

Supplementary Information Tables:
2019–20 Departmental Results Report

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Departmental Sustainable Development Strategy

This supplementary information table supports the commitment in the *Federal Sustainable Development Act (FSDA)* to make environmental decision-making more transparent and accountable to Parliament. It also contributes to an integrated, whole-of-government view of activities supporting environmental sustainability.

The departmental information reported in this supplementary information must take into account information previously prepared in accordance with the following guidance documents:

- [2017 to 2020 Guidance for the Preparation of Departmental Sustainable Development Strategies](#)
- [Guideline on Green Procurement for Small and Micro Departments](#)
- [Guide to Preparing Supplementary Information Tables: 2019–20 Departmental Plan](#) (Departmental Sustainable Development Strategy)

These documents provided text and tables to help departments describe their actions and performance measures and show how their actions support the achievement of the goals and targets of the Federal Sustainable Development Strategy (FSDS).

1. Introduction to the Departmental Sustainable Development Strategy

The [2016 to 2019 Federal Sustainable Development Strategy \(FSDS\)](#) presents the Government of Canada's sustainable development goals and targets, as required by the *Federal Sustainable Development Act*. The Canadian Space Agency adheres to the principles of the FSDS, and while not bound formally by the Act, supports reporting on the implementation of the Departmental Sustainable Development Strategy.

2. Sustainable development in the Canadian Space Agency

The Canadian Space Agency's Departmental Sustainable Development Strategy for 2017 to 2020 describes the department's actions in support of achieving a Low-Carbon Government. This supplementary information table presents available results for the departmental action[s] pertinent to this goal. Previous years' supplementary information tables are posted on the Canadian Space Agency's website.

3. Departmental performance by FSDS goal

The following tables provide performance information on departmental action in support of the FSDS goals listed in section 2.

Context: Low-Carbon Government

Although the Canadian Space Agency is not bound by the *Federal Sustainable Development Act* and is not required to develop a full departmental sustainable development strategy, the Canadian Space Agency adheres to the principles of the Federal Sustainable Development Strategy (FSDS) by implementing the *Policy on Green Procurement*.

The *Policy on Green Procurement* supports the Government of Canada's effort to promote environmental stewardship. In keeping with the objectives of the policy, the Canadian Space Agency supports sustainable development by integrating environmental performance considerations into the procurement decision-making process through the actions described in the "FSDS goal: low-carbon government" table in section 2. Through the Greening Government Strategy, CSA is also participating in the Low-Carbon Government Goal for the following actions: Improve the energy efficiency of our buildings/operations and modernize our fleet.

Low-Carbon Government: The Government of Canada leads by example by making its operations low-carbon

FSDS target(s)	FSDS contributing action(s)	Corresponding departmental action(s)	Starting point(s) Performance indicator(s) Target(s)	Results achieved	Contribution by each departmental result to the FSDS goal and target
Reduce greenhouse gas emissions from federal government buildings and fleets by 40% below 2005 levels by 2030, with an aspiration to achieve it by 2025.	Improve the energy efficiency of our buildings/operations*	Complete a Carbon Neutral study	<p>Starting points: 2280 tCO₂ in 2005–06</p> <p>Performance indicator: % change in GHG emissions from 2005-06 to current reporting fiscal year</p> <p>Target: 40% reduction in GHG emissions from 2005-06 levels by</p>	The study's data collection phase is completed. The building modeling phase will be completed in 2020–21. The results of the study are also expected in 2020–21. CSA is on track to meet the GHG emission target of	FSDS: With the results, the Canadian Space Agency will be in a position to develop a plan to reduce its GHG emissions related to its real property operations of its headquarters and main GHG contributor. In this way, the CSA will contribute to reducing the total GHG emissions of

FSDS target(s)	FSDS contributing action(s)	Corresponding departmental action(s)	Starting point(s) Performance indicator(s) Target(s)	Results achieved	Contribution by each departmental result to the FSDS goal and target
			2030, with an aspiration to achieve it by 2025.	40% below 2005-06 levels by 2025. In 2019–20, CSA generated 1235 tCO ₂ from its facilities and fleet. This represents a reduction of 1044 tCO ₂ from 2005–06 levels by 45.8%.	the government operations. United Nations Sustainable Development Goals (UNSDG): 7-9-11-13
	Modernize our fleet	Promote the purchase of hybrid or zero-emission vehicles (ZEVs) when replacing a vehicle from the CSA fleet. Optimize fleet management decision with data collection and the use of telematics.	<p>Starting point: At the beginning of 2019–20, 20% of CSA’s fleet is ZEVs or hybrid</p> <p>Performance indicator:</p> <ul style="list-style-type: none"> • % of new light-duty unmodified administrative fleet vehicle purchases that are ZEVs or hybrid • % of the fleet that are ZEVs 	In 2019–20, 100% of new light-duty unmodified administrative fleet vehicle purchases have been ZEVs or hybrid. CSA completed its planned purchase of a hybrid vehicle. At the end of 2019–20, 40% of CSA’s fleet is ZEVs or hybrid and 100% are equipped with telematics.	<p>FSDS: By replacing its gasoline-powered vehicles with hybrid or zero-emission vehicles, the CSA contributes to reducing the total GHG emissions related to federal operations and to ensure that the government’s administrative vehicle fleet is at least 80% ZEV by 2030.</p> <p>UNSDG: 7-11-12-13</p>

FSDS target(s)	FSDS contributing action(s)	Corresponding departmental action(s)	Starting point(s) Performance indicator(s) Target(s)	Results achieved	Contribution by each departmental result to the FSDS goal and target
			<p>or hybrid</p> <ul style="list-style-type: none"> • % of the fleet that is equipped with telematics <p>Target:</p> <ul style="list-style-type: none"> • 75% of new light-duty unmodified administrative fleet vehicle purchases are ZEVs or hybrid • 80% of the fleet is ZEVs or hybrid by 2030 100% of the fleet is equipped with telematics by the end of 2019-20. 		

FSDS target(s)	FSDS contributing action(s)	Corresponding departmental action(s)	Starting point(s) Performance indicator(s) Target(s)	Results achieved	Contribution by each departmental result to the FSDS goal and target
	Support the transition to a low-carbon economy through green procurement	Implement a directive to respond to the Policy on Green Procurement	<p>Starting point: 2019</p> <p>Performance indicator: Date of implementation for the Green Procurement Directive</p> <p>Target: Green Procurement Directive ready to be implemented by the end of 2020</p>	Due to the COVID-19 pandemic, the revision of the Green Procurement Directive has been delayed. It is projected to be approved in 2020–21, as planned.	<p>FSDS: With the implementation of a Green procurement directive, CSA will ensure its active participation on the Policy on green procurement, thus reducing the Canadian government environmental impact related to the purchase of goods and services and promote sustainable procurement.</p> <p>UNSDG: 12.7</p>

FSDS target(s)	FSDS contributing action(s)	Corresponding departmental action(s)	Starting point(s) Performance indicator(s) Target(s)	Results achieved	Contribution by each departmental result to the FSDS goal and target
		Draw a portrait of goods and services purchased by the Agency	<p>Starting point: 2020/Baseline data not available</p> <p>Performance indicator:</p> <ul style="list-style-type: none"> • Date that the report is obtained; and; • Date that the targets identified. <p>Target: By 2022, the report is obtained and targets are identified.</p>	A study conducted by PSPC, allowed the CSA to identify some of its most significant GHG emission contributors amongst its purchases of goods and services. Despite the study's limitations, the most likely highest GHG contributors were identified. Increased collaboration with PSPC is needed to reduce the GHG emissions and environmental impacts of CSA procurement.	<p>FSDS: By obtaining a better understanding of its purchases of goods and services, the CSA will be in a position to prioritize its actions to ensure the reduction of its GHG emissions and its environmental impacts related to its purchases.</p> <p>UNSDG: 12.7</p>
		Identify and evaluate the potential for responsible methods of	<p>Starting point: 2018/Baseline data not available</p> <p>Performance indicator: % of new</p>	The CSA evaluated potential methods for sustainable procurement and introduced	FSDS: Using optimized methods of procurement and incorporating environmental considerations and

FSDS target(s)	FSDS contributing action(s)	Corresponding departmental action(s)	Starting point(s) Performance indicator(s) Target(s)	Results achieved	Contribution by each departmental result to the FSDS goal and target
		procurement and establish environmental/social criteria in supplies	contracts that include environmental criteria Target: 50% of new contracts will include environmental criteria by April 2022.	environmental criteria for request for proposals and contracts with one of its sectors. In 2019–20, three significant contracts had included environmental criteria and clauses.	criteria into procurement decisions is expected to encourage suppliers to reduce the environmental impact of the goods and services they deliver, and in their supply chains. It will also contribute to the transition to a low-carbon economy. UNSDG: 12.7
	Demonstrate innovative technologies	Not applicable.	Not applicable.	Not applicable.	Not applicable.
	Promote sustainable travel practices	Not applicable.	Not applicable.	Not applicable.	Not applicable.
	Understand climate change impacts and build resilience	Not applicable.	Not applicable.	Not applicable.	Not applicable.

FSDS target(s)	FSDS contributing action(s)	Corresponding departmental action(s)	Starting point(s) Performance indicator(s) Target(s)	Results achieved	Contribution by each departmental result to the FSDS goal and target
	Improve transparency and accountability	Not applicable.	Not applicable.	Not applicable.	Not applicable.
	Develop policy for low carbon government	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Additional departmental sustainable development activities and initiatives related to Low-Carbon Government

Additional departmental activities and initiatives	Starting point(s) Performance indicator(s) Target(s)	Results achieved	Contribution by each departmental result to the FSDS goal
See Part 4			

4. Report on integrating sustainable development

During the 2019–20 reporting cycle, the Canadian Space Agency had no proposals that required a strategic environmental assessment (SEA) and no public statements were produced.

As part of the CSA's efforts to further integrated sustainability in its daily management practices, the CSA has put in place other contributing measures, such as:

- Tracking and disclosing its GHG emission for each facility through RETScreen.
- Reducing waste generation through prevention, reduction, recycling, reuse, and valorization. Related to this measure, the CSA has conducted two waste audits to better understand the types and the quantity of waste generated at its facilities. The results were the following and are used as starting points:
 - Facility 1:
 - Non-hazardous waste: The waste diversion rate is 36.81% for 54.29 tons of waste produced
 - Plastic waste: The waste diversion rate is 35.99% for 2.92 tons of plastic waste produced
 - Facility 2:
 - Non-hazardous waste: The waste diversion rate is 56.81% for 3.73 tons of waste produced
 - Plastic waste: The waste diversion rate is 22.74% for 0.129 tons of plastic waste produced
 - The above results compare to the Greening Government Strategy targets of:
 - diverting at least 75% by weight of non-hazardous waste from landfills by 2030;
 - diverting at least 75% by weight of plastic waste from landfills by 2030;
- The CSA is working to renew the waste program to increase the waste diversion rate and reach the targets of the Greening Government Strategy. In addition, by tracking, diverting, and reducing its waste, CSA contributes to reduce scope 3 GHG emissions created by waste production, transportation, and disposal. This also allows the CSA to collaborate with its suppliers, thus contributing to the transition to sustainability in the industry.

Details on transfer payment programs of \$5 million or more

General information

Name of transfer payment program	Contributions under the Canada/European Space Agency (ESA) Cooperation Agreement.
Start date	The Canada-ESA Cooperation Agreement was renewed in February 2019 and entered into force on June 13, 2019 with its ratification. The revised Terms and Conditions of the program were approved in April 2019, and became effective on November 26, 2019.
End date	January 1, 2030 (end date of the Agreement).
Type of transfer payment	Contribution
Type of appropriation	Annually through Estimates.
Fiscal year for terms and conditions	The revised Terms and Conditions for the contributions, under the 2020-30 Cooperation Agreement, were approved and became effective in 2019–20.
Link to the department's Program Inventory	Space Capacity Development
Description	Enhance Canadian industry's technological base and provide access to European markets for value-added products and services in the fields of Earth observation (EO), telecommunications, navigation, space exploration and generic technological activities; foster the participation of Canadian academia and make possible the demonstration of Canadian space technologies in European microgravity and space exploration missions and programs. This is achieved through a financial contribution by the CSA to ESA optional programs.
Results achieved	<p>For the period of January 1, 2015 to December 31, 2019, Canada has achieved a return coefficient of 1.07, which is much higher than the minimum guaranteed to ESA Member States (0.91 at end of 2019) and the ideal value 1.00). This coefficient indicates that as a result of the Canada-ESA Cooperation Agreement, Canada is successful in obtaining its fair share of ESA contracts, although the period of the statistics is short.</p> <p>Over the 2019-20 fiscal year, Canadian companies have increased the technology readiness level of over 30 Canadian technologies supported by ESA programs.</p> <p>Through Canada's participation in ESA Earth Observation programs, more specifically the Earth Observation Envelope Program, Copernicus Space Component Program, and</p>

	<p>European Earth Watch, the CSA has continued to support Canadian companies with the development of advanced space-borne instruments and sub-systems, user-oriented applications, and ensuring access to the data for Canadians. In November 2019, Canada announced new subscriptions of 17.64M€ (approx. \$28.46M) in the Future Earth Observation Program, Copernicus Space Component Program, and European Earth Watch, for ALTIUS and Arctic Weather Satellite missions.</p> <p>The CSA supported the development and demonstration of innovative space technologies through its participation in ESA's General Space Technology Program, in which Canada subscribed 0.7M€ (approx. \$1.05M) in November 2019.</p> <p>Through its partnership with the ESA, the CSA has continued to position the Canadian industry and scientists in scientific and technological development related to the European Exploration Envelop Program (E3P), in which Canada subscribed 23.3M€ (approx. \$37.05M) in November 2019.</p> <p>Canada's participation in the European Advanced Research in Telecommunications Systems (ARTES) has continued to allow our industry to access forward-looking studies on new telecommunications services, and to develop new satellites, technologies, equipment, and applications. In November 2019, Canada extended its participation in ESA's satcom activities, by announcing new subscriptions of 15.01M€ (approx. \$24.46M). Several Canadian companies were awarded contracts over the last year. Finally, Canadian companies continued to work on projects under the Navigation Innovation and Support Program (NAVISP). Projects include the development of a high performance, low profile multi-constellation antenna targeting survey, precision agriculture, marine and aviation market segments; development of a high-precision, cloud-based corrections service for Global Navigation Satellite System (GNSS) receivers; expansion of Skydel's GNSS simulator to seize arising European market opportunities; and development of a hardware/software codesign framework for GNSS software receiver by Space Codesign.</p>
<p>Findings of audits completed in 2019–20</p>	<p>N/A</p>
<p>Findings of evaluations completed in 2019–20</p>	<p>No evaluation was carried out over the 2019-20 fiscal year. The next evaluation is planned for 2022-23.</p>

Engagement of applicants and recipients in 2019–20	The CSA continued to actively consult the Canadian space sector (industry and academia) and Government of Canada departments and agencies as part of the program selection process. More specifically, Canadian stakeholders were invited to provide inputs to support the CSA’s decision-making process in preparation of Canada’s participation to ESA’s Ministerial Council in November 2019. Hence, the Canadian space sector provided feedback to the CSA regarding Canada’s participation in the ESA’s optional programs.
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Financial information (dollars)

Type of transfer payment	2017–18 Actual spending	2018–19 Actual spending	2019–20 Planned spending	2019–20 Total authorities available for use	2019–20 Actual spending (authorities used)	Variance (2019–20 actual minus 2019–20 planned)
Total contributions	41,766,413	29,977,215	32,123,000	36,135,375	36,092,091	3,969,091
Total program	41,766,413	29,977,215	32,123,000	36,135,375	36,092,091	3,969,091
Explanation of variances	The variance is due to the variation in payments, in accordance with the budgetary feasibility principle governing contributions from member states and Canada to ESA, against Canada's binding multi-year legal obligations with respect to its participation in ESA optional programs.					

General information

Name of transfer payment program	Class Grant and Contribution Program to Support Research, Awareness and Learning in Space Science and Technology
Start date	October 1, 2009
End date	N/A — Ongoing program
Type of transfer payment	Grant and Contribution
Type of appropriation	Annually through Estimates
Fiscal year for terms and conditions	2009–10
Link to the department's Program Inventory	1.1 Space Utilization 1.2 Space Exploration 1.3 Space Capacity Development 1.4 Internal Services (Communications Services, Management and Oversight Services)
Description	<p>This program supports knowledge development and innovation in the CSA's priority areas while increasing the awareness and participation of Canadians in space-related disciplines and activities. The program has two components: a) Research and b) Awareness and Learning.</p> <p>The Research Component aims to support the development of science and technology; foster the continual development of a critical mass of researchers and highly qualified people in Canada; and support information gathering and space-related studies and research pertaining to Canadian Space Agency priorities.</p> <p>The Awareness and Learning Component aims to provide learning opportunities to Canadian students in various space-related disciplines; to support the operations of organizations dedicated to space research and education; and to increase awareness of Canadian space science and technology among Canadian students and their participation in related activities.</p> <p>This Transfer Payment Program is composed of grants and contributions.</p>
Results achieved	In 2019–20, Canadian universities, for-profit and not-for-profit organizations established and operating in Canada as well as individuals have made significant contributions to knowledge creation in space science and technology priority areas through 21 new Announcements of Opportunity (AOs) and initiatives, resulting in 89 new grants and contributions.

	<p>For more information regarding these initiatives consult the Programs Results Section of the DRR.</p> <p>Global Results: The annual follow-up surveys enabled the CSA to capture the following results: 605 publications among which 72 were peer reviewed and 1035 presentations among which 179 were focused on being accessible to the general public. 3675 research team members were involved in the supported initiatives; of these 3128 were Highly Qualified Personnel (HQP), including 533 Faculty members, 1788 students and Post-Doctoral Fellows and 807 technicians and other research team members.</p> <p>A total of 1179 research organizations have been involved in the funded projects (mostly Universities, Foreign Research organizations, the private sector). 64.5% of research partners are international and 35.5% are national.</p>
<p>Findings of audits completed in 2019–20</p>	<p>An audit of the Management Framework for the Class Grant and Contribution Program was completed in 2019-20. The Program is managed in accordance with the <i>Policy on Transfer Payments</i>, the <i>Financial Administration Act</i> (FAA) and the program terms and conditions. Opportunities for improvement were identified regarding recipient audit and service standards.</p>
<p>Findings of evaluations completed in 2019–20</p>	<p>No evaluation was completed in 2019-20 Next evaluation is planned and expected to be completed in 2021–22.</p>
<p>Engagement of applicants and recipients in 2019–20</p>	<p>Since January 2012, an initiative to engage recipients has been undertaken through a survey. The CSA has extended this initiative via its web page in order to establish a dialogue with potential applicants and recipients.</p> <p>Consultations, presentations to, and discussions with the academic and industrial communities as well with other potential recipient groups, are ongoing and will continue.</p>

Financial information (dollars)

Type of transfer payment	2017–18 Actual spending	2018–19 Actual spending	2019–20 Planned spending	2019–20 Total authorities available for use	2019–20 Actual spending (authorities used)	Variance (2019–20 actual minus 2019–20 planned)
Total grants	8,674,322	10,423,648	10,003,000	9,284,725	9,284,634	(718,366)
Total contributions	10,507,215	15,975,628	16,570,000	14,205,900	14,205,899	(2,364,101)
Total program	19,181,537	26,399,276	26,573,000	23,490,625	23,490,533	(3,082,467)
Explanation of variances	The variance is due to a multitude of variations, which are inherent in the management of the Canadian Space Program's (CSP) resources. They result from the fact that budgetary requirements by vote are not linear from one year to the next, requiring vote transfers or fund carry forwards to another fiscal year.					

Gender-based analysis plus

Institutional GBA+ Capacity

Since 2017, Gender-Based Analysis plus (GBA+) is integrated in the requirements of the Investment Governance and Monitoring Framework and is part of the roles and responsibilities of the executive sponsor.

A policy has been implemented to state the roles and responsibilities of CSA personnel and stipulates that all initiatives that are new or which need re-approval will be subject to a GBA+. More specifically, the policy requires that:

- All CSA initiatives (e.g. policies, programs, projects, grants and contributions, budget proposals) that are new or which need re-approval will be subject to GBA+ to ensure they do not have detrimental impacts on certain diverse groups of women, men and non-binary people and that they seek to achieve better results for all Canadians.
- Documented evidence of the elaboration of GBA+ is required to support approval of initiatives for Treasury Board (TB) Submissions and Memorandum to Cabinet (MC).
- The documented evidence of the elaboration of GBA+ will be collected in order to monitor the implementation and continuous improvement of the GBA+ processes at CSA, and for reporting to Status of Women Canada (SWC) on a regular basis.

The President is responsible for ensuring that the Government of Canada's commitment to implementing GBA+ is fulfilled at the CSA as per the aforementioned policy requirements.

The Executive Committee Members are responsible for:

- Ensuring that gender and other identity factor considerations are identified and that inequalities are corrected within the context of their respective program's activities, from policy and program development to service delivery, including in MC and TB Submissions.
- Supporting and encouraging GBA+ training opportunities for their employees.
- Appointing one of their members as the GBA+ Champion who will be the functional authority for GBA+ at the CSA.
- Appointing a GBA+ Point of contact for each branch of the CSA.

The Executives and managers are responsible for:

- Applying GBA+, and for integrating the results thereof, to the decision-making process within their sector.
- Supporting their employees who are engaged in applying GBA+ to the initiatives under their responsibilities, from concept to implementation to operations as applicable, and for supporting related adjustments that might be required in this regard.

- Providing training opportunities in GBA+ for their employees.

During the development of the Strategic Workforce Management Plan, consultations were held with the various groups of the CSA to gather their comments on the actions and issues identified. These consultations are carried out through internal CSA committees, including the Continuous Improvement Committee and the Employment Equity and Diversity Advisory Committee. Also, consultations with GBA+ points of contact in the organization took place to ensure that the actions identified will not have any negative impact on certain diverse groups of women, men and gender diverse people and that they will help achieve better outcomes for Canada's diverse population.

Highlights of GBA+ Results by Program

Canada in Space

In 2019-2020, the CSA reviewed several initiatives through the lens of GBA +. These initiatives were mainly aligned with four of the six goals of the Gender Results Framework, namely education and skills development; equal participation in the economy and prosperity; reducing poverty and improving health and well-being; and promoting gender equality around the world. The following section presents three of these initiatives and highlights some significant elements of their respective analysis.

1. **Deep Space Exploration Robotics (DSXR):** Recognizing Canada's leadership and expertise in space robotics, NASA has asked the CSA to design, build, and supply the robotic system that will be used in future deep space exploration missions. The development and implementation of the interfaces will be carried out by contractors as part of a competitive procurement approach. GBA+ considerations have been identified with respect to the composition of the Canadian space workforce. The majority of employees working in science, technology, engineering, and mathematics (STEM) are male, making them more likely to benefit from the positive impact of the proposal. For this reason, CSA investments are expected to be accompanied by specific provisions in contracts and / or contribution agreements, in order to encourage companies to consider more women and other under-represented groups in STEM in their hiring plan. Through this action, the CSA is aiming to contribute to the diversification of the Canadian space sector, to the prosperity and economic participation of all Canadians, as well as to participate in the establishment and maintenance of a diverse and highly skilled Canadian workforce.
2. **WildFireSat** aims to provide daily forest fire monitoring data to the Canadian Forest Service (CFS) of Natural Resources Canada (NRCan) and Environment and Climate Change Canada (ECCC), in order to help them fulfill their respective mandates. The project is particularly beneficial to Canadians living in remote areas and near wooded areas, as well as residents of Western Canada (i.e. British Columbia and Alberta) considering that forest fires are more frequent there. The GBA+ did not identify any gender-related obstacles in the proposed selection process, considering that the selection of the contractor is made on the basis of technical and managerial expertise. In addition, before awarding a contract over \$ 1M, the contractor will have to certify its commitment to implement

	<p>employment equity.</p> <p>3. MARS SAR: The initiative aims to study the recent climatic history of the planet Mars. In partnership with Canadian industry, CSA is committed to providing NASA with a radar instrument capable of acting both as a Synthetic Aperture Radar (SAR) and as an underground probe to collect and process data required for mapping shallow ice. The instrument could also prove useful on Earth to study the state of Canada's permafrost. In particular, the analysis of the proposal showed that the initiative represents a rewarding employment experience for recently graduated employees and that the candidate selection process is free from bias or obstacles in terms of the participation of the groups targeted by the proposal. Nevertheless, it is possible that the company selected to carry out this project is located in provinces where the space industry workforce is highly concentrated, that is to say Ontario (43%) and Quebec (34%). Positive repercussions are also expected for Canadian populations living in remote areas, including many Aboriginal communities. For example, improving the capacity to monitor melting ice would allow northern communities to be supplied more quickly with boat access in the spring.</p>
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Response to parliamentary committees and external audits

Response to parliamentary committees

There were no parliamentary committee reports requiring a response in 2019-20.

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

There were no audits in 2019–20 requiring a response.

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

There were no audits in 2019–20 requiring a response.

Status report on transformational and major Crown projects

General information

Project name	RADARSAT Constellation Mission (RCM)
Description	<p>The RADARSAT Constellation Mission (RCM) is the next generation of Canadian Earth observation (EO) radar satellites. RADARSAT-1 was launched in 1995 and continued its operation until March 2013. RADARSAT-2, developed by the private sector in partnership with the Government of Canada (GoC), was launched in 2007 for a seven-year mission, but given its current performance, it is expected to remain operational for several more years. Canada has established itself as a leading global supplier of C-band satellite radar data for EO. The successor mission to RADARSAT-2, the RCM will contribute to maintaining the leadership position of Canadian industry in space radar technology and value-added product markets.</p> <p>The RCM is comprised of three identical satellites equipped with two payloads: a powerful Synthetic Aperture Radar (SAR) and an Automatic Identification System (AIS). The RCM mission was successfully launched on June 12th, 2019 and, after successful commissioning, started operations and delivering data to its Government of Canada users on November 27th, 2019. The three-satellite configuration provides on average daily coverage of Canada's maritime approaches and frequent coverage of Canada's land, as well as the capability to observe a specific point over 90% of the world's surface. It also provides a four-day exact revisit, allowing coherent change detection using an InSAR mode (as opposed to 24 days with previous RADARSAT missions). The creation of a three-satellite constellation increases the frequency of available information, as well as the reliability of the system, making it better suited to respond to the needs of a large variety of users that develop services and information products.</p> <p>The scope of the RCM Major Crown Project includes the requirement definition, design, development, manufacturing, integration, testing and launch of the satellites as well as the design, development, manufacturing and installation of the associated ground segment. One year of operation of the three-satellite constellation is also included as well as an application development program.</p> <p>The RCM provides reliable data in all weather and illumination conditions in support of federal departments' operations and mandates in areas such as maritime surveillance, disaster management, environmental monitoring and natural resource management. The</p>

	<p>constellation has the ability to cover the North Pole region up to four times a day.</p> <p>In support of the maritime surveillance requirements of federal departments, the RCM is the principal data source envisaged for wide-area surveillance of Canada's remote areas and marine approaches. The daily coverage of marine areas also supports fisheries monitoring, ice and icebergs monitoring, pollution monitoring, and integrated ocean and coastal zone management. The RCM's maritime surveillance capabilities also support Canadian sovereignty and security. Only satellite data can offer regular cost-effective information to task ships and aircraft with intercepting suspicious vessels.</p> <p>The RCM's maritime surveillance capabilities also support Canadian sovereignty and security. The RCM satellites are able to capture ship-originated Automatic Identification System (AIS) signals from space. The combination of space-based radar images and AIS signals provides a powerful surveillance capacity over Canada's maritime approaches and elsewhere in the world.</p> <p>In support of disaster management, both in Canada and around the world, the RCM provides critical and timely data to support disaster mitigation, warning, and response and recovery activities, while helping Canada meet its obligations with respect to international disaster relief. The types of disasters for which RCM data will be used for monitoring and relief purposes include floods, oil spills, volcanic eruptions, earthquakes and hurricanes. RCM data will also contribute to the production of more accurate weather forecasts and warnings pertaining to marine conditions, winds, severe storms and floods.</p> <p>In support of environmental monitoring, the RCM provides data for wide-area change detection in order to provide support for activities such as water management, wetlands mapping, coastal change monitoring and changes in the permafrost in northern Canada.</p> <p>In support of natural resource management, RCM data is a critical source of information to monitor the changing state of Canada's agricultural areas, forests and wildlife habitats. RCM data is also used in the mining and energy sectors for resource exploration operations to ensure that critical infrastructure is monitored properly for safety and integrity.</p> <p>In addition, the RCM will sustain the development of Canadian high-technology design and manufacturing capabilities and the integration of satellite data into information products and services. Canada's space and geomatics industries will benefit from better positioning in international markets and privileged access to data deemed essential by many international users.</p>
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Project outcomes	<p>This Major Crown Project (MCP) contributes to the Space Utilization program, which includes the provision of space-based solutions and the progression of their utilization. It also serves to install and run ground infrastructure that operates satellites, receives, processes and distributes the data. This Program utilizes space-based solutions to assist Government of Canada (GoC) organizations in delivering growing, diversified and cost-effective programs and services within the purview of their respective mandates, each related to key national priorities such as sovereignty, defence, safety and security, resource management, environmental monitoring and the North. It also provides academia with data required to perform its own research.</p> <p>The contribution of the MCP to the program objectives is measured through the Performance Information Profile results and indicators for the Space Utilization program. The primary performance indicator for this program is the number of data scenes acquired from CSA-supported SAR satellites. In 2019-20, the target was to acquire 40,000 data scenes and the result was 57,657 data scenes including the scenes acquired during the commissioning period. A total of 47,033 scenes were delivered to users from the beginning of RCM operations on November 27, 2019. The delay with the DND Polar Epsilon-2 project has delayed DND's capability to start using RCM data, initially planned to begin in December 2019, but delayed to early 2020-21.</p>
Industrial benefits	<p>The RCM is expected to generate significant industrial benefits in the space and Earth Observation sectors, such as employment, innovation, economic growth, competitiveness and improved productivity. Investments in the RCM also support the growth of small and medium-sized companies as well as Canadian capabilities in terms of infrastructure and services.</p> <p>The prime contract includes a requirement for 70% Canadian content, excluding launch services and subsystems for which there are no suppliers available in Canada. As of March 31, 2020, this corresponds to a Canadian content requirement of \$571.1 million. For the same period, the CSA provided the Canadian industry with funding of more than \$619.9 million to carry out work resulting directly from the design of the RCM MCP, thus surpassing the requirement.</p> <p>The prime contract also requires that 3.5% of the 70% Canadian content be subcontracted in the Atlantic Canada region. For the same period, the actual Atlantic Canada content was \$25.9 million, considerably higher than the requirement of \$20.0 million.</p> <p>The prime contract includes reporting obligations and performance measurements as well as financial penalties for not meeting the minimum Atlantic Canada content requirement.</p>
Sponsoring department	Canadian Space Agency (CSA)

Contracting authority	Public Services and Procurement Canada (PSPC)
Participating departments	Agriculture and Agri-Food Canada Canadian Coast Guard Environment and Climate Change Canada Fisheries and Oceans Canada Global Affairs Canada Indigenous and Northern Affairs Canada Innovation, Science and Economic Development Canada National Defence and the Canadian Armed Forces Natural Resources Canada Parks Canada Public Safety Canada Royal Canadian Mounted Police Statistics Canada Transport Canada
Prime contractor	MDA Systems Ltd. (a division of MacDonal, Dettwiler and Associates), Richmond, British Columbia
Major subcontractors	Tier 1 Major Subcontractors: - MDA Montreal, Ste-Anne-de-Bellevue, Quebec - Magellan Aerospace, Winnipeg, Manitoba - MDA, Halifax, Nova Scotia - SpaceX, Hawthorne, California, USA - Airbus Defence and Space, United Kingdom - Honeywell Aerospace, United Kingdom Tier 2 and Tier 3 Canadian Subcontractors: - Stelia Aerospace North America, Lunenburg, Nova Scotia - IMP Group, Halifax, Nova Scotia - DRS, Ottawa, Ontario

	<p>- Mecachrome, Mirabel, Quebec</p> <p>- Maya, Montreal, Quebec</p>
Project phase	The RCM project is in Phase E1 – Operations since November 27 th , 2019, which should last for one year.
Major milestones	<p>Phase A: Requirement Definition (March 2008)</p> <p>Phase B: Preliminary Design (March 2010)</p> <p>Phase C: Detailed Design Review (November 2012)</p> <p>Phase D: Launch satellite #1, #2, and #3 (2019)</p> <p>Phase E1: Operations (part of MCP) (2020)</p> <p>Phase E2: Operations (not part of MCP) (2026)</p>
Progress report and explanation of variances	<p>On December 13, 2004, the Domestic Affairs Committee of Cabinet granted approval-in-principle to a 10-year program to implement a RADARSAT Constellation Mission (RCM) aimed at addressing the operational needs of users from the public and private sectors in relation to Canadian sovereignty and marine surveillance, environmental monitoring and change detection, and disaster management. The RCM would be government owned and operated.</p> <p>On June 6, 2005, Treasury Board granted Preliminary Project Approval (PPA) for the RCM and expenditure authority for the Project Initial Planning and Identification (i.e. Phase A). During Phase A, feasibility studies were completed, user requirements were defined, and risk mitigation activities and options analysis for the bus and payload were carried out. The initial scope of work for Phase A was completed in December 2006. Phase A was then extended to allow additional technical risk reduction activities to continue during the period prior to the Phase B contract award. This was completed in March 2008.</p> <p>In March 2007, Treasury Board approved a revised Preliminary Project Submission to proceed to Phases B and C. Following a competitive Request for Proposal (RFP) process, Public Services and Procurement Canada (PSPC) obtained authority to enter into negotiations with MDA, the prime contractor, and awarded the contract for Phase B in November 2008. The Preliminary Design (i.e. Phase B) was completed in March 2010. The contract for Phase B was subsequently amended to include the detailed design (i.e. Phase C).</p> <p>A second revised PPA was approved by Treasury Board in December 2010. The purpose of this revised PPA was to provide additional expenditure authority to include the procurement of long-lead items during Phase C and also to include a technology demonstration for</p>

	<p>Automatic Identification System (AIS) payloads, funded by the Department of National Defence.</p> <p>The final review of the overall mission-level system detailed design, the Mission Critical Design Review (CDR), was conducted in November 2012. A selected set of activities, such as completing the design qualification activities and the procurement of long-lead items, were pursued under Phase C and were completed in March 2015. These selected activities were scheduled to be completed in March 2014 but were delayed due to technical difficulties encountered during the building of the qualification models. The delay has no impact on the project.</p> <p>Treasury Board granted Effective Project Approval for the RCM in December 2012, which provides expenditure and contracting authorities to complete the project and carry out the first year of RCM operations (Phases D and E1). The contract was awarded on January 9, 2013. Since the contract award, planning activities have been completed and major milestones achieved to initiate the implementation phase of the satellites and associated ground systems.</p> <p>In 2013, a Deputy Ministers' Governance Committee on Space (DMGCS) was established to provide oversight, coordination and accountability on the RCM MCP. The DMGCS reports to the Minister of Innovation, Science and Economic Development and provides strategic direction while making timely decisions to address issues and risks that could affect the success of the MCP.</p> <p>In 2016–17, assembly, integration and testing of the last of the three synthetic aperture radar (SAR) and automatic identification system (AIS) payloads were completed, and the payloads were delivered. Challenges in completing the flight software were addressed. Assembly and integration of the first satellite was completed, and its testing was well underway.</p> <p>Significant progress continued to be achieved in the manufacturing of the RCM satellites throughout 2017–18. The third satellite bus was delivered, and the remaining five ground segment subsystems were completed. Upgrades to CSA headquarters in Saint-Hubert to accommodate the RCM ground segment subsystems were also completed in 2017–18, and mission control centre was ready to receive the ground segment subsystems when delivered in the latter part of 2017–18. In addition, seven of the nine Government Furnished Equipment (GFE) ground segment subsystems had passed acceptance testing by the end of 2017-18.</p>
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	<p>In 2018–19, the assembly, integration and testing of the three satellites was completed; the satellites were transported to a location near the launch site in California for storage until the start of the launch campaign; the training of the operations personnel was completed; and in the latter part of 2018–19, the full-up rehearsals were completed in preparation for the launch of the three satellites, which was planned for the spring of 2019. The launch date was first delayed from the fall of 2018 to the winter of 2019 due to delays in the launch service provider’s launch schedule and subsequently to the spring of 2019 due to a mishap with the recovery of the Falcon 9 launch vehicle first stage that was assigned to the launch of the RCM.</p> <p>The three RCM spacecraft were successfully launched into orbit in June 2019 and the system commissioning was completed five months later in November 2019. Shortly thereafter, in December 2019, routine operations and the provision of SAR data to users commenced. The RCM Major Crown Project also includes the first year of operations, until the end of November 2020. Due to a delay related to the Polar Epsilon-2 (PE-2) implementation of the capability to order and handle classified data, which required the installation of ground segment equipment and software in the RCM Ground Segment, the end of the RCM project has been extended to July 2021, shortly after when PE-2 would reach its final operating capability.</p>
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General information

Project name	James Webb Space Telescope
Description	<p>The James Webb Space Telescope (JWST) is a joint international mission involving National Aeronautics and Space Administration (NASA), the European Space Agency (ESA) and the Canadian Space Agency (CSA). The mission concept is for a large field-aperture telescope to be located 1.5 million km from Earth. As a successor to the highly successful Hubble Space Telescope, the James Webb Space Telescope will be used by the astronomy community to observe targets ranging from objects within our solar system to the most remote galaxies which can be seen during their formation in the early universe. The science mission is centred on the quest to understand our origins:</p> <ul style="list-style-type: none"> • Observing the very first generation of stars to illuminate the dark universe when it was less than one billion years old; • Understanding the physical processes that have controlled the evolution of galaxies over cosmic time and, in particular, identifying the processes that led to the assembly of galaxies within the first four billion years after the Big Bang; • Understanding the physical processes that control the formation and early evolution of stars in our own and other nearby galaxies; and • Studying the formation and early evolution of proto-planetary disks, and characterizing the atmospheres of isolated planetary mass objects. <p>The James Webb Space Telescope is scheduled for launch in 2021. James Webb scientific instruments are designed to work primarily in the infrared range of the electromagnetic spectrum, with some capability in the visible range. The James Webb Space Telescope has a large mirror, 6.5 metres in diameter and a sun shield that will be the size of a tennis court once deployed in outer space.</p> <p>Canada is providing the Fine Guidance Sensor (FGS) and the Near-Infra-Red Imager and Slitless Spectrometer (NIRISS). The FGS is integral to the attitude control system of the James Webb Space Telescope, and consists of two fully redundant cameras that will report precise pointing information. Canadian expertise in this area was established previously with the successful fine error sensors for the former Far Ultraviolet Spectroscopic Explorer (FUSE) mission. Packaged with the FGS but functionally independent, the NIRISS</p>

	<p>covers the 0.7 to 5 micrometer spectral range. NIRISS provides a specialized capability for surveys of objects such as primeval galaxies, for the study of transiting planetary systems and for high-contrast imaging applications such as the detection of extrasolar planets.</p> <p>With Honeywell Aerospace (formerly COMDEV) as the prime contractor, the James Webb Space Telescope-FGS Major Crown Project consists of the design, development, testing and integration into the spacecraft, launching and commissioning of the FGS and NIRISS. By participating in this leading-edge international space exploration mission, the CSA is actively promoting Canadian scientific expertise and innovative, advanced space technologies.</p> <p>The National Research Council's Herzberg Astronomy and Astrophysics (NRC Herzberg) is a key Government of Canada (GoC) partner for activities related to the development of science instruments and distribution of telescope data. In return for its overall investment in the James Webb Space Telescope, Canada will obtain a minimum of 5% of the time on this unique space telescope.</p> <p>Already, the news of Canada's involvement in this international space exploration mission is inspiring youth, educators and amateur astronomers, and rallying members of Canada's world-renowned astrophysics community.</p>
<p>Project outcomes</p>	<p>The JWST project supports the CSA's Space Exploration program by expanding Canada's presence in space through space exploration missions. The performance indicator for this program is the number of space exploration missions in operation. For 2019-20, CSA's target for this indicator was 15 missions and the actual result is 16 missions. Once operational, the JWST will directly contribute to CSA's capacity to achieve this program outcome.</p> <p>More specific outcomes pertaining to the JWST project are as follows:</p> <ul style="list-style-type: none"> • Technological know-how acquired through Space Exploration endeavours. (Astronomy and planetary), • CSA's participation in space exploration missions provides access to scientific data about the Solar system and the universe. Canadian know-how and expertise allow Canada to lead or participate in international space astronomy missions. <p>Furthermore, the beneficiaries of this project include:</p> <ul style="list-style-type: none"> • Canada's Science Community: Canada's participation will advance Canada's scientific capacity to generate important new knowledge of the universe and of our solar system, while forging collaborative research with other leading scientists

	<p>working in the field. It will allow Canada to develop a new expertise in the area of astronomy and maintain Canadian scientists' world renown in the field of science. The access to data that will be granted to Canadian researchers will allow our space scientists the chance to share in discovery opportunities and to deepen our understanding of our world and our universe.</p> <ul style="list-style-type: none"> • Highly Qualified Canadians: Canadian scientists will be directly involved in the mission planning for the utilization of NIRISS and the operations of this instrument. This level of activity will enhance their international profiles through their involvement in the international JWST mission. • Next Generation of Canadians: Canada's participation in JWST will inspire young Canadians to pursue education and careers in the fields of science, math, technology, engineering and project management, thus contributing to Canada's overall science and technology capacity.
Industrial benefits	<p>The high visibility of this international mission contributes to the international competitiveness of Canadian industry and academia by demonstrating and branding a successful application of Canadian Science & Technology. The JWST project is directly contributing to the retention and attraction of Highly Qualified People (HQP) for both academia and industry in Canada. In 2019-20, the project continued to employ approximately 12 highly skilled personnel at Honeywell Aerospace (formerly COMDEV). The experience gained by these HQPs enabled Honeywell to gain expertise for possible spin-off work in the future.</p>
Sponsoring department	Canadian Space Agency (CSA)
Contracting authority	Public Services and Procurement Canada (PSPC)
Participating departments	<p>NRC Herzberg Astronomy and Astrophysics</p> <p>Innovation, Science and Economic Development (ISED)</p>
Prime contractor	—Honeywell Aerospace, Ottawa, Ontario
Major subcontractors	<p>—Teledyne, USA</p> <p>—Corning Netoptix, USA</p> <p>—IMP Aerospace Avionics, Canada</p> <p>—ABB Bomem, Canada</p>

	<ul style="list-style-type: none"> —MDA, Canada —INO, Canada —BMV, Canada —CDA Intercorp, USA —ESTL, Europe —Bach Research Corporation, USA —Materion, USA —Camcor, Canada
Project phase	Phase D—Implementation
Major milestones	<p>Phase A: Requirement Definition (2004)</p> <p>Phase B: Preliminary Design (May 2005)</p> <p>Phase C: Detailed Design (September 2008)</p> <p>Phase D: Manufacturing/Assembly, Integration/Testing, Pre-launch preparations, Launch/System Commissioning (2021)</p> <p>Phase E: 5 years Operations (part of MCP) (2022-2027)</p>
Progress report and explanation of variances	<p>In March 2004, Treasury Board gave Preliminary Project Approval at an indicative cost of \$71.7 M (including applicable taxes). This approval gave the authorization to proceed with the definition phase (preliminary design).</p> <p>In April 2005, Treasury Board gave revised Preliminary Project Approval and Expenditure authority for the entire Definition Phase at a substantive cost estimate of \$35.1 M (including applicable taxes). Before the completion of the detailed design of the FGS, CSA requested increased expenditure authority to complete the project.</p> <p>In February 2007, Treasury Board granted Effective Project Approval for a substantive total cost estimate of \$104.2 M (including applicable taxes). The project was also designated at that time as a Major Crown Project. Before the completion of the detailed design of the FGS, CSA requested increased expenditure authorities to complete the project under the Implementation Phase.</p> <p>In December 2007, Treasury Board granted revised Effective Project Approval for a substantive cost estimate of \$165.8 M (including applicable taxes) with four conditions which were met. These</p>

	<p>conditions were as follows: (1) That the CSA provide to Treasury Board Secretariat (TBS) a copy of the quarterly reviews prepared for the President of the CSA, (2) That the CSA provide to Treasury Board Secretariat with a viable plan for removal of the Tuneable filter, 30 days after the completion of the second Critical Design Review (CDR), (3) That the CSA conduct a review of the recent projects (10 years), and explore new costing approaches or risk contingency estimation methods which might better serve the CSA, within 6 months and (4) That the CSA provide to Treasury Board Secretariat with a report on approaches to ensure appropriate cost verification.</p> <p>Besides the significant launch date slippage, NASA also discovered in 2010 that the infrared detectors, extremely sensitive cameras capable of “seeing” light produced by heat, were showing signs of performance degradation due to a design issue. Following an extensive investigation, NASA concluded that all detectors, including the four procured by Canada, need to be replaced. Teledyne Scientific & Imaging LLC (Teledyne), the supplier of detectors, was subcontracted to COM DEV and Canada has been responsible for assuming the costs associated with this procurement since 2007, as per the terms of an agreement with NASA. Indeed, two years after their acceptance, the detectors started to show the same degradation during extensive testing. This type of technical issue was covered by the risk contingency granted under the 2007 authorities which had identified the risk associated with cutting-edge technology and potential design changes due to the complexity of this mission. As a result, the risk contingency fund enabled the procurement of these four new detectors without contributing to a project cost increase.</p> <p>In February 2014, the Treasury Board granted revised effective project approval at a substantive cost estimate of \$185.9M (including applicable taxes). This represented an increase of \$20.2M from the previous authorities received in 2007. In 2007, when the project obtained TB approval for the revised EPA the mission launch date was anticipated to be May 2013. Following a re-planning exercise conducted by National Aeronautics and Space Administration (NASA) to implement a JWST mission plan with a high certainty of achieving the launch date, the launch date was slipped to October 2018, extending the project life by 5.5 years. In addition to schedule adjustment by NASA, there was an associated increase in the mission’s integration and test phase, which ultimately resulted in the cost increases that could not be absorbed by the CSA project’s original contingency.</p> <p>The project is running on budget for the revised NASA JWST launch date of March 2021. Any additional slips in the NASA launch schedule</p>
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	<p>will be beyond the TB authorities received in 2014. This situation is being monitored very closely.</p> <p>The work remaining to be completed for this project is as follows:</p> <p>Although the flight instrument was delivered in 2012, the project is still in the Implementation phase where the CSA and its prime contractor must provide direct support for the integration of the FGS/NIRISS with the spacecraft element, for the launch activities and for the spacecraft commissioning activities until late 2021.</p> <p>Specifically, in 2020, the entire observatory will undergo more tests during what is called “observatory-level testing”. This testing is the last exposure to a simulated launch environment before flight and deployment testing on the whole observatory. These tests are planned to be completed in 2020, leading to launch in 2021.</p> <p>Official mission operations, with a duration of 5 years, will commence after the completion of the telescope’s commissioning, six months after its launch. The James Webb Space Telescope operations centre will be located in the Space Telescope Institute in Baltimore, Maryland, in the United States. Canadian scientists will be on location to directly support the operations of the FGS and NIRISS throughout the mission’s operations. The operations will also be supported by engineering staff in order to be able to address technical issues if and when they occur to ensure the functionality of Canada’s instruments.</p>
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