ice analysis; and COVID-19 data modelling. In 2020–21:

- The NRC continued to contribute to the next generation of advanced manufacturing processes that support Canadians in their daily work through collaborative work and research in high-precision robotic manufacturing, innovative 3D printing technologies, and a new high-accuracy 3D imaging prototype. Other manufacturing and transportation technology initiatives that will lead to mass customization and high-value applications include: next-generation thermal barrier coatings, high performance protective coatings on landing gear, heat management optimization through additive manufacturing, virtual predictive tools and optimization for aluminum alloys, and prototyping of over-moulded smart parts.
- The NRC and Montréal-based e2IP Technologies developed and patented a printable over-moulded smart part. This was accomplished using molecular ink to print electronic circuits and sensors onto 2D sheets of thin plastic to create smart surfaces. This achievement resulted in an international award for excellence in aircraft innovation for a passenger console prototype (Crystal Cabin Award 2021 for Material and Components) and an award for printed engineered electromagnetic surfaces (2021 CES Innovation Award).
- To contribute to the development of quantum-safe cryptography, NRC researchers improved the performance of a quantum-secure key encapsulation suite, which was submitted to the US National Institute of Science and Technology and qualified as one of the alternate candidates for public-key encryption and key-establishment algorithms.
- The NRC successfully demonstrated a fiber-coupled, 'plug-and-play' single photon source in collaboration with the Canadian Space Agency (CSA), based on NRC nanowire quantum dot technology. This work is expected to produce significant impact for both satellite and terrestrial quantum key distribution networks, where cryptographic keys are shared between end users in a secure manner.
- Through the NRC's Indigenous Languages Technology project, which contributes to the dissemination and preservation of Indigenous languages for Canadian communities, the NRC created technology for Indigenous audiobooks and delivered 23 ReadAlongs in 5 languages to communities, with 11 additional languages near completion. The NRC worked with

collaborators on tools to reinforce Inuktitut’s official language status in Nunavut, including translation and spell-check language software and a machine translation system for the largest ever Inuktitut-English text alignment. In addition, verb conjugators for two dialects of Mohawk, Ohsweken and Kahnawà:ke were developed and work began on verb conjugators for Michif and Algonquin.

- The NRC developed a novel AI method for three month predictions of ice conditions over large areas; improved an iceberg drift model using machine learning instead of physics-based methods; and designed the world’s largest indoor frazil³ ice testing facility to test ice blockages in water intakes.
- The NRC used AI and machine learning to develop prototype applications for more sophisticated analysis of ship performance; developed a numerical testbed to evaluate navigation in Canadian waters by autonomous surface ships, and sensor suites that can be used to characterize the environment surrounding an autonomous ship; and used physical and numerical modelling to better understand the hydrodynamics and operability of submarines and autonomous underwater vehicles.

The NRC also harnessed digital technologies in the advancement of intelligent transportation systems, and in 2020–21:

- Launched a consortium on Advanced Air Mobility (AAM), which involves applying a revolutionary aircraft technology called eVTOL, capable of hovering, taking off and landing vertically to address real world transportation needs with minimal impact to the environment. Autonomous AAM solutions will enable faster air transportation of medical supplies (i.e. blood, donor organs, and patients) and improve emergency response by assessing natural disasters, such as floods and wildfires. AAM aircraft will also be able to access remote locations, including Indigenous communities.
- Contributed AI technology for autonomous flight that involves guidance cues to a pilot via display systems for the Canadian Vertical Lift Autonomy Demonstration project’s ‘Open-Loop’ flight testing, working towards full autonomy of aircraft. The first closed loop test planned for summer 2021 will be the first-ever autonomous flight system on a full-scale aircraft in Canada.
- Completed the development of an AI-based drone detection technology to monitor urban areas and counter unauthorized drone flights. As the first tool of its kind to accurately distinguish drones from birds and other aircraft in near real-time, the technology will assist in a variety of safety and privacy matters, and complex problems such as the detection and classification of unidentified objects in a given airspace.
- Improved the safety and efficiency of a Canadian shortline railway system by using Instrumented Wheelsets, and cloud-based analytics to optimize track design, reduce

³ Ice crystals formed in turbulent water, as in swift streams or rough seas.

derailments, and improve VIA Rail ride quality. This work builds on the [2020–21 Evaluation of the NRC’s Automotive and Surface Transportation Program](#)^x findings that the program’s extensive rail research has garnered a strong reputation, specifically due to its work on Instrumented Wheelsets.

- Established an industrial R&D group to conduct research on railway wheel shelling issues, developed enhanced modeling of wheel/rail fatigue and wear to address cold weather challenges impacting rail safety, and established a new test facility to conduct research on the effect of cold weather on railway air brake systems to understand the impacts on uncontrolled train movement.

The NRC represents Canada’s interests in astronomy and astrophysics, maintaining Canada’s largest observatories and conducting research to push the limits of our understanding of the universe. In collaboration with McMaster University, the NRC established a stable, scalable, and interactive platform that processes and analyses telescope data. The platform was fully deployed for use by Canadian astronomers using some of the world’s leading astronomy facilities, including the Atacama Large Millimetre/submillimetre Array (ALMA).

In 2020–21, NRC efforts to help build a diverse pipeline of future STEM talent included:

- Prioritization of student hiring of employment equity (EE) designated groups, with 65 percent of students hired identifying within one or more EE designated group, and 42 percent identifying as visible minorities.
- Delivery of information sessions on inclusive hiring to supervisors to help increase workforce diversity, and refresh of the self-identification campaign, which led to an increase in representation across EE designated groups.
- Addition of 155 opportunities for undergraduate and graduate students, and post-doctoral fellows, with \$7.5M in stimulus funding to support Canadian students during the pandemic.
- Recognition for providing outstanding student work experiences for NRC students hired to work on an open-source scanning transmission electron microscope prototype, through the 2020 UBC Science Co-op Employer Recognition Award.

Departmental Result 2: Innovative businesses grow

Supporting our clients

The NRC is committed to supporting the growth of innovative, high-potential Canadian firms by providing specialized advice, services and funding to help SMEs reach their potential and grow to scale. When surveyed, 87 percent of R&D clients reported positive benefits of working with the NRC (exceeding the target of 86 percent). The NRC earned \$65.1M in revenue from industry clients for the services it provided (11 percent below target of \$73.1M, mainly due to reduced revenue generation early in the pandemic).

Support for the COVID-19 Response

In 2020–21, NRC IRAP supported companies to address challenges that arose from the pandemic and provided over 3,500 COVID-19 related advisory services to existing clients. Under the ISC COVID-19 Challenge program, NRC IRAP sponsored 7 challenges for SMEs, committed \$14M in funding, and disbursed \$8M to support 23 projects with Canadian SMEs. With a significantly reduced timeline, NRC IRAP worked with ISC to streamline the evaluation and award process, allowing Canadian SMEs to develop solutions quickly.

NRC IRAP worked closely with the Canadian Centre for Cyber Security to help businesses safeguard themselves against the increased risk of cybersecurity attacks. Through a pilot initiative, NRC IRAP supported 138 firms in accessing cybersecurity advisory services, 25 firms working on CyberSecure Canada certifications, and delivered guidance, as well as a workshop, to others.

NRC IRAP established a suite of Subject Expert Teams (SETs) to coordinate and accelerate support to Canadian SMEs for the detection, prevention and treatment of COVID-19. Comprising 70 NRC IRAP employees, the SETs provided more than 500 SMEs with advice and funding in 2020–21.

NRC IRAP Innovation Assistance Program

NRC IRAP played a unique and pivotal role helping firms in financial need due to the economic impacts of COVID-19 by providing wage subsidies to innovation-based SMEs through the new NRC IRAP Innovation Assistance Program (IAP). To lay the groundwork, the NRC IRAP team built the program from the ground up, completing round-the-clock work under strict timelines and launched only six days after the official announcement. Leveraging \$370M in funding, the IAP supported over 2,200 firms and over 26,000 jobs in 2020–21.

Subject Expert Team	Results Achieved
Sanitization	Assisted more than 80 firms to address Canadian supply chain vulnerabilities for hand sanitizers and established a back-up plan for industry access to hard surface disinfectants.
Ventilators and Intubation	Assisted firms in sourcing components, fixtures and critical breathing simulators, and strengthened ventilator supply chain capacity through funding to parts manufacturers.
Vaccines and Therapeutics	Collaborated to identify lead vaccine and therapeutic candidates for COVID-19 and associated illnesses. A streamlined review process enabled agreements in under 20 days, resulting in 14 projects providing a total of \$41.1M to lead vaccine and therapeutic firms.
PPE	Helped facilitate particle filtration testing of samples, which impacted more than 160 million respirators, and contributed to draft performance standards for respirator filtering. NRC IRAP provided \$2.5M to 22 SMEs and supported 8 respirator manufacturers in developing submissions for HC authorization.
Diagnostics and Testing (D&T)	Helped firms develop test kit projects, with 3 receiving HC authorization, and coordinated a COVID-19 Testing Pilot with the Greater Toronto Airports Authority to engage more than 300 airport staff members in weekly screening tests.
Swabs	Provided support to firms through access to sterilization and packaging, and connections to diagnostic kit manufacturers and export markets. 10 manufacturers received HC pre-authorization, and NRC IRAP set up contributions to facilitate clinical swab testing for 8 firms to test safety and effectiveness.

Last year, the COVID-19 pandemic called on the NRC to support a range of initiatives to better prepare Canada for future health challenges. The NRC continued to support businesses in developing health innovations for a healthier future.

- The NRC began research on how to limit the spread of viruses throughout aircraft interiors, for a safer, healthier post-COVID-19 air travel experience. Supporting Canadian SMEs in developing novel technology to disinfect aircraft cabins, the NRC enabled testing of maneuverability and dose efficacy in a realistic environment, and provided timely COVID-19 mitigation for airlines.
- NRC software was transferred to SMEs for several health care applications, including a roadmap for the management of concussions in young adults, remote patient care and monitoring, and the NRC bActive surgical simulation software platform.
- The NRC maintained operations at its Algal Research and Plant Growth centres during the pandemic to support clients, including a local life science company developing a sustainable source of protein for fish feed and animal food, a client developing a plant-based COVID-19 vaccine, and a Canadian company with bacteria/probiotic plants and inocula for sustaining the soybean, pea and lentil markets in Canada.

Spotlight: Vaccines and Therapeutics

In 2020–21, the NRC supported Canada’s vaccine and therapeutics efforts from development through to administration.

The NRC worked with Canadian vaccine developers in advancing several vaccine candidates to increase domestic capacity:

- The NRC worked with VBI Vaccines to advance its COVID-19 vaccine, through preclinical assessments and an improved production process. The first candidate entered Phase 1 clinical trials in March 2021 and the NRC is working with VBI to accelerate development of its second candidate aimed at addressing COVID-19 variants.
- The NRC worked with VIDO-InterVac to advance its COVID-19 protein candidate vaccine, which began Phase 1 clinical trials in February 2021. This included rapid establishment of a production process and tech transfer to a Canadian company for the production of GMP-quality clinical material.
- NRC IRAP provided financial and advisory support to help firms advance early-stage R&D of made-in-Canada vaccines and therapeutics. Of \$150M over three years, NRC IRAP delivered over \$41M to seven vaccine firms and seven therapeutic firms.

Supporting businesses beyond COVID-19

In addition to its role in supporting Canadian firms withstand the pandemic, NRC IRAP supported 9,349 SME firms by providing \$319.7M in funding to 3,055 innovative Canadian SMEs and advisory services to an additional 6,294 unfunded firms; supported over 12,100 jobs in client firms; and nominated 29 firms to the Accelerated Growth Services program. Support through NRC IRAP helped clients grow their revenues by 32 percent and employment by 20 percent (from 2017 to 2019), significantly exceeding targets (20 percent and 10 percent, respectively).

- NRC IRAP supported the placement of 892 graduates in quality jobs with innovative Canadian SMEs through the Youth Employment Strategy; 90 percent of graduates who completed internships reported employment after their placement.
- The Large Value Contribution (LVC) program allows NRC IRAP to provide larger funding amounts to the most promising Canadian firms to accelerate work on high value/high impact R&D projects. In its second year, the LVC program funded 26 projects spanning the country, including 14 new projects in 2020-21, with funding of \$1M to \$3M each.
- NRC IRAP posted 37 challenges (the most from any of the 20 participating departments) for innovative Canadian firms to develop near-to-market solutions through the ISED ISC Challenge program. Three innovative challenges were launched under the program to support a domestic PPE supply chain: Canadian-made filtration material to manufacture N95 respirators and surgical masks; recycling technologies for single-use disposable PPE; and compostable surgical masks and respirators.

With reliable networks more important than ever, the NRC operated its Canadian Photonics Fabrication Centre under strict protocols to help telecommunications companies expand, maintain and repair their networks and services to meet demand during the pandemic. The NRC CPFC also worked with NRC IRAP to deliver capabilities needed by Canadian SMEs to improve their competitive positions and economic outlooks. This included: optimization of the wafer fabrication process to significantly improve device performance, development of a new deep vertical gratings etch process, and process optimization for an international client.

The NRC uses its expertise, knowledge and connections to help technology-based SMEs scale-up, access global value chains and become internationally competitive. In 2020–21, the NRC advanced international relations through several initiatives, including:

- Through EUREKA projects and the Canadian International Innovation Program (CIIP), NRC IRAP continued to support opportunities for Canadian SMEs in pursuing international R&D collaboration on projects with high potential for commercialization. Notable achievements in 2020–21 include: support for 39 new EUREKA projects totaling \$18.5M; opportunities for Canadian organizations to join EUREKA Cluster consortium projects, resulting in Esri Canada Ltd. becoming the first Canadian company to join the board of directors for the software intensive solutions EUREKA cluster; engagement of 12 EUREKA participating countries in 2 calls for proposals focused on COVID-19 challenges, resulting in 15 approved projects with 7 Canadian participants; \$3.15M in CIIP projects with Brazil, South Korea and India; and 5 CIIP Partnership Development Activities with South Korea, Brazil, India and Germany, with overall participation from 53 Canadian SMEs.
- The NRC designed and delivered a new Global Value Chain (GVC) pilot project which will establish a standardized GVC program model for Canadian SMEs in the coming years. In 2020–21, the NRC focused on GVC access activities in Japan, coordinated over 50 business-

to-business meetings, scouted over 130 SMEs, and delivered a total of 11 projects, surpassing the target of 8.

- NRC IRAP continued to co-deliver the CanExport SMEs Program with Global Affairs Canada (GAC) and supported over 1,425 projects. The program introduced COVID-relief measures by adapting program guidelines to enable Canadian companies to continue export development activities during the pandemic. NRC IRAP also expanded its relationship with GAC to include co-delivery of the CanExport Innovation Program, which assists Canadian SMEs, academia and research centres to pursue collaborative R&D agreements with international partners.

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

Protecting Canadians

Collaborations and engagement with OGDs play an important role in advancing some of the most pressing and long-term challenges Canada faces. Even with the priority of addressing solutions to the COVID-19 pandemic, the NRC was able to co-author 62 peer-reviewed publications with other federal departments (up 21 percent from 2019–20), although fell short of its target for revenue earned from OGDs, with \$76.4M collected (target of \$77.6M).

Support for the COVID-19 Response

When Canada's supply of PPE ran dangerously low in the early days of the pandemic and the supply chain of test kits and disinfectants became a national challenge, the NRC worked with a range of collaborators and quickly pivoted to develop testing and production capabilities.

- To ensure PPE imports were safe for frontline health care workers, NRC researchers established a made-in-Canada testing lab, by designing and building testing equipment to certify particle filtration efficiency and blood penetration standards for face masks and surgical gowns. At the time, no other capacity for such tests existed in Canada and over 5,000 PPE samples were evaluated for performance and efficiency, helping to inform decisions on the use of more than 120 million PPE items. The NRC continues to work with partners in industry and government interested in developing the testing capability by providing advisory services and expertise to help them modify existing testing infrastructure to meet standards. To further

Building Canada's Testing Capacity

Early in the pandemic, it became clear that Canada would need millions of nasal swabs for COVID-19 testing. NRC IRAP and researchers worked together to help manufacturing and technologies companies retool their operations to produce nasal swabs, and build a Canadian industry capacity. One NRC-supported firm, Precision ADM, was first to have its product approved by HC and increased its manufacturing capacity to 8 million swabs per month.

increase Canada’s overall testing capacity, the NRC also established a testing network with 40 labs across the country, including 12 new domestic PPE manufacturers.

- To help create and maintain capacity to manufacture essential PPE in Canada, the NRC provided funding to innovative SMEs for alternative filtration material for use in N95 respirators and surgical masks, including: washable masks with barrier properties, and N95 respirator, surgical mask, and community mask prototypes (Stedfast Inc.); novel cellulose-based filtration material for N95 respirators and recyclable and compostable surgical masks (Performance BioFilaments Inc.); and reconfiguring oil-and-gas sector manufacturing equipment to manufacture N95 filter material (Roswell Downhole Technologies). The NRC is also partnering with Dorma Filtration to help make N95 masks using 3D printing, injection moulding and digital technology.
- To address a lack of critical reagents for COVID-19 screening tests, the NRC’s Human Health Therapeutics Program repurposed its microbial fermentation facility to produce ~60,000 liters of buffers for PHAC, enough for 7 million COVID tests. The NRC also joined forces with McGill University to develop cell lines for the production of key enzymes required for COVID-19 screening tests.
- The NRC also supported PHAC by calibrating dead-space volume of syringes and needles for the administration of COVID-19 vaccines. The use of low dead-space syringes is important to minimize vaccine waste and retrieve the target number of doses from each vaccine vial.
- Mobilizing its rapid biomanufacturing cell line platform to develop and produce large quantities of critical COVID-19 spike protein, the NRC was the first public organization to make available a reference reagent for widespread purchase and R&D use. This resulted in more than 80 material transfer agreements to provide antigen to various groups, as well as a licence to a Canadian SME which has commercialized a diagnostic kit. The NRC also collaborated on the development of a SARS-CoV-2 spike protein (i.e. antigen) reference material to serve as a standardized source of antigen for test kits.
- The NRC was able to use advanced laser scanning technology to engineer “generic 96 deep well plates” for test kits, which allowed Canadian private companies to support production of test kits for PHAC and regional COVID-19 labs.

Spotlight: Pandemic Response Challenge program

The [Pandemic Response Challenge program](#)^{viii} (PRCP) was launched as an emergency, two-year Challenge program in response to the COVID-19 pandemic. Collaborative projects under four pillars were quickly initiated to help protect the health of Canadians from this and any future pandemics: Rapid Detection and Diagnosis; Therapeutics and Vaccines; Digital Patient Care and Pandemic Analytics; and Enabling Adaptive Responses. 22 projects with 21 unique collaborators from academia and industry were awarded for over \$4.2M in multi-year funding in various fields including vaccine, diagnostic and digital and pandemic analytics. Highlights of work under the PRCP include:

- Released the first and largest fully curated open-access lung ultrasound imaging dataset for COVID-19 detection, developed with the University of Waterloo;
- Supported companies across Canada in the production of reagents and plastic consumables for 33 million COVID-19 tests;
- Partnered with Clēan Works, an Ontario-based company, to test technology for decontaminating N95 respirators, and distributed the Clēan Flow Healthcare Mini to hospitals, research institutes and universities across the country and
- Initiated research projects in areas such as: inclusive and standardized virtual care; low-cost contactless sensing of vital signs for home and emergency room use; diagnostics testing capabilities ranging from rapid colorimetric testing, testing of asymptomatic patients and genetic sequencing; interactive digital tool for addressing sub-clinical mental health issues; and digital tools for addressing sleep disorders in front-line health care workers.

In collaboration with PHAC, HC, Infrastructure Canada (INFC), and Indigenous Services Canada, and in partnership with domestic and international partners via EUREKA, the NRC helped develop COVID-19 guidance for buildings, ensured guidance to the public and Canadian workplaces was technically sound, and launched a coordinated work plan addressing ventilation and the risk of spread of COVID-19 in Canadian buildings.

Delivering on government priority areas beyond COVID-19

Building on the four [Challenge programs](#)^{vii} established in 2018–19 to address some of Canada’s most pressing issues, last year the NRC developed three new Challenge programs set to launch in 2021–22: Aging in Place, Internet of Things: Quantum Sensors, and Arctic & Northern. To date, the NRC has provided more than \$50M in G&C funding to support 128 projects valued at over \$103M with 113 unique collaborators through its Challenge programs. In response to COVID-19, the NRC also launched the Pandemic Response Challenge program (PRCP) in 2020–21.

Challenge program	Results Achieved
Disruptive Technology Solutions for Cell and Gene Therapy ^{xi}	The program initiated 7 new projects with 7 collaborators and committed over \$2M in multi-year G&C funding. To date the program has advanced a total of 14 projects with 14 unique collaborators and committed over \$11.5M in G&C funding.
Materials for Clean Fuels ^{xii}	The program initiated 15 new projects with 14 unique collaborators and committed almost \$6.4M in multi-year G&C funding. To date, the program has committed a total of almost \$12M in multi-year funding commitments to advance 23 projects with 20 unique collaborators. Projects have focused on novel materials for CO ₂ conversion, clean hydrogen production, and accelerated materials discovery, leading to 14 new publication in 2020–21 and 15 publications to date, with a further 31 in development.
High-Throughput and Secure Networks (HTSN) ^{xiii}	The program initiated 16 new projects and committed more than \$4.2M to 16 unique collaborators from industry, academia and non-profits to cover costs of collaborating on projects. To date, a total of \$16M in multi-year G&C funding has been committed to advance 43 projects with 33 unique collaborators. HTSN has also established a contract with Indigenous Works on the development of an HTSN Indigenous Engagement Strategy.

Artificial Intelligence for Design (AI for Design) ^{xiv}	The program initiated 16 new projects with 18 unique collaborators and committed over \$3M in multi-year G&C funding to develop AI methods for the acceleration of cell and gene therapy innovations, materials discovery and photonics design. To date, the program has committed over \$5.3M across 24 projects with 28 unique collaborators, including partners at 12 of the U15 universities. The AI for Design program has supported more than 45 students and post-doctoral fellows and led to 30 peer-reviewed publications with another 25 in development, along with 2 provisional patents.
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The NRC continued to support [Canada’s five Innovation Superclusters](#):^v Digital Technology; Protein Industries; Advanced Manufacturing; AI-Powered Supply Chains (Scale AI); and Ocean, by providing access to its research facilities, personnel and NRC IRAP project assessment services through its [Supercluster support programs](#).^{vi} To date, the NRC has provided more than \$20.1M in G&C funding to support 69 projects valued at over \$37.3M with 67 unique collaborators through its Supercluster support programs.

Supercluster support	Results Achieved
Sustainable Protein Production program ^{xv}	The program initiated 12 new projects with 12 unique collaborators and committed over \$3.2M in multi-year G&C funding, in areas focused on food processing, safety and quality; crop genomics; and starch valorization. To date, over \$4.6M in G&Cs has been committed to 19 projects with 19 unique collaborators. A collaborative research agreement was also signed with multinational agricultural company, Corteva, to develop canola varieties with improved protein quality and content suitable for food and feed applications.
Ocean program ^{xvi}	The first round of projects was initiated in 2020–21, with over \$2.6M in multi-year G&C funding across 14 projects with 14 unique collaborators. Projects spanned areas such as bioproducts from waste streams; production platforms for renewable source products; fishing and tour boat electrification; and ship bridge simulations using AI.
AI for Logistics program ^{xvii}	In its first year, the program initiated 19 projects with 19 unique collaborators and almost \$6.7M in multi-year G&C funding, including research in AI for cargo drone security, resiliency in road freight, rail track safety, and smart pavement.
Digital Health and Geospatial Analytics ^{xviii}	The program initiated five new projects with five unique collaborators and committed an additional \$1.5M in multi-year funding. This brings the total number of projects to 10 with 10 unique collaborators and a total to-date of \$2.2M committed in multi-year G&C funding.
Advanced Manufacturing program ^{xix}	The program initiated four new projects with four collaborators and committed over \$736K in multi-year G&C funding. To date, the program has advanced seven projects with seven collaborators and committed over \$3.9M in multi-year G&C funding. Projects have focused on recycling technologies for polymer glazing in transportation; a predictive framework for robotic finishing; advanced autonomous manufacturing manipulation; evaluation of metal/composite hybrids for automotive structural components; and development of a composite lower frame for an agricultural vehicle track system.

The NRC continued collaborative work to advance health technologies, policies and standards for a healthier future for Canadians, including food production and safety, bacterial toxin detection, consumer safety in the cannabis market, and genomics research.

- The NRC released dried cannabis reference material, the first of its kind to be developed by a National Metrology Institute, which will help testing labs and OGDs ensure reliability and accuracy of cannabis testing in Canada. The NRC continued to work on documentary

standards for cannabis test methods, with standard methods for cannabinoids and pesticides undergoing the balloting process within ASTM International (formerly known as the American Society for Testing and Materials), where more than 1,000 members of its D37 Cannabis Committee vote on the standard prior to approval.

- The NRC continued collaborations with Justice Canada on evaluating drug screening equipment, and in 2020–21 was authorized to evaluate alcohol breath analysers. The NRC also worked with HC’s Controlled Substances and Cannabis Branch on measuring contaminants in legal and illegal cannabis vape liquids.
- Emerging food and environmental contaminants pose a significant challenge without proper testing procedures in place. As a leading provider of certified reference materials (CRMs) for toxic heavy metals, NRC researchers continued to develop new rapid detection and quantification methodologies for cyanobacterial toxins, including a novel real-time analysis method of anatoxins. The NRC applied this new method for the Government of New Brunswick to analyze toxins responsible for dog poisonings in 2018 and 2019.
- Methods were also developed and applied for detection of various cyanobacterial toxins in water, seafood and dietary supplement materials, with significant progress in the development of reference materials for diverse classes of cyanobacterial toxins. In 2021, the NRC received National Institutes of Health funding to produce certified dietary supplement reference materials.
- The NRC released 13 new CRMs, including new uranium ore concentrate, certified in collaboration with the Canadian Nuclear Safety Commission and foreign nuclear security agencies, as well as a new set of ultra-high purity metallic CRMs to support Canadian advanced manufacturing efforts.
- The NRC contributed biological, engineering, and energy efficiency technologies for Naurvik, a collaborative initiative with CSA, Agriculture and Agrifood Canada, and the community of Gjoa Haven. Led by the Arctic Research Foundation, the initiative aims to develop a local food production system in the Canadian Arctic, for year-round fruits and vegetables using renewable energy and controlled environment technologies. Following the evaluation of four strawberry cultivars in Saskatoon, seeds from the best performing cultivar were shipped to Gjoa Haven, where community members conducted a successful production trial. The first strawberry harvest was gifted to a community elder and this cultivar continues to be used for community production of strawberries.
- The NRC demonstrated that PowerBlade technology can automate on-chip library preparation from pre-purified DNA samples, and using droplet microfluidics, demonstrated the possibility of identifying bacteria and viruses from body fluids (blood, urine, saliva) or spacecraft environment (air, water, food).
- The NRC continued to provide leadership, ongoing program coordination and secretariat support to the Genomics R&D Initiative (GRDI), including support to the interdepartmental

GRDI Assistant Deputy Minister Coordinating Committee. NRC researchers continue to collaborate with other federal researchers on Shared Priority Projects on Antimicrobial Resistance and Metagenomics-Based Ecosystem Biomonitoring.

The NRC worked collaboratively with OGDs and industry partners to take action against climate change to help position the country to achieve net-zero emissions by 2050 and carbon-neutral construction.

- In collaboration with INFC, the Climate Resilient Buildings and Core Public Infrastructure Initiative completed national guidance documents for the climate change resiliency of infrastructure and buildings, including national guidance for wildland urban interface fires and flood resilient buildings, and produced future climatic design data for use by Canadian codes and standards.
- The Reconciliation Agreement on Construction Codes under the Canada Free Trade Agreement Regulatory Reconciliation and Cooperation Table was signed by several jurisdictions and put in force. Work began on reducing or eliminating variations in the technical requirements of Construction Codes, timely adoption of Construction Codes, and transformation of the National Code Development System to meet jurisdiction needs. This work is aligned with findings from the [2020–21 Evaluation of the NRC’s Codes Canada](#),^{xx} which recommended working with the Canadian Commission on Building and Fire Codes to ensure that challenges with governance are addressed to improve the effectiveness of the National Model Code Development System.
- The NRC participated in sustainability innovation networks, including Greening Government, Laboratories Canada, and the Strengthened Climate Plan to help define and enable government sustainability programming and policy. The NRC also co-hosted 49 webinars on high-performance building technologies.
- The first version of the Technical Guide for Northern Housing, expected to be published in 2021, was developed by the NRC, First Nations National Building Officials Association, Natural Resources Canada, an Indigenous advisory group, and engineering and architectural consultants.
- The NRC worked with the Canadian Coast Guard on the design and optimization of the Icebreaking Program in support of the [National Shipbuilding Strategy](#);^{xxi} and worked with the Department of National Defence on developing and validating ship energy models to enable energy efficient vessel operations and reduce greenhouse gases.

Gender-based analysis plus

In 2020–21, NRC IRAP formed the Client Inclusiveness Team and Indigenous Special Interest Group to coordinate support for women and BIPOC (black, indigenous, and other people of color)-led companies. Through NRC IRAP’s Contributions to Organizations, 3 projects were put in place in 2020–21, allowing more than 30 women and Indigenous-led SMEs to access targeted

services, such as leadership programs, preparedness for procurement contracts, strategic planning, and business development, all with an intent to reduce barriers to growth.

Experimentation

In 2020–21, the NRC continued to build capacity and expand awareness of experimentation across its programs to promote decision-making based on findings from experimentation efforts.

The NRC continues to experiment with the Monitored Network Time Protocol Service and to trial more accurate remote time dissemination services (NRC-Timelink) to keep pace with emerging technologies and more demanding user requirements in telecommunications, infrastructure, navigation and finance. In 2020–21, hardware and software upgrades and studies on improving accuracy resulted in a more than two-fold improvement in performance of the NRC TimeLink’s holdover operation. In addition, this new capability was published in the International Bureau of Weights and Measures Key Comparison Data Base, and scientific papers describing the performance of NRC-Timelink were submitted to scientific journals and presented at conferences.

To support the creation of buildings and infrastructure and validate new construction technologies, the NRC:

- Used large scale pilot projects in New Brunswick to study how occupants dealt with grid modernization strategies in homes and commercial buildings, the impact of distributed resources on peak energy consumption and grid stability, and linkages between new energy efficient technologies and the health and productivity of building occupants;
- Demonstrated Canada’s first net-zero carbon retrofit of a commercial building;
- Collaborated with HC and SMEs to demonstrate innovative radon control technologies in 21 Canadian homes and enabled 4 changes to the National Building Code;
- Collaborated with HC on the use of an innovative non-destructive method to identify key formaldehyde emitters in new homes through a field study in 17 houses; and
- Produced a guideline for management of overheating risks related to the health of residential building occupants.

NRC IRAP continued efforts to diversify hiring of mid-to-late-career professionals; improve the matching program for potential hires to learn more about the role of an ITA; and expand the social media recruitment strategy. The recruitment strategy generated positive results, with 61 percent of applicants self-identifying as part of an EE designated group, nearly three times higher than 2018–19 and 61 percent of new ITAs self-identifying as part of at least one EE designated group, nearly two times higher than 2018–19.

In the final year of a pilot program between NRC IRAP and the CSA to support Canadian SMEs in the development of biomedical technologies in conjunction with terrestrial applications for deep space, 14 projects were supported for a total contribution of \$2.3M. The pilot was successful in providing CSA with access to a broader pool of health technologies that could be

adapted for space medicine. Based on the success, CSA and NRC IRAP are organizing a “Healthcare Without Boundaries Colloquium,” in which funded firms will present projects to the broader space medicine community.

NRC IRAP pilot programs established in 2019–20 with the Business Development Bank of Canada (BDC) and the National Bank were assessed to evaluate the effectiveness of the referral process and identify program improvement opportunities to support SME access to capital. In 2020–21 the pilot program with BDC was expanded across all of NRC IRAP.

2030 Agenda for Sustainable Development

The NRC tabled its first [Departmental Sustainable Development Strategy \(DSDS\)](#)^{xxii} in 2020–21, which sets out the NRC’s environmental sustainability priorities, goals and targets, and actions to achieve them. In alignment with the six goals identified in the [Federal Sustainable Development Strategy](#):^{xxiii} greening government, effective action on climate change, clean growth, modern and resilient infrastructure, clean energy, and safe and healthy communities, the NRC contributed to the following Sustainable Development Goals (SDGs) – see the NRC’s DSDS for more detail:

- [SDG 7: Ensure access to affordable, reliable, sustainable and modern energy](#)^{xxiv} – Engaged two communities to resolve operational hurdles for clean technology integration, which will lead to reduced energy cost and support sustainable and diverse economic growth in remote and Indigenous communities.
- [SDG 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation](#)^{xxv} – Completed two pilot demonstrations^{xxv} using satellite-based structural health monitoring technologies to improve resiliency and carbon footprint of new and existing infrastructure; NRC IRAP contributed to the transition to a low carbon economy by supporting 405 clean technology projects valued at \$59.6M.
- [SDG 11: Make cities inclusive, safe, resilient and sustainable](#)^{xxvi} – 10 potentially contaminated site files have been closed or are being risk managed with a long term strategy to reduce potential environmental and human health risks from identified NRC contaminated sites.
- [SDG 12: Ensure sustainable consumption and production patterns](#)^{xxvii} – 91 percent of all identified functional specialists were trained in green procurement and 100 percent of maintenance and service contracts included “green” considerations to reduce the environmental impact of government procurement decisions.
- [SDG 13: Take urgent action to combat climate change and its impacts](#)^{xxviii} – Surpassed targets for reduction of the NRC footprint through major energy retrofits, management of plant maintenance, and zero-emission fleet vehicles.

Results achieved

Departmental Results	Performance Indicators	Targets	Date to achieve target	2020–21 Actual results	2019–20 Actual results	2018–19 Actual results
Scientific and technological knowledge advances	Citation score of NRC-generated publications relative to the world average ⁴	1.50	March 31, 2021	1.38	1.38	1.51
	Number of peer-reviewed publications generated by the NRC ⁵	1,000	March 31, 2021	1,090	1,003	1,030
	Number of patents issued to the NRC	160	March 31, 2021	118	173	156
	Number of licence agreements	40	March 31, 2021	54	37	31
	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) ⁶	1.0	March 31, 2021	1.02	1.01	1.02
Innovative businesses grow	Percentage of R&D clients who report positive benefits of working with the NRC	86%	March 31, 2021	87%	92%	90%
	Percentage revenue growth of firms engaged with the NRC (IRAP-engaged firms) ⁷	20%	March 31, 2021	32%	31%	27%
	Percentage growth in Canada's science & technology related jobs through NRC supported firms (IRAP-engaged firms) ⁷	10%	March 31, 2021	20%	20%	18%
	Revenue earned from clients and collaborators	\$76.4M	March 31, 2021	\$65.1M	\$88.5M	\$79.7M
Evidence-based solutions inform decisions in Government priority areas	Revenue earned from other federal government departments	\$77.6M	March 31, 2021	\$76.4M	\$77.7M	\$93.1M
	Number of NRC peer-reviewed publications co-authored with other federal government departments	60	March 31, 2021	62	51	35

⁴ 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 2021.

⁵ Based on NRC peer-reviewed publications indexed in Scopus as of April 2021.

⁶ Results in the table are focused on the workforce representation of women up to fiscal year-end 2020–21. Results for Aboriginal peoples (Indigenous) were 0.44 in 2020–21 and 0.38 in 2019–20. Results for persons with disabilities were 0.33 in 2020–21 and 0.27 in 2019–20. Results for members of visible minorities were 0.99 in 2020–21 and 0.95 in 2019–20. 2018–19 results are based on 2011 census data; 2019–20 and 2020–21 results are based on 2016 census data. Targets will be set for all four underrepresented groups as part of the 2022–23 Departmental Plan process.

⁷ Measured over a period of two calendar years and lagging by two years.

Budgetary financial resources (dollars)

2020–21 Main Estimates	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	2020–21 Difference (Actual spending minus Planned spending)
1,077,399,652	1,077,399,652	1,821,151,733	1,503,588,404	426,188,752

Human resources (full-time equivalents)

2020–21 Planned full-time equivalents	2020–21 Actual full-time equivalents	2020–21 Difference (Actual full-time equivalents minus Planned full-time equivalents)
3,099.9	3,270.3	170.4

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

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 and/or required to meet corporate obligations of an organization. Internal Services refers to the activities and resources of the 10 distinct service categories that support Program delivery in the organization, regardless of the Internal Services delivery model in a department. The 10 service categories are:

- ▶ Acquisition Management
- ▶ Communications Services
- ▶ Financial Management
- ▶ Human Resources Management
- ▶ Information Management
- ▶ Information Technology Management
- ▶ Legal Services
- ▶ Materiel Management
- ▶ Management and Oversight
- ▶ Real Property Management

Protecting our people

In 2020–21, the NRC’s common and corporate services swiftly pivoted to respond to new and urgent demands as a result of the COVID-19 pandemic and the rapid shift to remote work for the majority of the NRC workforce. Despite the shift in priorities, the NRC continued to make progress on the strategies and initiatives of its five-year Strategic HR Plan.

- The NRC heightened its focus on Equity, Diversity and Inclusion (EDI) needs and advanced its commitment to actively foster an anti-racist culture by launching an anti-racism portal for employees and supervisors. In addition, NRC senior executives signed the “Commitment of Action toward a Diverse, Inclusive and Anti-Racist NRC”, a pledge to learn, reflect and take steps to drive positive and enduring change within themselves and the organization.
- The NRC organized and promoted panels focused on EDI and commemorative events for Black History Month and Disability Employment Awareness Month, and continued to implement mandatory EDI training for all employees and supervisors. The NRC also conducted a thorough review of its hiring, promotion and retention practices to help identify systemic barriers and inform its updated EDI Strategy, and embedded EDI commitments in executive performance agreements to foster accountability.
- The NRC’s “Celebrating the Success of Women in STEM” Symposium was held on International Day of Women and Girls in Science, with around 1,400 virtual participants, 11 national and international speakers, and nearly 90 research posters. The NRC also worked with Hacking Health to organize two virtual sessions to increase awareness of young female scientists working in health technologies.
- Building on the success of the Women in STEM pilot, a mentoring program was developed as part of the NRC Leadership Development Framework to facilitate dialogue on topics including career development, work-life balance, and the acquisition of new leadership skills. To support NRC supervisors during the pandemic, webinars were held in areas such as virtual teams and wellness, and a supervisor toolkit for supporting employee development was launched.
- A key focus for 2020–21 was education and awareness of mental health and well-being of NRC employees in the COVID-19 context. 125 mental health and wellness sessions were delivered to NRC employees, and crisis training sessions were delivered to executives and HR practitioners, which will be expanded to all supervisors in 2021–22. A “Mental Health and COVID-19” portal and toolbox was created to support staff, and wellness related speaker events were offered.
- Internal service operations and processes were adapted for the COVID-19 environment. New

Communication on COVID-19

The NRC was one of the first federal government organizations to provide its employees with easy, remote access to critical information and updates about COVID-19 through a secure portal accessible on personal devices. Based on feedback, 86 percent of staff felt that the NRC did a good job of keeping them informed from the outset of the pandemic.

measures included second language evaluation (SLE) testing with a third party provider⁸, new procedures and considerations for international hires and telework arrangements, modification to the relocation process, shift to digital authorizations, and streamlined service offerings while enabling virtual events such as onboarding and career fairs.

In 2020–21, the NRC refreshed its values and ethics policy framework and made progress on several initiatives to foster respect, civility and inclusiveness in the workplace, including:

- Launch of the new NRC Policy on Workplace Harassment and Violence Prevention and Resolution, with mandatory training for staff;
- Development of a new Policy on Conflict of Interest (set to launch in 2021–22), including an in-depth risk assessment in response to audit findings;
- Delivery of Ombuds and Informal Conflict Resolution services to staff and over 70 virtual sessions on conflict resolution, difficult conversations, and respect and civility;
- Delivery of a special directive regarding research ethics in the pandemic context, ensuring the protection of human research subjects, and integration of new COVID-19 approaches and considerations in research ethics processes; and
- Launch of a Directive on Communications and Dissemination of Research and Scientific Information, in support of the NRC Research and Scientific Integrity Policy.

IT infrastructure plays a pivotal role in NRC business operations and in 2020–21, the pandemic put new pressures on the organization’s IT environment and the need for enhanced infrastructure.

- To protect the health and safety of employees, the majority of NRC staff transitioned to telework at the onset of the pandemic, with a small percentage working on-site to perform essential tasks (client service and maintenance of equipment and facilities). Several NRC branches worked together with Shared Services Canada to optimize the NRC network for sustainable remote operations, including server upgrades, additional licenses, and new equipment. To help staff stay connected, engaged and productive, the NRC made enhancements and implemented new virtual and collaborative tools, including crucial videoconferencing applications.
- Several key IT improvements were completed, including: an NRC IRAP web server upgrade to support the rollout of NRC IRAP IAP; the COVID-19 Portal was enhanced to accept NRC IRAP IAP applications; infrastructure was deployed for hosting projects related to the COVID-19 response, Blockchain, and rail data analytics; and a new cloud-based storage solution was piloted to enable cloud desktop back-up for researchers.
- To support the government transition to digital, the NRC adopted electronic approvals and signatures, increased use of its enterprise content management system, decreased paper-based records, and leveraged the NRC’s open repository to make scientific publications more

⁸ Prior to the pandemic, SLE testing was conducted strictly by the Public Service Commission.

available. In addition, new tools and guidance material were developed to facilitate improved data management practices.

The NRC continued to make enhancements to its business management services, through new approaches to client relationship management. In 2020–21, the NRC completed work to streamline its client agreement process, and 700 agreements were signed with R&D clients and collaborators.

The NRC enhanced governance for disclosure of inventions through a formalized decision-making process, which resulted in a 6 percent increase in disclosures in 2020–21, including 17 disclosed through a new fast-track decision process for expedited COVID-19-related inventions. The NRC also established 15 multi-disciplinary IP commercialization teams and initiated targeted outreach to potential receptors, and discussions are underway with 8 companies exploring potential to license NRC technology.

The NRC is developing a Real Property Portfolio Plan, with an emphasis on right-sizing the NRC's footprint, carbon reduction, fostering collaboration, and building modern and more resilient infrastructure. The NRC continued to update its building condition assessment and included the findings in its strategy to revitalize NRC buildings, with 30 completed so far. An investment of over \$1B by Laboratories Canada to build new science infrastructure on the Montreal Road campus to serve as the new site for the TerraCanada and Transportation Safety and Technology Science Hubs will be the largest investment for the campus, renewing much needed infrastructure for the NRC and its partners.

The NRC Incident Command Team and the Business Management Support Committee worked to ensure employees on and off site had the information and resources needed to stay safe while continuing to serve clients and Canada. The team monitored on-site attendance, provided regular updates and timely emergency management advice and guidance, developed risk assessments, and implemented on-site safety protocols; processes were also streamlined to allow rapid and safe access to biological samples, equipment, as well as supplies and services for researchers needed for urgent COVID-19 work.

Budgetary financial resources (dollars)

2020–21 Main Estimates	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	2020–21 Difference (Actual spending minus Planned spending)
139,856,365	139,856,365	155,536,704	145,066,909	5,210,544

Human resources (full-time equivalents)

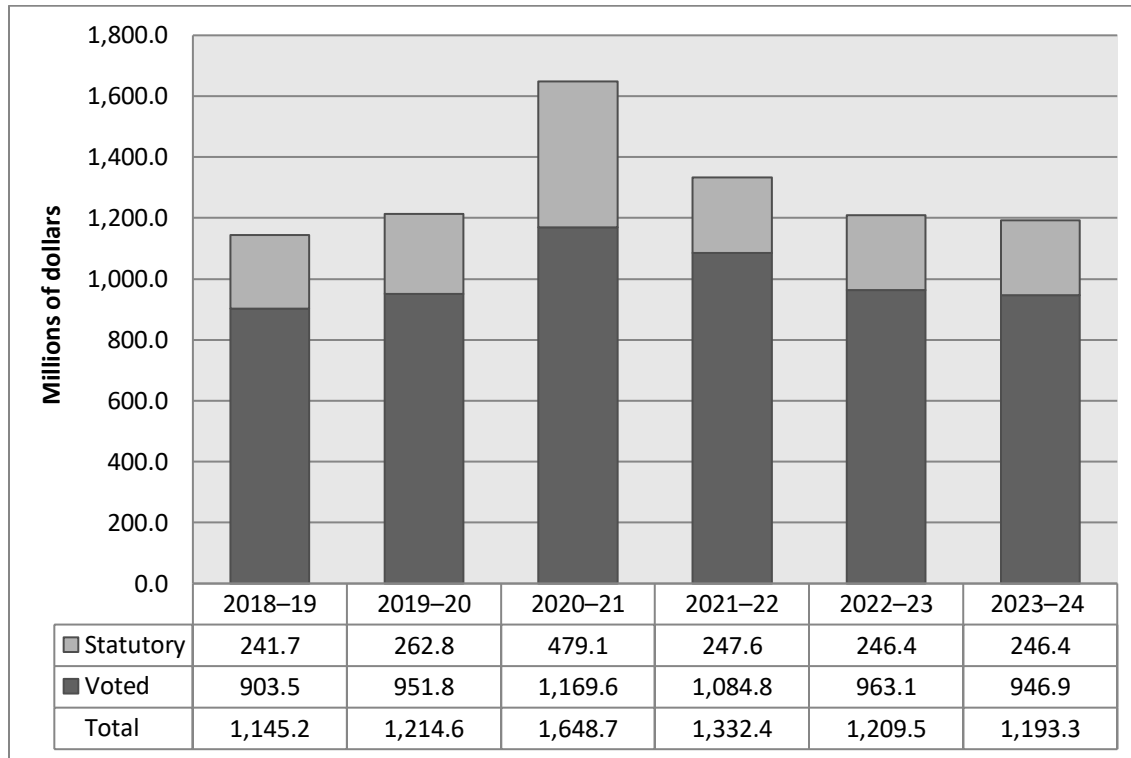
2020–21 Planned full-time equivalents	2020–21 Actual full-time equivalents	2020–21 Difference (Actual full-time equivalents minus Planned full-time equivalents)
928.0	991.0	63.0

Analysis of trends in spending and human resources

Actual expenditures

Departmental spending trend graph

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



The NRC's actual spending trend over the last three years has increased, with spending of \$1,648.7M in 2020–21, representing growth of \$434.1M from the \$1,214.6M spent in 2019–20. This increase is largely associated with significant funding increases, much of which were the result of COVID-19. This includes incremental statutory funding under the *Public Health Events of National Concern Payments Act* (PHENCPA). Significant increases include:

- \$375.5M in transfer payments delivered through NRC IRAP IAP (\$120M voted, \$255.5M statutory);
- \$55.9M in capital infrastructure spending to support new Biologics facilities (\$48.7M voted, \$7.2M statutory);
- \$3.3M in transfer payments (statutory) for research and development related to vaccines, therapeutics and biologics; and
- \$14.2M in incremental transfer payments for the Youth Employment and Skills Strategy Program (\$5.2M voted, \$9M statutory).

The rising cost of salaries also contributed to the increased spending in 2020–21.

Actual spending of \$1,648.7M in 2020–21 in comparison to planned spending of \$1,217.3M represents an overall increase of \$431.4M (35 percent). The variance from 2020–21 plans is almost entirely due to the additional funding received as a result of COVID-19.

The following table summarizes 2020–21 spending and year-over-year variances.

<i>In millions of dollars</i>	2020–21 Spending	Variance from 2019–20	Variance from 2018–19
NRC IRAP – Firms and Organizations	317.9	(2.4)	59.5
NRC IRAP - Canada Accelerator and Incubator Program	-	-	(18.0)
International Astronomical Observatories Program	25.5	(3.6)	(2.2)
TRIUMF	59.4	4.3	2.1
Collaborative Science, Technology and Innovation Program	27.9	13.8	18.8
NRC IRAP - Youth Employment and Skills Strategy	19.2	4.1	2.1
NRC IRAP – Innovation Assistance Program	375.5	375.5	375.5
Grants under Innovative Solutions Canada Program	10.0	9.7	9.6
NRC IRAP Vaccines & Therapeutics/Other	4.6	3.4	3.4
Grants and Contributions	840.0	404.8	450.8
Federal Infrastructure Initiative	28.5	11.1	(2.3)
COVID-19 funding - BMC and the Clinical Trial Material Facility	55.9	55.9	55.9
All other	26.2	(7.5)	(4.8)
Capital	110.6	59.5	48.8
Operating	494.1	28.5	41.5
Statutory Revenue	138.0	(61.1)	(44.0)
Contributions to Employee Benefit Plans (EBP)	66.0	2.3	6.3
Operating/Revenue/EBP	698.1	(30.2)	3.8
Total Expenditures	1,648.7	434.1	503.4

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

Core Responsibility and Internal Services	2020–21 Main Estimates	2020–21 Planned spending	2021–22 Planned spending	2022–23 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	2019–20 Actual spending (authorities used)	2018–19 Actual spending (authorities used)
Science and Innovation	1,077,399,652	1,077,399,652	1,183,443,723	1,056,941,850	1,821,151,733	1,503,588,404	1,059,106,699	992,172,039
Internal Services	139,856,365	139,856,365	148,943,324	152,575,603	155,536,704	145,066,909	155,495,166	153,031,813
Total	1,217,256,017	1,217,256,017	1,332,387,047	1,209,517,453	1,976,688,437	1,648,655,313	1,214,601,865	1,145,203,852

Actual human resources

Human resources summary for Core Responsibility and Internal Services

Core Responsibility and Internal Services	2018–19 Actual full-time equivalents	2019–20 Actual full-time equivalents	2020–21 Planned full-time equivalents	2020–21 Actual full-time equivalents	2021–22 Planned full-time equivalents	2022–23 Planned full-time equivalents
Science and Innovation	3,062.6	3,115.5	3,099.9	3,270.3	3,251.3	3,251.3
Internal Services	887.6	993.9	928.0	991.0	984.1	984.1
Total	3,950.2	4,109.4	4,027.9	4,261.3	4,235.4	4,235.4

The NRC's actual 2020–21 FTEs (4,261.3) has increased by 152 FTEs (4 percent) when compared to the 2019–20 FTE level (4,109.4). The increase is mostly attributable to increased FTEs within Science and Innovation, accounting for 95 percent of the year-over-year change from 2019–20.

Description	2020–21 FTEs	Variance from 2019–20	Variance from 2018–19
R&D FTEs	2,598.5	121.3	198.5
NRC IRAP FTEs	447.5	23.3	49.9
Internal Services and Enabling Services FTEs	1,215.3	7.3	62.7
Total NRC FTEs	4,261.3	151.9	311.1

Expenditures by vote

For information on the NRC's organizational voted and statutory expenditures, consult the [Public Accounts of Canada 2020–2021](#).^{xxx}

Government of Canada spending and activities

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

Financial statements and financial statements highlights

Financial statements

The NRC's financial statements (audited) for the year ended March 31, 2021, are available on the [NRC's website](#).^{xxxi}

Financial statements highlights

Condensed Statement of Operations (audited) for the year ended March 31, 2021 (dollars)

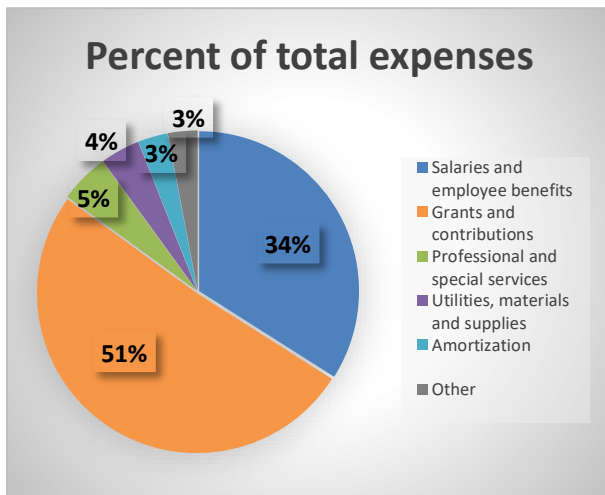
Financial information	2020–21 Planned results	2020–21 Actual results	2019–20 Actual results	Difference (2020–21 Actual results minus 2020–21 Planned results)	Difference (2020–21 Actual results minus 2019–20 Actual results)
Total expenses	1,218,520,000	1,627,272,000	1,224,535,000	408,752,000	402,737,000
Total revenues	193,676,000	155,691,000	183,434,000	(37,985,000)	(27,743,000)
Net cost of operations before government funding and transfers	1,024,844,000	1,471,581,000	1,041,101,000	446,737,000	430,480,000

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, 2020 have been proportionally consolidated with the NRC's March 31 accounts.

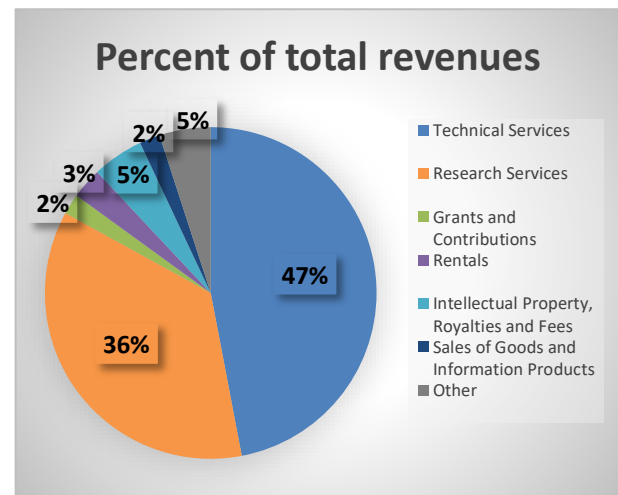
The NRC’s consolidated total expenses of \$1,627M in 2020–21 represent an increase from \$1,225M in 2019–20. The NRC’s major expense components are salaries and employee benefits (\$554M) and grants and contributions (\$821M), representing 85 percent of total expenses. The \$403M increase is primarily due to an increase in grants and contributions of \$403M, an increase in salary and employee and benefits of \$30M offset by a decrease of \$30M in other operating expenses which includes a decrease of \$16M in transportation and communication. The increase in grants and contributions is mainly due to \$375.5M in new funding related to NRC IRAP IAP and a \$10M increase in the ISC program. The salary increase is mainly due to renewed collective agreements, and an increase in the number of full time employees. The decrease in transportation and communication is mainly due to reduced travelling during the COVID-19 pandemic. The planned expenses, as reported in the NRC’s Consolidated Future Oriented Financial Statements in the 2020–21 Departmental Plan were \$1,219M. The variance between planned and actual results of \$409M is primarily due to increases in grants and contributions.

The NRC generates revenue which can be reinvested in operations. The NRC’s consolidated total revenues of \$156M in 2020–21 represent a decrease from \$183M in 2019–20. The NRC’s major revenue components were research services (\$56M) and technical services (\$73M), representing 83 percent of revenues. The planned revenue, as reported in the NRC’s Consolidated Future Oriented Financial Statements in the 2020–21 Departmental Plan was \$194M. The total variance of \$38M is largely attributed to technical service (\$21M lower than the planned results), grants and contributions (\$9M lower than the planned results) and research services (\$11M lower than the planned results).

Expenses by Type (2020–21)



Revenues by Type (2020–21)



**Condensed Statement of Financial Position (audited) as of March 31, 2021
(dollars)**

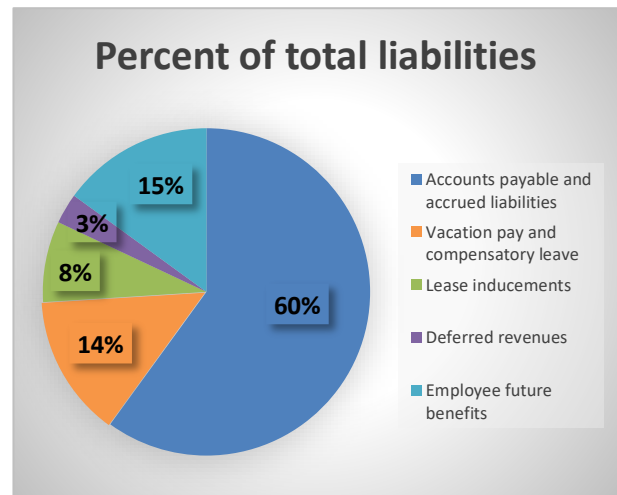
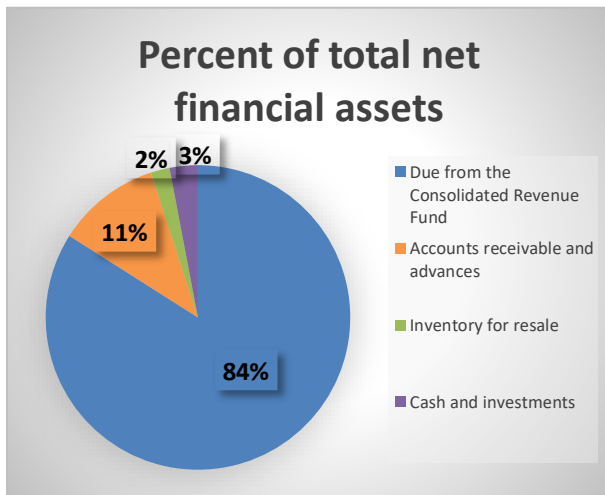
Financial Information	2020–21	2019–20	Difference (2020–21 minus 2019–20)
Total net financial assets	321,409,000	306,156,000	15,253,000
Total net liabilities	291,571,000	281,326,000	10,245,000
Departmental net financial assets	29,838,000	24,830,000	5,008,000
Total non-financial assets	794,526,000	727,766,000	66,760,000
Departmental net financial position	824,364,000	752,596,000	71,768,000

The NRC’s consolidated net financial assets totaled \$321M as at March 31, 2021, an increase of \$15M from the March 31, 2020 balance of \$306M. 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 \$17M increase of the Due from the CRF.

The NRC’s consolidated liabilities consist of accounts payable and accrued liabilities, vacation and compensatory leave, lease inducements, deferred revenues, lease obligation for tangible capital assets and employee future benefits. The balance as at March 31, 2021 of \$292M represents a \$10M decrease from the March 31, 2020 balance of \$281M. The increase is primarily due to a \$9M increase in accounts payable and accrued liabilities payable.

Net Financial Assets as at March 31, 2021

Liabilities as at March 31, 2021



Corporate information

Organizational profile

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

Institutional head: Mitch Davies, President

Ministerial portfolio: Innovation, Science and Economic Development

Enabling instrument: *National Research Council Act*,^{xxxii} 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 as reflected in his mandate letter. 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](#).^{xxxiii}

For more information on the department's organizational mandate letter commitments, see the [Minister's mandate letter](#).ⁱ

Operating context

Information on the operating context is available on the [NRC's website](#).^{xxxi}

Reporting framework

The NRC’s Departmental Results Framework and Program Inventory of record for 2020–21 are shown below.⁹

Core Responsibility: Science and Innovation		
Departmental Results Framework	Departmental Result: Scientific and technological knowledge advances	I1. Citation score of NRC-generated publications relative to the world average
		I2. Number of peer-reviewed publications generated by the NRC
		I3. Number of patents issued to the NRC
		I4. Number of licence agreements
		I5. 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)
	Departmental Result: Innovative businesses grow	I6. Percentage of R&D clients who report positive benefits of working with the NRC
		I7. Percentage revenue growth of firms engaged with the NRC (IRAP-engaged firms)
		I8. Percentage growth in Canada's science and technology related jobs through NRC supported firms (IRAP-engaged firms)
		I9. Revenue earned from clients and collaborators
	Departmental Result: Evidence-based solutions inform decisions in Government priority areas	I10. Revenue earned from other federal government departments
		I11. Number of NRC peer-reviewed publications co-authored with other federal government departments
Program Inventory	Advanced Electronics and Photonics	
	Aerospace	
	Aquatic and Crop Resource Development	
	Automotive and Surface Transportation	
	Business Management Support (Enabling)	
	Collaborative Science, Technology and Innovation Program	
	Construction	
	Design & Fabrication Services (Enabling)	
	Digital Technologies	
	Energy, Mining and Environment	
	Genomics Research & Development Initiative Shared Priority Projects	
	Herzberg Astronomy & Astrophysics	
	Human Health Therapeutics	
	Industrial Research Assistance Program	
	International Affiliations	
	Medical Devices	
	Metrology	
	Nanotechnology	
	National Science Library	
	Ocean, Coastal and River Engineering	
	Research Information Technology Platforms (Enabling)	
	Security and Disruptive Technologies	
	Special Purpose Real Property (Enabling)	
TRIUMF		

Internal Services

⁹ See [GC InfoBase](#)^{xxix} for the full names and descriptions of the Departmental Results Indicators in the NRC’s Departmental Results Framework.

Supporting information on the program inventory

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

Supplementary information tables

The following supplementary information tables are available on the [NRC's website](#):^{xxxi}

- ▶ Reporting on Green Procurement
- ▶ 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](#).^{xxxiv} 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

National Research Council Canada
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Ottawa, Ontario, Canada K1A 0R6
Phone: (613) 993-9101 or toll-free 1-877-NRC-CNRC (1-877-672-2672)
Fax: (613) 991-9096
TTY number: (613) 949-3042
E-mail: info@nrc-cnrc.gc.ca
Web address: <https://nrc.canada.ca/en/>^{xxxiii}

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 ministérielle)

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.

experimentation (expérimentation)

The conducting of activities that seek to first explore, then test and compare the effects and impacts of policies and interventions in order to inform evidence-based decision-making, and improve outcomes for Canadians, by learning what works, for whom and in what circumstances. Experimentation is related to, but distinct from innovation (the trying of new things), because it involves a rigorous comparison of results. For example, using a new website to communicate with Canadians can be an innovation; systematically testing the new website against existing outreach tools or an old website to see which one leads to more engagement, is experimentation.

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 process used to assess how diverse groups of women, men and gender-diverse people experience policies, programs and services based on multiple factors including race ethnicity, religion, age, and mental or physical disability.

government-wide priorities (priorités pangouvernementales)

For the purpose of the 2020–21 Departmental Results Report, those high-level themes outlining the government's agenda in the 2019 Speech from the Throne, namely: Fighting climate change; Strengthening the Middle Class; Walking the road of reconciliation; Keeping Canadians safe and healthy; and Positioning Canada for success in an uncertain 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.

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 Minister of Innovation, Science and Industry Mandate Letter, <https://pm.gc.ca/en/mandate-letters/2021/01/15/minister-innovation-science-and-industry-supplementary-mandate-letter>
- ii Mandate Letter for the NRC President, <https://nrc.canada.ca/en/corporate/about-nrc/mandate-letter-mr-iain-stewart-september-6-2018>
- iii Collaboration Centres, <https://nrc.canada.ca/en/research-development/research-collaboration/collaboration-centres>
- iv NRC Ideation Fund, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/ideation-fund-where-breakthroughs-begin>
- v Innovation Superclusters Initiative, <https://www.ic.gc.ca/eic/site/093.nsf/eng/home>
- vi NRC Supercluster support programs, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/supercluster-support-programs>
- vii NRC Challenge programs, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/challenge-programs>
- viii Pandemic Response Challenge program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/pandemic-response-challenge-program>
- ix Impact of COVID-19 on the central nervous system, <https://onlinelibrary.wiley.com/doi/full/10.1111/ene.14442>
- x 2020–21 Evaluation of the NRC’s Automotive and Surface Transportation Program, <https://nrc.canada.ca/en/corporate/planning-reporting/evaluation-automotive-surface-transportation-research-centre>
- xi 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>
- xii Materials for Clean Fuels Challenge program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/materials-clean-fuels-challenge-program>
- xiii High-Throughput and Secure Networks Challenge program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/high-throughput-secure-networks-challenge-program>
- xiv Artificial Intelligence for Design Challenge program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/artificial-intelligence-design-challenge-program>
- xv Sustainable Protein Production program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/sustainable-protein-production-program>
- xvi Ocean program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/ocean-program>
- xvii AI for Logistics program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/artificial-intelligence-logistics-supercluster-support-program>
- xviii Digital Health and Geospatial Analytics, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/digital-health-geospatial-analytics>
- xix Advanced Manufacturing program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/advanced-manufacturing-program>
- xx 2020–21 Evaluation of the NRC’s Codes Canada, <https://nrc.canada.ca/en/corporate/planning-reporting/evaluation-nrcs-codes-canada>
- xxi National Shipbuilding Strategy, <https://www.tpsgc-pwgsc.gc.ca/app-acq/amd-dp/mer-sea/sncn-nss/index-eng.html>
- xxii NRC’s Departmental Sustainable Development Strategy, <https://nrc.canada.ca/en/corporate/planning-reporting/departmental-sustainable-development-strategy-2020-2023>
- xxiii Federal Sustainable Development Strategy, <https://www.fdsd-sfdd.ca/index.html#/en/goals/>
- xxiv Sustainable Development Goal 7, <https://www.un.org/sustainabledevelopment/energy/>
- xxv Sustainable Development Goal 9, <https://www.un.org/sustainabledevelopment/infrastructure-industrialization/>
- xxvi Sustainable Development Goal 11, <https://www.un.org/sustainabledevelopment/cities/>
- xxvii Sustainable Development Goal 12, <https://www.un.org/sustainabledevelopment/sustainable-consumption-production/>
- xxviii Sustainable Development Goal 13, <https://www.un.org/sustainabledevelopment/climate-change/>
- xxix GC InfoBase, <https://www.tbs-sct.gc.ca/ems-sgd/edb-bdd/index-eng.html#start>
- xxx Public Accounts of Canada, <http://www.tpsgc-pwgsc.gc.ca/recgen/cpc-pac/index-eng.html>
- xxxi NRC website, <https://nrc.canada.ca/en/corporate/planning-reporting/financial-performance-reporting>
- xxxii *National Research Council Act*, <https://laws-lois.justice.gc.ca/eng/acts/N-15/index.html>
- xxxiii NRC website, <https://nrc.canada.ca/en/>
- xxxiv Report on Federal Tax Expenditures, <https://www.canada.ca/en/department-finance/services/publications/federal-tax-expenditures.html>