

Environment and  
Climate Change Canada

# Science Strategy 2024 to 2029

Forward-Looking Science for  
the Environmental Challenges  
of Today and the Future



Environment and  
Climate Change Canada

Environnement et  
Changement climatique Canada

Canada

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# Acknowledgements

The Environment and Climate Change Canada (ECCC) 2024–2029 Science Strategy was developed through engagement across the Department including consultation with ECCC science-policy leaders and an employee town hall event. It was drafted in collaboration with subject matter experts from across the Department as well as reviewed by other science-based departments and agencies and unions.

The development of this Strategy benefited from the support and guidance of ECCC's science governance forums, including the Assistant Deputy Minister Science Table and Directors General Science Tables, with representation from ECCC branches, including the Science and Technology Branch, Canada Water Agency, Canadian Wildlife Service, Climate Change Branch, Enforcement Branch, Environmental Protection Branch, International Affairs Branch, Meteorological Service of Canada, Public Affairs and Communications Branch, Strategic Policy Branch, and the Departmental Science Advisor. The Strategy was further improved through the support and input provided by the Audit and Evaluation Branch, Corporate Services and Finance Branch, and Human Resources Branch.

**Thank you to all who contributed.**

# Message from Our Deputy Ministers



In a rapidly changing world, our Department’s mandate—to conserve and protect the health, diversity, and vibrancy of the environment across Canada—is more important than ever. Environmental degradation and the increasing number and intensity of extreme events are making it harder for us to fulfill our mandate. We must constantly learn in order to continue offering Canadians world-class policies, programs, and services to safeguard our natural heritage and the resilience of natural systems. To fulfill these responsibilities, relevant and actionable science of the highest quality is essential.

In 2014, Environment and Climate Change Canada (ECCC) published a departmental science strategy that set the direction for our science over five years. It allowed us to better align our science with federal priorities by identifying the key scientific areas needed to support our mandate. Since that time, climate change and other pressing environmental challenges have accelerated and intensified environmental degradation, species decline, biodiversity loss, and extreme weather events. The effects of these crises on the health, well-being, and economic prosperity of people living in Canada are also increasing. More than ever, it is essential for ECCC to offer government policies, programs, and services that address today’s environmental challenges.

ECCC has now revised the 2014 science strategy to better reflect the current context. The 2024–2029 Science Strategy articulates a new vision for our science to better support the Department’s response to urgent environmental challenges. It also identifies forward-looking directions for our science. These reflect and emphasize the horizontal nature of the Department’s work and the efforts needed for continuous improvement. It also presents an opportunity to broaden and deepen collaboration with our partners on critical environmental challenges at every scale, from local to global.

This renewed Science Strategy is an important statement of support for the scientific integrity, rigour, and innovative spirit of our people who, collectively, drive ECCC’s science agenda forward. While our mandate to provide impartial, robust science has not changed, the 2024–2029 Science Strategy brings us to the next level, with an ambitious agenda for departmental science that keeps pace with the rapidly changing environmental context.

Thank you to all of our employees for your ongoing commitment to the core values for science set out here. And thank you for pursuing and applying the forward-looking science that will best serve Canadians as we work together to address unprecedented environmental challenges now, and into the future.

**Jean-François Tremblay**  
Deputy Minister

**Lawrence Hanson**  
Associate Deputy Minister

# Message from Our Assistant Deputy Minister of Science & Technology



ECCC science is about problem solving. Whether they are supporting the development of programs and services, providing baseline data, building relationships, or determining the right questions to ask from the start, our scientists are dedicated to ground-breaking work that helps protect and conserve the environment in Canada for all. This commitment to scientific excellence is essential to informed decision-making, policy development, and robust service delivery.

The 2024–2029 Science Strategy reflects the complex environmental challenges we face today, which demand a collective approach that respects diverse expertise and perspectives.

The Strategy promotes enhanced scientific collaboration and communication across the Government of Canada and beyond, including the provinces, territories, Indigenous rights holders

and communities, research institutions, and international forums, to mobilize scientific insights toward meaningful action. Whether supporting Indigenous-led conservation efforts, contributing to international environmental agreements, advancing citizen science, or undertaking cutting-edge research with partners and international collaborators, ECCC science practitioners will use this new Strategy as a guide to continue to work inclusively and collaboratively.

The Strategy builds on principles set out by Canada's Office of the Chief Science Advisor. It guides the evolution of how we practice science in our Department. It highlights the importance of bridging, braiding, and weaving Indigenous science across the entire spectrum of our science practice while also applying Gender-Based Analysis Plus to our programs and services. In addition, the Strategy aligns with our continued effort to make our scientific data and information more open, accessible, and engaging.

Strengthened horizontal governance across the Department and with our partners will be key to making the most of our scientific capacity as we bring this Strategy to life. At the same time, continuing to grow opportunities for all ECCC personnel to advance our science vision will keep us agile, relevant, and transparent.

This Strategy is about who we are and who we want to be as a science-based organization. I look forward to working together with colleagues across the Department and beyond to support the ongoing evolution of ECCC's science for the benefit of all Canadians now, and in the future.

**Marc D'Iorio**

Assistant Deputy Minister  
Science and Technology Branch

# Executive Summary

Since the establishment of Environment Canada in 1971 as the federal department responsible for preserving the environment, science has been essential to our work. ECCC's science continues to be the basis for how we lead, convene, and collaborate to understand and address increasingly complex environmental challenges and build a sustainable future. Facing interconnected environmental crises, such as climate change, biodiversity loss, environmental degradation, and extreme weather events, ECCC science provides robust, impartial evidence and advice to inform policy, programs, and services that make a difference for people and the environment in Canada. At facilities located across the country, and through domestic and international collaboration, ECCC scientists contribute to targeted solutions for regional, national, and global challenges. From engaging in long-term environmental monitoring and research, to rapidly mobilizing the best available scientific advice on pressing issues, ECCC's dedicated experts demonstrate scientific excellence.

To support the continued evolution of our science and the success of the Department in meeting its growing responsibilities, the ECCC Science Strategy 2024-29 (the Strategy) presents a new **vision for ECCC science**. It outlines the core values of our organization and focuses on our people, our science, and our governance framework and enabling infrastructure.

To guide our science, the Strategy presents **four science directions** that highlight forward-looking, inclusive, and actionable science. **Core values for science** underpin every aspect of the Strategy. These values renew ECCC's commitment to long-standing scientific and public service principles while emphasizing the evolution of how different types of knowledge are valued, how science is conducted, and how information is shared. These core values underpin continued scientific excellence at ECCC.

The **foundational supports, mechanisms, and management practices** needed to execute the Strategy are also described. These elements will enable ECCC experts to deliver on departmental priorities, with a focus on leveraging collaboration and new technologies, enhancing relationships, and making strategic investments in our workforce.

This Strategy stands apart from previous efforts. Fundamentally, it updates and refocuses our priorities for science to keep pace with the complexity of environmental challenges and highlights the emerging tools and approaches to address them. However, this Strategy is not only about the important science that ECCC does. It also emphasizes a transformation in how we perform science as a federal department while supporting our people and modernizing how we govern our science-related activities.

More than ever, strategic collaboration and partnerships at every scale are a key element of success. The Strategy reflects how collaboration will be the default for how we work as an organization—including connecting with academia, other government departments, communities, and the private sector—to mobilize expertise and innovation across Canada and globally. To help us better understand and steward the environment, it is also crucial to bridge, braid, and weave Indigenous science with Western approaches across the full scientific process. Diverse organizations have inherent

value; they are also more dynamic, creative, and productive. To that end, this Strategy makes important links between ECCC's science and broader departmental diversity, inclusion, and employment-equity initiatives to help attract and retain the best and brightest. In addition, synthesizing and mobilizing diverse forms of knowledge across disciplines, including the social and behavioural sciences, will further strengthen the impact of our policy, programs, and services.

Alongside new policies and guidance on scientific integrity and open science, the Strategy will help us strengthen how we support our experts in communicating scientific information to combat misinformation and disinformation.

In parallel with the development of the Strategy, ECCC has established the Science Advice Governance Framework, which includes dedicated forums to implement the Strategy, explore emerging and long-term issues, and strategically reposition resources. As part of this effort, we will also place greater emphasis on performance measurement and improve connections with corporate planning to support the implementation and continued relevance of the Strategy.

Working together is essential to producing science of the highest calibre. This has also applied to how we created the Strategy, which has been informed and shaped by the views of both ECCC personnel and our expert counterparts in other federal science-based departments and agencies. The implementation (and subsequent reviews) of the Strategy will require the continued collaboration of science producers, users, and enablers from across the Department and beyond as we work together to address the urgent environmental challenges of today and the future.



# Vision

ECCC: Trusted source of science and innovation to inform policy and provide services that protect people and the environment across Canada, now and into the future.

## Science Directions

### Enable

the prediction and projection of weather, extreme events, and environmental conditions in a changing climate

### Inform

climate change mitigation and adaptation for a net-zero, resilient Canada

### Guide

the conservation, restoration, and sustainable management of nature and enhance ecosystem resilience and services

### Support

protection of the environment now and into the future

## Values For Science

Collaboration

Scientific Integrity

Diversity, Inclusion, and Equity

Bridging, Braiding, and Weaving Indigenous Science

Responsiveness

Transparency

## Foundational Supports

People

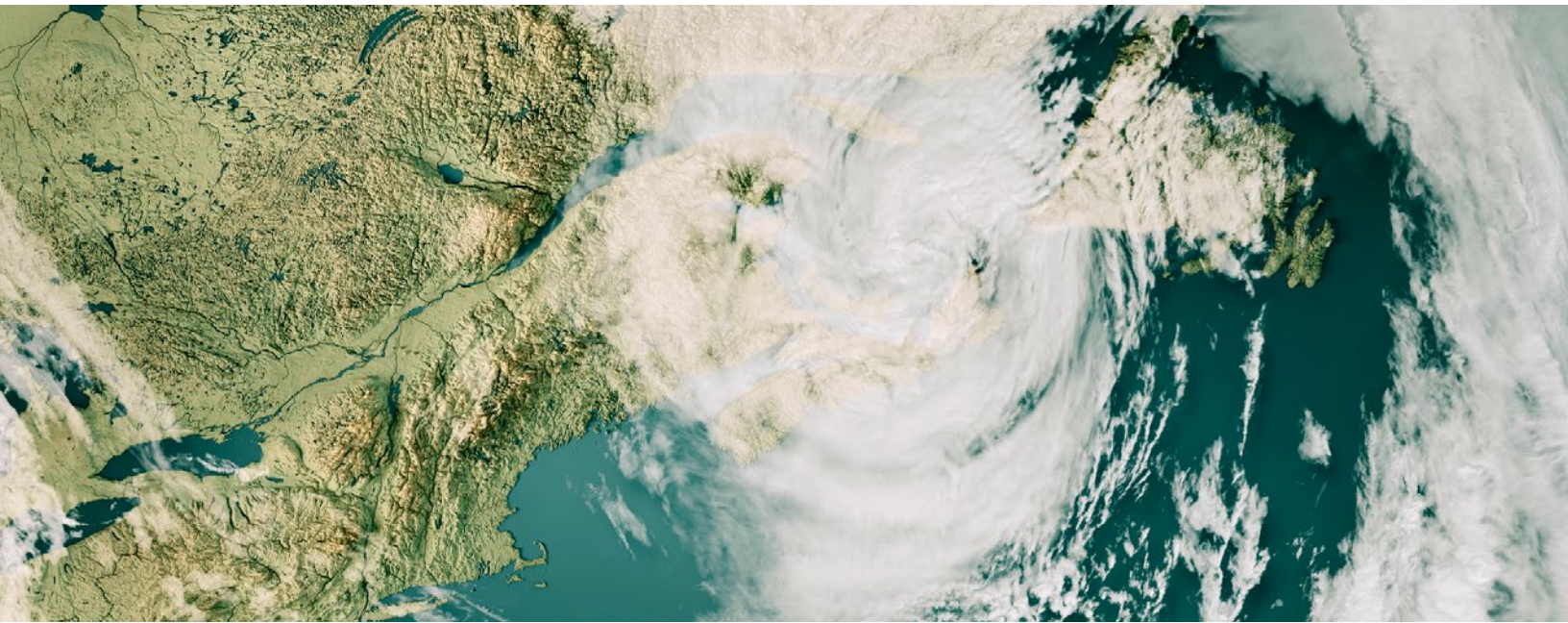
Knowledge Synthesis and Mobilization

Communication

Infrastructure

Science Advice Governance

Data



# Context for ECCC Science

ECCC is the lead federal department responsible for protecting and conserving Canada's natural heritage while striving for a clean, safe, and sustainable environment for present and future generations. Scientific insights are critical to delivering on this mandate. Experts across ECCC provide scientific data, analysis, and advice<sup>1</sup> to inform government policies and programs that directly affect people living in Canada and the choices they make.

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<sup>1</sup> Science advice refers to scientific information, and the processes and institutions by which this information is provided, to inform decision-making (see [Appendix A: Glossary of Terms](#)).

The **complex intersections of climate change with other pressing environmental challenges** are accelerating and intensifying environmental degradation, species decline, biodiversity loss, and extreme weather events. The effects these interconnected crises are having on the health, well-being, and economic prosperity of people living in Canada are also increasing. This places an ever-growing importance on ECCC science to inform government policy, programs, and services that address the causes of climate change while anticipating and responding to its widespread effects. Because these effects vary across Canada, it is important to take collaborative and inclusive approaches to science that respond to both common and unique challenges. For example, ECCC has a crucial role in responding to the rapid warming of the Arctic and other northern regions in partnership with northern communities, other government departments and agencies, and domestic and international experts.

The evidence of ECCC's world-class science is all around us. It has provided the groundwork for Canada's **evolving environmental legislative landscape**, which includes many acts that ECCC administers and enforces.<sup>2</sup> Legislation such as the modernized *Canadian Environmental Protection Act, 1999* provides opportunities for ECCC science to contribute to a healthier, more sustainable, and more just future.

**Many new and evolving domestic environmental protection and sustainability initiatives** rely on ECCC scientific activities. These include key initiatives such as Canada's plans to mitigate and adapt to climate change, the Freshwater Action Plan, and the creation of the Canada Water Agency, comprehensive approaches to pollution prevention and management (such as reducing plastic waste), and the Enhanced Nature Legacy for Canada initiative. These and many other initiatives aimed at addressing complex environmental challenges in Canada will require enhanced horizontal collaboration to access and leverage the best available science.

ECCC science is also recognized globally and supports Canada in a growing number of **international agreements and collaborations**. For example, Canada's implementation of the United Nations 2030 Agenda for Sustainable Development involves multiple commitments that will draw on ECCC scientific expertise in areas such as affordable and clean energy, sustainable cities and communities, responsible consumption and production, climate action, and the conservation of life below water and on land. In 2022, Canada played a key role in establishing the Kunming-Montreal Global Biodiversity Framework to safeguard nature and halt and reverse biodiversity loss. This includes a commitment to conserve 30% of the country's lands and oceans by 2030 through a renewed National Biodiversity Strategy. ECCC science informs how these ambitious but achievable conservation targets are determined and how they will be met in Canada.

To strengthen the management of chemicals in Canada and beyond, ECCC engages in extensive scientific work at the Organisation for Economic Co-operation and Development (OECD) and the United Nations Environment Programme. Alongside representatives from national Indigenous organizations and expert collaborators from diverse sectors, ECCC's climate change science and research activities will continue to support Canada's active participation in the Intergovernmental Panel on Climate Change. For example, ECCC science and research contributed significantly to the body of data and knowledge that informs the Panel's sixth assessment report. Canada has joined over 120 countries to commit to net-zero greenhouse gas emissions by 2050 and has set progressive five-year reduction targets to achieve that objective. Canada has also advocated for concerted international action to address plastics pollution. To achieve these ambitious goals, ECCC science is vital to monitor and quantify emissions and pollution and to better understand their sources, pathways, and fate.

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<sup>2</sup> See overview in [Appendix B](#).

**Advancements in how science is conducted, managed, and communicated** are also continuing to happen within the Department. The ECCC Departmental Science Advisor (DSA) participates in Canada's Office of the Chief Science Advisor DSA Network, contributing to a government-wide culture of science. Since its last science strategy, ECCC has adopted the Policy on Scientific Integrity and the *Open Science Action Plan* to guide values for science and support public trust in federal science to counter misinformation and disinformation. The Indigenous Science Division has been created to support the **bridging, braiding, and weaving<sup>3</sup> of Indigenous science** with existing ECCC science expertise and to promote research relationships founded on respect for the rights of Indigenous Peoples in Canada. A new **Science Advice Governance Framework** will promote evidence-informed decision-making, collaboration across disciplines, and knowledge synthesis. ECCC has strengthened research and data security and culture and established the Office of the Chief Data Officer to foster a data-driven culture. ECCC has also introduced **behavioural science** to its work, through the Program of Applied Research on Climate Action, in partnership with the Privy Council Office and Natural Resources Canada. A detailed picture of the state of the environment in Canada, informed by ECCC science, is now being publicly communicated through the Canadian Environmental Sustainability Indicators. ECCC scientists and policy-makers continue to explore emerging ethical issues in science, such as alternatives to the use of animals in research, and opportunities and challenges related to the use of artificial intelligence.

The continued excellence of ECCC science is closely linked to **current and emerging technologies**. Over the past decade, ECCC has leveraged technological advancements, such as high-performance computing, improved modelling capabilities, and genomics<sup>4</sup> tools to contribute to environmental protection, community resilience, and sustainable prosperity in new and innovative ways. ECCC scientists have also helped refine these tools through exploratory research and practical application. Emerging technological innovations, such as cloud computing, artificial intelligence, and satellite Earth observation provide further opportunities for ECCC to deliver on the Department's mandate. These advancements are not only scientific tools, they are also fundamentally changing how government operates, collaborates, and communicates. It is therefore crucial for ECCC to keep pace with and responsibly leverage emerging technologies and their applications.

In this changing context, ECCC has added a new lens to its previous science strategy to reflect the interconnectivity of the environmental challenges we face, and the innovative and inclusive collaboration needed to find and implement solutions. While ECCC's mandate to provide impartial, robust science has not changed, the 2024–2029 Science Strategy brings us to the next level with an ambitious agenda for our Department's science today, and into the future.

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<sup>3</sup> Bridging, braiding, and weaving of Indigenous science with Western science refers to jointly determining science priorities, generating hypotheses, developing policy, and communicating and mobilizing data and knowledge (see [Appendix A](#)).

<sup>4</sup> The study of the structure and function of genes.

# 2



## Our People, Our Values

Every day, teams of dedicated ECCC professionals across Canada lead, convene and collaborate to advance, apply, and share scientific knowledge. Their diversity of expertise and experience strengthens the impact of our science. Their commitment to values and ethics underpins public trust in federal science. ECCC researchers, science advisors, technical and operational teams, enforcement officers, policy and program staff, and corporate personnel all contribute to the excellence of our scientific endeavours.

## ECCC Science Across Canada

ECCC scientific experts and research facilities are located from coast to coast to coast. These experts pursue science to better understand, protect, and conserve the diverse and changing environments found across Canada. Our scientists contribute to targeted solutions for local and regional challenges and develop national approaches to environmental and climate change actions.

ECCC professionals collaborate with a wide network of experts to address interconnected environmental challenges such as climate change, environmental degradation, species decline and biodiversity loss, and extreme weather events. For example, we collaborate with specialized experts from Canadian universities and communities across the country to improve our understanding of regional needs. And, by working with international partners, ECCC scientists are better equipped to address environmental issues that span regions and national boundaries.

In all our work it is essential that we respect the diversity of First Nations, Inuit, and Métis Peoples across Canada. We will continue working to bridge, braid, and weave ECCC science efforts with Indigenous science, and to value place-based knowledge to inform both ECCC and government-wide policies, programs, regulations, and services that are culturally and regionally relevant.



## 2.1 Scientific Excellence Upheld by Core Values

To anticipate and respond to pressing environmental challenges, government decision-makers and the public should have access to the best scientific data, information, and advice. For ECCC, achieving scientific excellence includes meeting this need. It involves a commitment to the highest standards of scientific integrity and being inclusive and transparent in our approach to science, and in delivering scientific information. Scientific excellence involves continually improving by integrating new information from a broad range of partners and sources and reflecting critically on processes and outcomes. By applying the following **core values for science**, ECCC staff uphold scientific excellence and contribute to the advancement of knowledge.

### Scientific Integrity

Scientific integrity is a cornerstone of ECCC's evidence-informed decision-making and the Department's reputation as a trusted and reliable source of scientific information. ECCC staff uphold the Departmental Policy on Scientific Integrity by applying principles of transparency, openness, and high-quality work; avoiding and managing conflicts of interest; maintaining high standards of impartiality and non-partisanship; and staying current with evolving research ethics.

ECCC aims to foster an organizational culture that supports and promotes scientific integrity across our work. This includes emphasizing the significant and meaningful contributions of science and research to government programs, policies, regulations, and decision-making.

### Responsiveness

ECCC's science activities should be aligned with the Department's mandate and relevant to the current and future needs of all people in Canada. Timely access to clear scientific data and advice enables decision-makers and the public to respond and adapt to current and emerging issues. ECCC is committed to providing early warnings of the potential threats and challenges facing people and the environment in Canada, and the early identification of opportunities such as from advancements in scientific knowledge and innovative technologies. By maintaining core expertise and capacity and pursuing strategic collaborations, the Department anticipates, identifies, responds, communicates, and adapts to new and evolving environmental realities and priorities in a timely manner.

### Collaboration

The scale of current environmental challenges requires inclusive collaborative efforts across disciplines and at multiple scales. As a science-based department, ECCC has the capability to coordinate and convene research communities to advance scientific inquiry as well as help give policy-makers access to evidence to support decision-making. ECCC actively engages with a diverse range of domestic and international research partners and data community members, including science-based departments and agencies and academic institutions, to emphasize collaboration and knowledge sharing across generations, disciplines, sectors, and regions. Playing a leadership role on the global stage provides opportunities for ECCC to contribute directly to international scientific advancements and efforts to address global environmental challenges as well as benefit from data and knowledge produced around the world.

Collaboration supports the continual improvement of programs and services as well as the value of public investments in shared infrastructure and technology. It also helps the Department attract and retain expertise. Partnerships that include different scientific areas, such as natural, social, and behavioural sciences; Indigenous science; and citizen science,<sup>5</sup> facilitate scientific progress and the production of diverse forms of data and knowledge. Connecting with leading-edge researchers and institutions strengthens federal science to address shared responsibilities, facilitates the mobilization of ECCC's data, and strengthens public trust in ECCC science, garnering greater support for action to protect and conserve the environment.

## Bridging, Braiding, and Weaving Indigenous Science

Bridging, braiding, and weaving Indigenous science and Indigenous leadership to the entire spectrum of science practice is essential to support Canada's commitments to renew nation-to-nation relationships and reconciliation with Indigenous Peoples. This includes co-determining science priorities, generating hypotheses, developing and implementing policy, and mobilizing and communicating data and knowledge.

Building Indigenous science capacity and strengthening equity across knowledge systems involves ongoing support for Indigenous science leadership and networks. It also includes aligning science planning with that of Indigenous governments, organizations, and communities, such as the *National Inuit Climate Change Strategy*; supporting the creation of science and knowledge materials that help revitalize Indigenous culture and languages; and valuing Indigenous place-based science and knowledge. ECCC is committed to making space for and supporting Indigenous leadership and innovation in science within and beyond the Department through knowledge mobilization, exchange, and transfer, and through respectful and reciprocal partnerships. Building Indigenous science capacity within ECCC continues to be a priority of the Indigenous Science Division. This approach aligns with federal policy and guidance aimed at renewing respectful nation-to-nation relationships, such as Canada's adoption of the *United Nations Declaration on the Rights of Indigenous Peoples Act*, *Principles Respecting the Government of Canada's Relationship with Indigenous Peoples*, and ECCC's *Practical Guide to Indigenous Consultation and Engagement*.

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<sup>5</sup> Citizen science refers to scientific activities that engage both professional scientists and everyday people.



## Indigenous Science Partnerships

Indigenous science is a **distinct, time-tested, and methodological knowledge system** that can enhance and complement Western science. It is the knowledge of survival since time immemorial and includes **multiple systems of knowledge, such as the knowledge of plants, water, the weather, and bird and animal behaviour and patterns**. Indigenous science is crucial to guiding and informing the most effective methods to build the relationships that bridge, braid, and weave Indigenous and Western science and knowledge systems. This will help inform and enhance decision-making in areas ranging from land management and stewardship methods and practices to meeting Canada's ambitious climate targets to protect people living in Canada and their communities.

Initiatives to apply an Indigenous lens to ECCC science, policy, and program activities are underway. For example, ECCC's **Indigenous Guardians** fund provides support for Indigenous-led stewardship of traditional lands, waters, and ice to benefit Indigenous Peoples, cultures, and the environment.

Currently, the Indigenous Science Division is participating in research with the Wei Wai Kum Kwiakah community on clam gardens. Clam gardens are an ancient Indigenous stewardship practice within intertidal beaches to enhance the productivity of clams and other shellfish or to create new habitat. This collaborative project will provide insights on food security and biodiversity conservation, while also touching on climate change adaptation. It is an example of how Indigenous science can be woven with Western science while respecting the rights and sovereignty of Indigenous Nations.



## Diversity, Inclusion, and Equity

An inclusive, respectful, and healthy work environment that is culturally and psychologically safe can empower all employees to participate fully and achieve science excellence. ECCC is proud of its diverse and inclusive workforce, but also recognizes the underrepresentation of equity groups in certain fields, such as science, technology, engineering, and mathematics (STEM). The Department seeks to both address the representational gaps reflected in available data and honour employee experiences to inform organizational change.

As a science organization, it is important for ECCC to actively seek out and incorporate different viewpoints to reflect the rich diversity of people in Canada. Applying Gender-Based Analysis Plus to scientific activities (including planning, inquiry, advice, and communication efforts) can inform how science and research are conducted. It also enhances ECCC capacity to address environmental challenges and attract and retain a diverse and engaged scientific workforce.

## Transparency

The impact of ECCC's science efforts is strengthened when scientific information and advice, along with associated uncertainties, can be easily accessed by decision-makers and the public.

Transparency in how science is used in decision-making influences the credibility and use of departmental science. Aligned with a government-wide effort, ECCC is advancing a phased approach toward making federal science open and accessible through the Department's *Open Science Action Plan*.

ECCC also supports the public good by delivering accessible and usable products and services that mobilize and communicate expert-driven and impartial science in plain language.

# 3



## Our Focus, Our Science Directions

In its effort toward a clean, safe, and sustainable environment for current and future generations, ECCC is committed to leading a collaborative whole-of-government and whole-of-society approach to protect and conserve Canada's natural heritage. This task is especially critical in a changing climate, where science plays an essential role in informing actions on climate change, biodiversity loss, and environmental sustainability. By addressing knowledge gaps, fostering scientific innovation, and promoting sustainable practices through diverse partnerships and impactful science communications, ECCC strives to maximize the impact of our science, paving the way for a greener, more resilient future.

## 3.1 Our Science Vision

ECCC: Trusted source of science and innovation to inform policy and provide services that protect people and the environment across Canada, now and into the future.

## 3.2 Our Mandate-Driven Science Directions

This Science Strategy presents four main science directions that the Department will pursue to respond to evolving and pressing national and international environmental issues. These science directions are aligned with the Department's core responsibilities and will guide ECCC's scientific endeavours over the next five years and beyond:

1. Enable the prediction and projection of weather, extreme events, and environmental conditions in a changing climate.
2. Inform climate change mitigation and adaptation for a net-zero, resilient Canada.
3. Guide the conservation, restoration, and sustainable management of nature and enhance ecosystem resilience and services.
4. Support protection of the environment now and into the future.

The Science Strategy will strengthen the Department's ability to respond to key challenges and emerging issues, allowing ECCC science to remain at the forefront of solutions to the environmental challenges of the future.



## Enable the Prediction and Projection of Weather, Extreme Events, and Environmental Conditions in a Changing Climate

High-impact weather-related events such as flooding, heat waves, wildfires, tornadoes, and poor air quality can lead to disastrous consequences. Such events are expected to intensify and increase in frequency.

ECCC is the sole federal organization in the country with the responsibility and capacity to predict and provide warnings of weather and environmental risks. The Department also develops longer-term projections of a changing climate and its implications. This information is critical for emergency management planning and response. It also informs day-to-day decisions made by people living across Canada.

The following focus areas are aimed at improving ECCC weather and environmental products and services in the coming years.

**a. Apply integrated and multi-scale approaches:**

- Advance science to support the monitoring, modelling, and predicting of Earth systems, weather, air and water quality, and long-term climate trends across time, space, and environmental domains.

**b. Address forecasting challenges in the Canadian context:**

- Advance science to support the production of improved risk-based services, such as localized forecasts.
- Incorporate social and behavioural sciences to understand how diverse groups of people living in Canada access and use information so that ECCC products and services continue to be accessible and relevant.

**c. Enhance data and information and leverage technological advances:**

- Develop modelling systems to support longer-term forecasting and prediction.
- Modernize analytical tools and infrastructure to support enhanced access to and integration of new datasets, including respectful inclusion of Indigenous science data, to inform assessment of risk and vulnerabilities and to better communicate weather and environmental conditions.
- Inform the current and potential use of innovative and fast-emerging technologies (such as artificial intelligence, machine-learning science, and cutting-edge Earth observation missions) to support continual improvement of numerical weather and environmental prediction and the evolution of integrated environmental monitoring.

**d. Advance research in a changing Arctic:**

- Apply surface observations, enhanced satellite data, and evolving models (numerical weather prediction, Earth systems models) to understand, predict, and project ongoing and future climate change in the Arctic, including extreme events and impacts on ecological, hydrological, and cryospheric<sup>6</sup> systems.
- Partner with northern communities to better understand the effects of a rapidly changing Arctic, including by viewing these effects using an Indigenous science lens.

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<sup>6</sup> The cryosphere refers to snow, glaciers, and permafrost, and river, lake, and sea ice.



## Inform Climate Change Mitigation and Adaptation for a Net-Zero, Resilient Canada

Ambitious and urgent action is needed to limit further climate warming and increase environmental and community resilience. ECCC has a key role to play in continuing to advance climate change science to meet the targets outlined in Canada's Emissions Reduction Plans and National Adaptation Strategy and address national climate priorities identified in the 2020 and forthcoming<sup>7</sup> *Climate Science 2050* reports.

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<sup>7</sup> *Climate Science 2050: National Priorities for Climate Change Science and Knowledge Report* will be published in 2024.

Science must also inform risk-based decision-making to identify and respond strategically to the effects of climate change. Over the coming years, research, monitoring, modelling, analysis, and knowledge mobilization will be essential in the following areas.

**a. Improve quantitative measuring and monitoring of greenhouse gases to achieve net-zero:**

- Improve the quantification and modelling of greenhouse gases to better estimate, project, and report on emissions and their removal from the atmosphere, and any trends in the carbon cycle.
- Develop alternate methodologies and evolve existing methodologies to improve emission inventories and projections.
- Advance a coordinated approach to access observations of greenhouse gases.

**b. Advance net-zero pathway science:**

- Conduct research to identify, assess, communicate, and help realize net-zero emissions by 2050. Consider a variety of the interrelated social, economic, technological, and environmental factors that may affect the success of potential pathways to net zero.
- Analyze the trends, risks, and role of various measures for achieving net-zero emissions (e.g., efficiency measures; behavioural change; electrification; renewable fuels; hydrogen and hydrogen-based fuels; bioenergy; Clean Growth<sup>8</sup> projects; carbon capture, utilization, and storage projects; among other initiatives).
- Improve the understanding of the impacts of nature-based carbon sources and sinks.<sup>9</sup>
- Integrate behavioural science research to inform effective program design, outreach, and public engagement on climate action.

**c. Improve the understanding of the implications of climate change on biodiversity in terrestrial and aquatic ecosystems:**

- Inform the development of climate actions and strategies, including the capacity of nature-based solutions to contribute to climate mitigation and adaptation and provide co-benefits.

**d. Improve the understanding of climate-altering technologies in the Canadian context:**

- Understand the potential for climate engineering and determine the implications of technologies that aim to deliberately alter the climate system, typically to counteract climate warming (e.g., solar radiation modification, marine geoengineering, carbon dioxide removal techniques).
- Conduct scientific assessments of climate-altering technologies and impacts on Canada.

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<sup>8</sup> This refers to efforts to improve the responsible use of natural resources, greatly reduce or eliminate negative ecological impact, and provide superior performance at lower cost.

<sup>9</sup> A carbon sink is a process, activity, or mechanism that removes carbon dioxide from the atmosphere.





## Guide the Conservation, Restoration, and Sustainable Management of Nature and Enhance Ecosystem Resilience and Services

The widespread and increasingly rapid loss of biodiversity threatens ecosystem functions and services essential to life on Earth. As the lead department responsible for biodiversity and ecosystem science and conservation,<sup>10</sup> ECCC activities will focus on improving outcomes for biodiversity in support of Canada's commitments to meet the targets of the Kunming-Montreal Global Biodiversity Framework under the Convention on Biological Diversity.

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<sup>10</sup> This includes both marine and terrestrial ecosystems.

Successful progress in the following priority areas includes meaningful collaboration with Indigenous Peoples and must draw from the insights of bridging, braiding, and weaving of Indigenous science with Western science.

**a. Strengthen understanding of wildlife and their habitats:**

- Maintain and improve the collection and integration of data and information to assess status and trends and characterize vulnerabilities of ecosystems.
- Leverage analytical and monitoring tools, such as the automated detection of wildlife, Earth observation initiatives, and citizen science, to address key knowledge gaps.
- Improve data sharing and accessibility by implementing open-science initiatives that support conservation.

**b. Enhance the ability to assess and predict threats to biodiversity:**

- Advance new research methods, such as genomics and quantitative techniques, to better understand the causes of changes in biodiversity and to predict cumulative effects of multiple threats.
- Enable a flexible response to changing ecological relationships and uncertainties associated with climate change and human activities.

**c. Advance solution-oriented research and mobilize science into conservation action:**

- Support the identification, prioritization, and evaluation of conservation actions.
- Advance science on tools such as nature-based solutions to address the challenges of biodiversity loss and climate change.
- Enhance approaches to support impact assessment and emergency management.
- Collaborate with partners to identify best practices for addressing threats to biodiversity using cross-sectoral and cross-disciplinary approaches such as One Health<sup>11</sup> and Gender-Based Analysis Plus.

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<sup>11</sup> The term One Health recognizes the interconnections between people, animals, plants, and their shared environment and the need for a multidisciplinary and collaborative approach to address shared health threats.



## Support Protection of the Environment Now and into the Future

Science underpins the identification and understanding of evolving risks and environmental impacts. It also informs response and risk management measures. Ongoing initiatives to prevent and manage pollution will continue to evolve with new or updated legislative, policy, and regulatory responsibilities. These changes will inform our science priorities. They will also drive the creation and use of new tools to assess and manage risks and measure the effectiveness of risk management measures.

To advance environmental protections, our science efforts will focus on the following areas.

**a. Science to prevent, manage, reduce, or eliminate harmful impacts of pollution in the environment:**

- Provide the science foundation to understand, prevent and address exposure to pollution in Canada, including areas where the greatest or disproportionate impacts to populations and environments are anticipated, including from high-hazard substances.
- Monitor air and water pollution in Canada including pollutants that impact Canada's North.
- Advance science to support emissions testing in the transportation sector, waste management, and pollution prevention.
- Generate experimental data and information to enhance understanding of the transport, fate, and behaviour of pollutants in the environment, in support of decision-making.
- Conduct scientific research to strengthen the understanding of the impacts of plastic pollution in the environment and inform the management of plastics. Provide timely science advice on these topics to support policy development, regulation, enforcement efforts and international engagement.

**b. Modernize how risks are assessed:**

- Investigate issues of concern that have been identified by critical and integrated science.
- Leverage new approaches and strategies to bring together information from diverse fields of study.
- Develop and adopt new technologies such as bioinformatics,<sup>12</sup> artificial intelligence, and data-analysis automation.
- Implement comprehensive environmental monitoring across ecosystems.
- Enable the evolving understanding of substances, pathogens, plastics, and mixtures in terms of their sources, pathways, fate, degradation, and real-life effects (including disproportionate impacts on populations and environments).
- Improve the communication of science to decision-makers.

**c. Science to underpin impact assessments:**

- Develop, refine, and enhance tools to support the assessment and understanding of the cumulative effects on the biophysical environment. As part of the impact assessment process, improve the general requirements and approach for assessing cumulative effects on the environment, biodiversity, human health, and communities resulting from past, present, and future human activities. Support the identification of mitigation measures.
- Increase transparency on how cumulative effects assessments inform decisions.
- Increase the accessibility of federal science to support cumulative effects assessments.

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<sup>12</sup> The use of computational tools to capture and analyze biological data.

**d. Enhance engagement and participation in science-based efforts to support environmental protections:**

- Expand the availability of plain-language tools aimed at managing environmental emergencies.
- Co-develop emergency plans and improve early notifications, such as visualizations of available pollution data in communities.
- Increase the understanding of cumulative effects, pollution hotspot locations, and impacts on environmental health to support better warning systems and information for the public.
- Normalize co-development and partnership in science priority setting, programming, and decision-making regarding environmental protections across Canada including with Indigenous rights holders, communities, environmental organizations, academia, and the public.

**e. Science to support managing water for the common good:**

- Monitor and analyze water quantity, water quality, and the health of aquatic ecosystems to advance integrated modelling to share knowledge and provide Canadians with data and information.
- Advance ECCC capacity to predict the function, vulnerability, and resilience, including biodiversity impacts, on a range of environmental drivers and pressures in future climate scenarios to inform both freshwater availability for key Canadian watersheds and science-based nutrient reduction targets.
- Conduct collaborative science of national and international significance, such as toxic and nuisance algae in aquatic systems and impacts of land-use management practices in relation to agricultural, urban, and mining activities.
- Identify and assess contaminants and their sources that threaten aquatic ecosystems such as plastics, metals, nanometals (tiny metal particles), and chemical mixtures, due to, for example, land use and climate change pressures.
- Develop new and innovative methodologies and protocols to continue providing authoritative and reliable measurements of contaminants and mixtures to strengthen environmental emergency preparedness.
- Broaden ECCC freshwater science to be inclusive of diverse knowledge systems and support the Canada Water Agency.

The science directions described above represent priority issues that the Department anticipates will drive its work over the coming years. Specific activities may be refined as ECCC science and research needs evolve.

Implementing the Strategy's vision and directions will affect the way ECCC plans, manages, and communicates its science. Enhancing collaborative relationships and partnerships both within and outside ECCC will strengthen these linkages, while applying core values for science will shape the way key science directions are put into practice.

# 4



## Foundational Supports For Science Excellence

The success of the Department's science efforts requires a range of sustained supports, mechanisms, and management practices. Reinforcing horizontal alignment with existing corporate governance structures and business plans and developing and adopting new plans to complement the Strategy, will support a comprehensive approach to science management and enablement at ECCC.

## 4.1 Foundational Focus Areas

The following **interconnected areas of focus** support ECCC science and will contribute to the implementation of the Strategy.

**Governance:** The Science Advice Governance Framework (SAGF) within ECCC was established to leverage the essential collaboration across branches and to strengthen the role, relevance, and impact of ECCC science in decision-making and delivering departmental responsibilities. The SAGF features science tables aimed at identifying science priorities across program areas, mobilizing science efforts, facilitating the work of expert bodies working to address emerging and cross-cutting issues, considering science advice, and addressing gaps in knowledge. The SAGF also emphasizes the bridging, braiding, and weaving of Indigenous science with Western science and the integration of the social and behavioural sciences. Having a transparent and structured approach to science advice helps to strengthen the Department's ability to address science-based issues effectively and increase public confidence in decision-making at ECCC.

In addition, within the Science and Technology Branch, a renewed Science Council made up of science practitioners will serve as an advisory body to senior management on science and research priorities. The Council will provide opportunities for branch personnel to provide science leadership and enhance collaboration.

The Department's DSA is further engaged in a network of federal science advisors to enhance collaborative multi-departmental initiatives, promote best practices and relevant evidence across mandates, and support the coordination of advice streams across government.

All of these new science-governance mechanisms support key elements of the ECCC Policy on Scientific Integrity regarding incorporating scientific evidence into decision-making, engaging employees in science program development and evaluation, and identifying science needs and gaps. They also complement existing collaborations with other federal departments and agencies and provincial, territorial, and Indigenous governments.<sup>13</sup>

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<sup>13</sup> For example, ECCC partners with domestic and international governments on response environmental emergencies through the [National Environmental Emergencies Centre](#); Canada, Alberta, and Indigenous governments are working together on [oils sands environmental monitoring](#).

## Productive Relationships with Canadian Research Institutions

Collaborating with researchers at Canadian universities and providing them with targeted support fosters fruitful science partnerships that leverage the respective strengths of the federal government and public research institutions. ECCC scientists maintain connections with Canadian universities through collaborative research, adjunct professorships, shared labs and infrastructure, and joint science communications.

Every year, ECCC produces hundreds of peer-reviewed science publications. About two-thirds of these publications are open-access and most include at least one collaborator from a Canadian university or other external research partner. These collaborations support Canada and our contributions to global environmental and climate change efforts on the international stage, such as the Intergovernmental Panel on Climate Change and United Nations Environment Programme.

Enhanced research collaborations, expert interchange, infrastructure sharing, and student hiring further help ECCC to develop high-quality personnel and build the national science capacity needed to meet challenges and leverage emerging scientific and technological innovations.





**People:** ECCC aims to be a renowned leader in environmental science that inspires and attracts the best and brightest, as both future employees and prospective collaborators, to enhance the impact of ECCC science internationally. In a competitive context, future science priorities will influence talent recruitment, retention, and career development across all science classifications, including the social and behavioural sciences. Evolving departmental science capacity means supporting underrepresented groups and valuing their perspectives to achieve a diverse vision of scientific excellence. This will involve continued change in hiring and career advancement practices, such as supporting accessible services and opportunities, encouraging culturally responsive mentorship, providing more leadership opportunities, and expanding measures of science excellence.

**Infrastructure:** Strategic investment in science and research infrastructure is essential to progress. Such investment is needed to leverage scientific data and information, build domestic science capacity, and foster collaboration. Federal departments have a unique responsibility to maintain long-term infrastructure that supports the delivery of critical services. This role is particularly pressing in northern and remote regions that can place heavy demands on essential science infrastructure. Internal and external partnerships, such as with Canadian universities, can also facilitate the coordinated procurement and management of high-performance computational resources, information technology infrastructure, innovative monitoring and observational tools, and modernized labs.

Integrated real property portfolio planning will be leveraged to optimize the use of shared horizontal science infrastructure such as labs, monitoring equipment, and fieldwork stations. The Office of the Chief Data Officer supports departmental investment in data storage, architecture, and security infrastructure. Strategic partnerships with other government departments, academic institutions, and external research organizations provide innovative and collaborative facilities to pursue leading-edge scientific research, effectively pool resources and capacity, improve access and management of data, enable security integration, and increase domestic talent in growing scientific fields. For example, ECCC participation in Laboratories Canada hubs like the Atlantic Science Enterprise Centre facilitates collaboration among federal and external partners.

**Data:** ECCC is embracing the Government of Canada's data strategy, which calls for easy-to-use, accessible, timely, secure, interoperable, and reliable open data, information, and science. The Department continues to implement a digital modernization roadmap that introduces new digital tools and platforms to transform data management, including data collection, storage, analysis, and sharing. This will strengthen collaborative partnerships with other federal departments, academia, science institutions and beyond, and enable the mobilization of ECCC science for decision-making. Further supports to integrate data from different sources and understand the effects of ECCC programs on diverse groups of people are also needed to inform decision-making. The renewal of the ECCC Data and Analytics Strategy and the development of a Scientific and Regulatory Data Strategy further align the Department's data management practices with advances in governance, analytics, big data, artificial intelligence, and machine learning.

Through the ECCC *Open Science Action Plan*, the Department is also moving toward making data more FAIR (findable, accessible, interoperable, reusable). The OCAP principles (ownership, control, access, and possession) for First Nations data sovereignty, the CARE principles (collective benefit, authority to control, responsibility, and ethics) for Indigenous data governance, and federal legislation regarding Indigenous data sovereignty further inform how ECCC collects, uses, and manages data.

## Satellite Earth Observation

Remote-sensing technologies on board Earth-orbiting satellites are used to gather information about our planet's land, hydrosphere (oceans, rivers, lakes), cryosphere (snow, ice, permafrost), and atmosphere. Canada's flagship satellite missions include the RADARSAT Constellation Mission and SCISAT. Canada is also contributing to the recently launched Surface Water Ocean Topography Mission, which is a collaboration between NASA and the French space agency, CNES.

ECCC is the largest federal user of satellite Earth observation (SEO) data, which underpins the Department's operational services, science, and innovation to understand a changing world.

Two new satellites are under development, the WildFireSat Mission and HAWC (High-Altitude Aerosols, Water Vapour and Clouds) Mission. The Canadian component of HAWC, which received funding in 2022, consists of three innovative Canadian instruments and a Canadian satellite that will be part of the international NASA-led Atmosphere Observing System.

RADARSAT+, the successor to the RADARSAT Constellation Mission, received funding in 2023 to ensure the continued gathering of essential SEO data. Other initiatives that are at the concept or planning phases include the Arctic Observing Mission, the Terrestrial Snow Mass Mission, and WaterSat. ECCC participates in these missions to enable our scientists to better advise how to address challenges such as air quality, climate change, and pressures on freshwater resources and ecosystems, particularly in remote northern regions, which are warming much faster than the global average.

To help keep people living in Canada informed and safe, ECCC contributes to various SEO missions through partnerships with domestic organizations such as the Canadian Space Agency and Natural Resources Canada, and with other countries, industry, and academic institutions. Additionally, as a member of the Committee on Earth Observation Satellites, Canada participates in and promotes the sharing of open data, scientific knowledge, and capacity building.



**Communication:** ECCC plays an important role in providing access to credible, transparent, and clearly communicated scientific information and data services. The scientific evidence that informs Government of Canada decision-making and policy development should be as transparent as possible. Clear and transparent communications can help dispel misinformation and maintain public trust in science. Beyond making raw data available, ECCC strives to communicate its science to diverse audiences in plain language. It also engages in science communication planning that involves sustained collaboration between science producers, managers, and communications teams, and engages with science users.

Other Department communications activities include supporting ECCC science practitioners by developing tools that enable engaging science communications, such as opportunities for the public to connect with the science experts themselves, providing communications and engagement training, supporting information management and technology, recognizing science communications achievements, and ensuring that robust information security processes support the safe delivery of credible data and information to partners and the public.

**Knowledge synthesis and mobilization:** Gathering and producing new data and information to fill knowledge gaps, develop recommendations, and inform decision-making is essential. Relevant data and knowledge may exist but might be inaccessible or siloed. ECCC actively engages in and supports the coordinated synthesis and mobilization of relevant and actionable research from across disciplines and sectors. ECCC-led knowledge-synthesis efforts, such as *Canada's Changing Climate Report* (2019 and forthcoming in 2025), provide a clear summary for policy-makers, decision-makers, and the public.

ECCC also engaged more than 500 climate program leaders and scientific experts across government, academic institutions, Indigenous organizations, and other groups to develop *Climate Science 2050: National Priorities for Climate Change Science and Knowledge*. This “what we heard” report, which will be published in 2024, identifies the most important scientific research and data needs nationally to better evaluate climate change and plan for its impacts in Canada.

Moving forward, ECCC's science will continue to draw on data and information from across disciplines and forms of knowledge to fulfill ECCC responsibilities, including achieving net zero and supporting adaptation to a changing climate, protecting and conserving biodiversity, contributing to environmental justice efforts, and supporting the right to a healthy environment, as provided under amendments to the *Canadian Environmental Protection Act*. The integration of social and behavioural sciences with ECCC's existing natural science capacity can enhance and deliver targeted science, foster knowledge synthesis and mobilization, and improve communication. This integration positions ECCC to continue to deliver relevant and timely programs, services, regulations, and policies.

## 4.2 Performance Measurement

An ongoing, periodic review process will be developed to assess the Strategy's effectiveness and implementation. This will inform any adjustments needed to improve implementation, provide information on the impacts of the Strategy, and identify opportunities to evolve and strengthen this and future strategies. Possible performance measures may include:

- The availability and relevance of ECCC science to internal policy-makers and decision-makers, wider research communities, and broader society.
- Evidence of a strong science culture (e.g., evidence showing that Department scientists are recognized internally, nationally, and internationally).
- Evidence of the impact and quality of ECCC science (e.g., institutional bibliometrics analyses, assessment of the quality of science products and services, and other relevant comparisons over time).
- Workforce statistics that show progress in addressing known equity gaps in science positions.
- Mechanisms are in place for the integration of Gender-Based Analysis Plus considerations into ECCC's science programming.
- The number or percentage of scientific research projects that bridge, braid, or weave with Indigenous science, and/or are co-led or co-developed by Indigenous Peoples or communities.
- The level of understanding among Canadians of environmental science issues (e.g., climate change, biodiversity loss, pollution), including the related processes, drivers, effects, and possible solutions.
- A risk management framework to address corporate risks relevant to achieving the Department's science objectives.
- Incorporation of scientific innovations into operational prediction tools for weather and environmental endpoints.
- Assessment of security risks for scientific research and safeguarding of sensitive scientific data and research processes in accordance with federal security-related guidance, including statements, policies, and procedures.

In addition, ECCC contributions to specific environmental outcomes will continue to be measured through existing audit and evaluation activities.

# 5



## Our Path Forward

The Strategy has set out a vision, directions, core values, and foundational supports to guide and support ECCC science for the coming years. Implementation involves putting these concepts into practice. Internal work plans will be developed as operational companions to the Strategy. These plans will link with annual departmental planning; leverage existing efforts, metrics, and reporting processes wherever possible; identify responsibilities for initiatives; and lay out timelines and performance indicators with periodic reviews and updates.

The success of this Science Strategy will be largely measured by how the Department values, promotes, and uses science, and how science is used to inform effective government decisions, public policies, and the choices made daily by diverse groups of people living in Canada.

ECCC will continue engaging with science experts, partners, and users across the country and internationally to better respond to and anticipate changing environmental challenges and priorities. This Strategy therefore represents a strong, yet adaptable commitment to the role of ECCC science in achieving a greener, more sustainable future.

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# Appendix A: Glossary of Terms

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**Braiding** This represents collaboration and partnership with Indigenous researchers, Knowledge Holders,<sup>14</sup> and communities on cross-cutting issues and on the development and implementation of ECCC programs, services, and policies. ECCC may lead, convene, or support Indigenous leadership in these efforts. Braiding promotes principles of reciprocity and mutual respect in science activities and includes recognizing and protecting the rights and sovereignty of Indigenous Peoples.

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**Bridging** This involves building awareness of the distinct, time-tested, and methodological knowledge systems of Indigenous Peoples. It can include facilitating knowledge mobilization, exchange, and transfer. As part of the reconciliation process, bridging can involve creating equitable and ethical spaces to acknowledge the role of Western science institutions in colonialism and its impact on Indigenous science.

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**Disciplines** These are branches of knowledge, study, or education. They generally use consistent internal theoretical and methodological approaches focused on specific topics of inquiry. Due to their continual specialization of knowledge and approaches, disciplines often become siloed. Collaboration across disciplines is necessary to provide scientific data, advice, and innovations to address complex and interconnected environmental challenges.

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**Indigenous science** This involves Indigenous Peoples' long-term understanding of ecological cycles and environmental processes. This understanding is embedded in intimate knowledge of the environment and in traditional and cultural activities. First Nations, Inuit, and Métis Peoples, their knowledge, and their relationship with the lands, waters, ice, and sky, make a critical contribution to developing solutions and responding to environmental challenges.

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<sup>14</sup> Knowledge Holders are the individuals who define Indigenous Knowledge for their communities.

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**Interdisciplinary** This involves the integration of different disciplines and fields of work to address specific challenges and improve outcomes. Interdisciplinary collaboration occurs regularly in ECCC science efforts.

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**Knowledge mobilization** This refers to translating scientific data, information, and results into useful knowledge for decision-makers and other science users. Effective mobilization allows an overwhelming volume of often dispersed and complex research outcomes to be distilled into usable information in a timely and accessible way. Strengthened connections between science producers and users can improve the relevance of science and research outcomes, maximizing the utility of investments in research.

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**Multidisciplinary** This refers to the consideration of relevant theory and findings from a variety of disciplines, but mainly in an additive or comparative fashion.

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**Science** This refers to the pursuit of knowledge and understanding of the natural world through the application of one or more elements of the scientific method. It includes both fundamental and applied natural, physical, biomedical, and social science, as well as engineering and mathematics. (Derived from a definition by the Science Council professional association and adopted within the Model Policy on Scientific Integrity.)

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**Science advice** This refers to the scientific information provided, and the processes and institutions by which this information is provided, to inform decision-making on matters of public policy, programs, and services. Science advice should be clearly communicated and impartial, and it should integrate the best scientific data, information, and advice.

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**Transdisciplinary** This describes the full integration of diverse theories, methods, knowledge, and perspectives, to form a holistic, coherent approach to a question or challenge that cannot be reduced to individual disciplines.

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**Weaving**

This involves appreciating and applying Indigenous science tools to inform approaches to environmental issues in ways that align with the approaches specified by Indigenous Nations, governments, and specific communities, as well as international instruments. At ECCC, weaving focuses on implementing and building capacity for Indigenous science across the Department. This can involve science knowledge exchange; employee recruitment, retention, and career progression; and dedicated organizational support and funding for capacity building within ECCC and beyond.

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# Appendix B: Overview of Our Mandate and Legislative Obligations

ECCC's science activities respond to evolving global, national, and regional challenges and to legislation, regulations, and commitments. ECCC has established core responsibilities<sup>15</sup> that are based on legislation, with further priorities informed by specific commitments outlined in the Minister's Mandate Letter, the Speech from the Throne, and federal budget announcements.

ECCC's core responsibilities include:

- predicting weather and environmental conditions;
- taking action on clean growth and climate change;
- conserving nature;
- preventing and managing pollution.

ECCC's scientific work is guided by and applied through a legislative and regulatory framework that addresses a broad range of complex environmental issues. This framework includes key legislation that provides the legal foundation for ECCC's activities:

- **Department of the *Environment Act*:** In 1971, this established Environment Canada as a department within the portfolio of the Minister of the Environment, making it responsible for preserving and enhancing the quality of the natural environment, providing meteorological services, and coordinating policies and programs to achieve environmental objectives.
- **The *Canadian Environmental Protection Act (CEPA)*:** This gives ECCC the authority to conduct environmental protection activities related to the regulation of toxic substances, fuel and engine emissions, international air, freshwater, and marine pollution, and the transboundary movement of hazardous waste, environmental monitoring and biomonitoring, pollution prevention planning, and the enforcement of the Act and its regulatory instruments. Under CEPA, ECCC assesses and manages toxic substances to mitigate their environmental impact through its renewed Chemicals Management Plan. ECCC operates within the framework of CEPA and is responsible for monitoring air and water quality and soil health, including identifying the sources and fate of pollutants. ECCC conducts inspections to verify compliance with CEPA and uses enforcement tools in cases of non-compliance. Court-qualified scientific or technical experts may be called as expert witnesses to support legal actions. Recent amendments to CEPA strengthen environmental protections and recognize, for the first time in federal law, that every individual in Canada has a right to a healthy environment.

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<sup>15</sup> See details in the ECCC [Departmental Results Framework](#).

- **The United Nations Declaration on the Rights of Indigenous Peoples Act, 2021:** This law advances the implementation of the UN Declaration as a key step in renewing the Government of Canada's relationship with Indigenous Peoples. All federal departments have a role to play in its implementation. For ECCC science activities, it will be important to understand and apply the associated Action Plan, particularly concerning free, prior, and informed consent; Indigenous data sovereignty; and respectful inclusion of Indigenous science and knowledge.
- **The Canadian Net-Zero Emissions Accountability Act:** This requires the Government to set national targets for the reduction of greenhouse gases based on the best scientific information available, and to promote transparency through annual reports to Parliament. The Act established an advisory body to provide the Minister with advice with respect to achieving net-zero emissions by 2050 and other matters referred to it by the Minister.
- **Fisheries Act:** The pollution prevention provisions of the Act are administered by ECCC. These prohibit the deposit of deleterious substances into water frequented by fish. The Department conducts inspections to verify compliance with the *Fisheries Act* and uses enforcement tools in cases of non-compliance. Court-qualified scientific or technical experts may be called as expert witnesses to support legal actions. Scientific sampling and monitoring of effluent in high-risk sectors also support the enforcement of this Act. A regulation under the Act establishes conditions for research activities in the Experimental Lakes Area in Northern Ontario.
- **The Canada Weather Modification Information Act:** This law is aimed at collecting information on any weather-modification activities in Canada. Its intention is to keep the Government and the public informed on these activities, measure the extent and development of the activities, and assist in establishing the scientific basis for weather modification.
- **Species at Risk Act and Migratory Bird Convention Act, 1994:** ECCC's research and conservation initiatives contribute to the protection of biological diversity and the sustainable use of its components, including the recovery of species at risk and protection of their habitats through the *Species at Risk Act*. ECCC science is crucial to identifying and monitoring species at risk; providing the best scientific data, information, and advice to support recovery of species and habitat; and building long-term relationships with Indigenous and Canadian communities to enhance monitoring and implement recovery strategies. Further, the *Migratory Bird Convention Act* requires ECCC to develop and implement policies and regulations to protect and conserve migratory birds, their populations, eggs, and nests, which requires ongoing monitoring and enforcement.
- **Canada Wildlife Act:** The Act allows for the creation, management, and protection of wildlife areas for wildlife research activities and the conservation and interpretation of wildlife. The purpose of Canada's protected locations, such as national wildlife areas and migratory bird sanctuaries, is to preserve habitats critical to migratory birds and other wildlife species, particularly those at risk.
- **The Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act:** This law is the basis for the regulation of the import, export, and interprovincial transportation of endangered, regulated, and invasive species. ECCC has multiple roles related to the Act, including the identification of species, regulation and enforcement, the provision of laboratory services for sample analysis, and expert testimony.
- **Canada Water Act:** ECCC's scientific efforts in freshwater management are conducted within the framework of this law, which allows the Department to take the lead on conducting research and monitoring the conservation, development, and use of Canada's water resources.

- ***Federal Sustainable Development Act:*** ECCC's scientific knowledge and research contribute to the implementation of the Federal Sustainable Development Strategy, which is guided by this Act. The Act requires federal departments and agencies to develop and implement strategies for long-term environmental sustainability.
- ***The Impact Assessment Act:*** This law outlines a process for understanding the effects of major development and resource-extraction activities and other projects carried out on federal lands. It also provides decision-making and compliance tools. To support the impact assessment process, ECCC is responsible for providing expert scientific advice within the Department's mandate and providing information as it pertains to the potential positive and negative environmental impacts of a project.