Environment and Climate Change Canada | Environnement et Changement climatique Canada

SCIENCE AND TECHNOLOGY BRANCH

Deputy Minister Introductory Briefing

February 2023

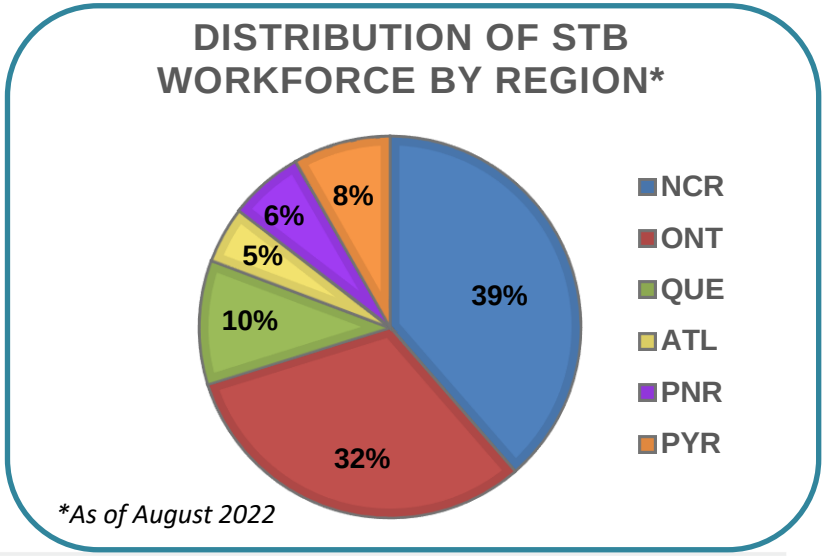
Environment and Climate Change Canada's 50th anniversary
50e anniversaire d'Environnement et Changement climatique Canada
Meteorological Service of Canada's 150th anniversary
150e anniversaire du Service météorologique du Canada

Canada

SCIENCE & TECHNOLOGY BRANCH (STB) OVERVIEW

Science and technology are essential to Environment and Climate Change Canada's (ECCC) mandate

- Under the *Department of the Environment Act* and the *Canadian Environmental Protection Act*, 1999, **ECCC is both mandated and enabled to conduct environmental research** on a range of issues
  - STB science is also foundational to administering other key acts, including the *Species At Risk Act* and pollution prevention provisions of the *Fisheries Act*
- **STB is the largest and leading environmental research institution in Canada**
- Diversified, scientific workforce of **~1,500 FTEs** in **34 offices** across Canada
- Collaborative work with science leaders in Canada and abroad:
  - **Productive relationships** with many research institutions, including in academia
  - **~800 peer-reviewed publications annually**, most including at least one collaborator
  - **~64% of peer-reviewed publications are open access**
- STB budget (2022-23): $226.7M, including O&M, salary, G&C, and capital



STB OFFICES/ FACILITIES ACROSS CANADA

STB VISION AND MISSION

Vision: Decisions are evidence-informed by the latest science that responds to environmental challenges facing Canadians

Mission: To provide holistic scientific knowledge, data and tools needed to enable ECCC's policies, programs and services to provide a clean, safe and sustainable environment for Canadians

Equity, Inclusion & Diversity: STB's diversity and inclusion working group aims to create a safe and positive space for open dialogue towards more positive behavioural, institutional, and policy change

- DG-level branch EE staffing committee
- Engaging with PSC and other science-based departments on EE within scientific classifications,
- Created an Indigenous Science Division

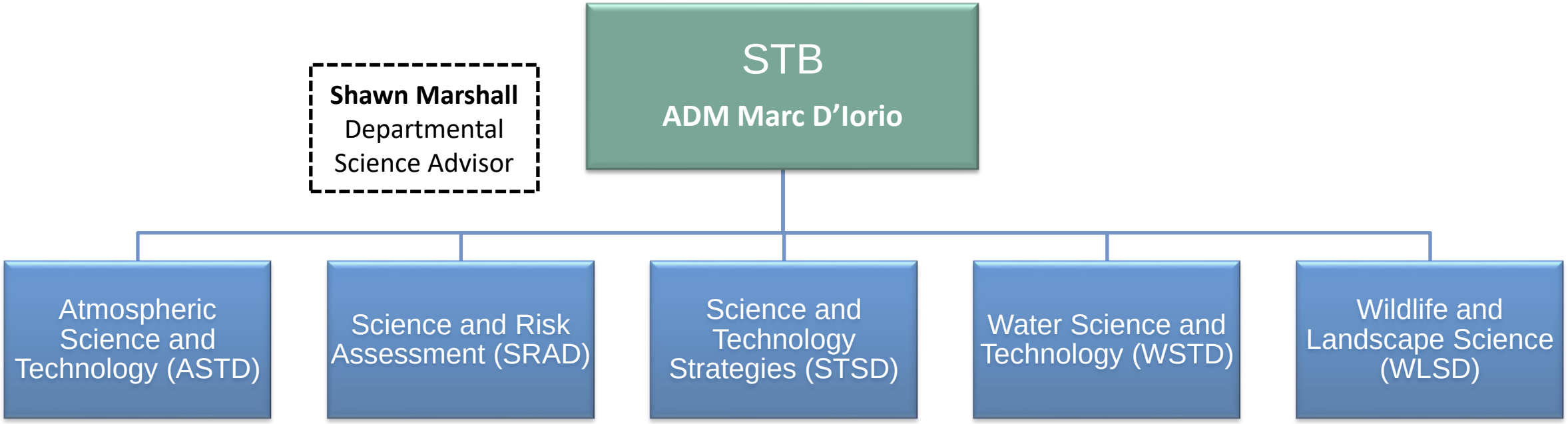
Science Principles:

ECCC S&T ORGANIZATIONAL MODEL COMPARED TO OTHER SCIENCE-BASED DEPARTMENTS/AGENCIES

Department/ Agency	S&T branch that does all or most of the science?	Lead scientist or science advisor role?	Notes
ECCC	Yes	ADM S&T, Departmental Science Advisor	Most science done by STB, but also in other branches (CWS, MSC), at 34 environmental science centres across Canada
NRCan	No	Chief Scientist, Departmental Science Advisor	Science conducted within six different department sectors (e.g., Lands and Minerals, Energy Efficiency and Technology, Strategic Policy and Innovation, Canadian Forest Service) at facilities across Canada
AAFC	Yes	ADM Science, Departmental Science Advisor	Science focused in the S&T Branch, with work done at 20 R&D centres and 30 satellite locations across Canada
DFO	No	ADM Science, Departmental Science Advisor	Strong regional structure to S&T; science conducted within department sectors (e.g., Ecosystems and Oceans Science, Aquatic Ecosystems) at 17 facilities across Canada
NRC	No	Chief Digital Research Officer, Chief Science Officer and Departmental Science Advisor (one position for all)	Research is the core mandate of the organization; science is conducted throughout various NRC divisions (e.g., Digital Technologies, Life Sciences, Transportation and Manufacturing) at facilities across the country

ORGANIZATIONAL STRUCTURE

ECCC is the lead government organization for environmental science advice in Canada

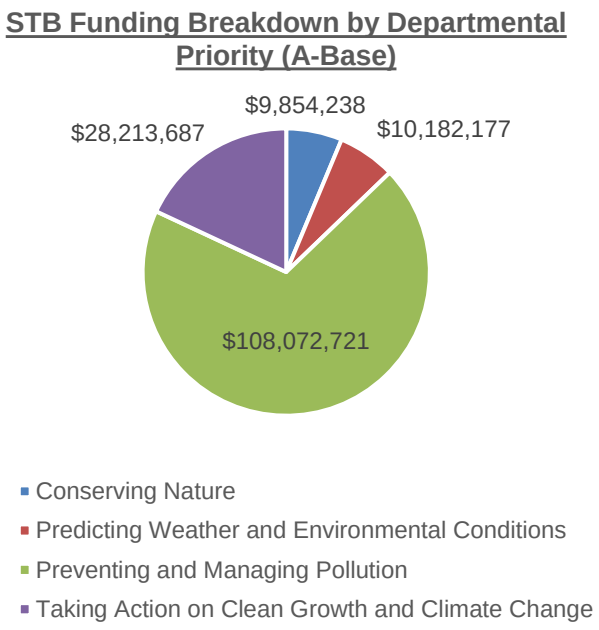


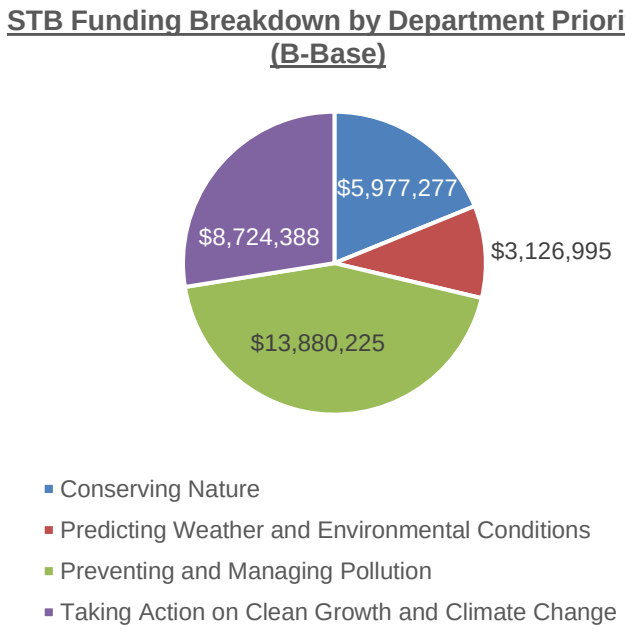
Directorates

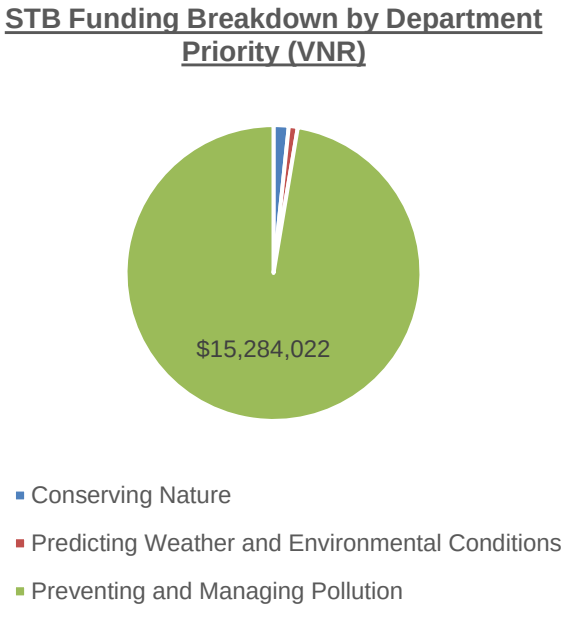
STB FUNDING OVERVIEW

- Federal priorities increasingly demand new research to keep pace with emerging issues, many dependent on STB research, monitoring, assessment, and analysis
- STB science is foundational to departmental priorities, policy and regulatory development, decision-making and measuring progress
- Funding is crucial to maintain and enhance STB's leadership in federal science

STB funding breakdown by departmental priority (ARLU January 2022):







SCIENCE & ADVICE TO INFORM AND SUPPORT

- STB science informs **policy, regulations, programs, and operations** in ECCC, across the Government of Canada, and beyond, both domestically and internationally
- STB products include **publications, data, models, and recommendations** to foster discussions on policy needs and science advice.
- A Science Strategy and improved Science Advice Governance will support the mobilization and evolution of STB's science resources.

POLICY	REGULATIONS	PROGRAMS	OPERATIONS
(e.g., Canada's Changing Climate Report informed and motivated domestic mitigation policy and the development of the National Adaptation Strategy)	*(e.g., Under the Chemicals Management Plan, the Science Assessment of Plastics informed the potential ban of six single-use plastic items, including the development of regulations)*	*(e.g., Estimation of GHG emissions to produce Annual National Inventory Report on GHGs to the United Nations Framework Convention on Climate Change; National Boreal Caribou Knowledge Consortium)*	*(e.g., Predictive tools to inform fire weather risk prediction, wildfire air quality smoke alerts, and emergency response)*

THE UNIQUE ROLE OF STB SCIENCE

- STB's science contributes to **18 of ECCC's 39 mandate letter commitments**
- In some areas, STB has the **only capabilities or mandate in the country** to do the research required, such as:
  - STB's Canadian Centre for Climate Modelling and Analysis developed Canada's only climate model
  - Environmental modelling (hydrology, ocean, sea ice, atmospheric processes) to support Canada's weather and environmental prediction services
  - National-scale and long-term air, water, soil, and wildlife monitoring programs
- STB research and monitoring contribute to **key international science initiatives**, reinforcing Canada's credibility and reputation as a science leader. Examples:
  - Target 7 (reducing pesticides risks) of the Kunming-Montreal Global Biodiversity Framework
  - Arctic Council/Arctic Monitoring and Assessment Programme (AMAP)
  - Intergovernmental Panel on Climate Change (IPCC)
  - World Climate Research Program Coupled Model Intercomparison Project (CMIP)
  - Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)
  - Global Atmospheric Watch Programme for black carbon and aerosol reporting
  - UNFCCC National Inventory Report
  - Great Lakes Water Quality Agreement

STB SCIENCE PRIORITIES

Taking action on clean growth and climate change

- National Inventory Report
- Modelling and analysis informs regulatory reporting requirements and improves climate services
- Processing and analysis of atmospheric variables informs climate policies and adaptation actions
- Contributions to scientific assessments inform international climate change negotiations
- Canada's Black Carbon Inventory
- Canada's official inventory of greenhouse gas sources and sinks
- Strategic planning guides Canadian climate change science and mitigation actions to address Canada's 2030 and 2050 emission reduction targets
- Canadian Focal Point for the Intergovernmental Panel on Climate Change

Predicting weather and environmental conditions

- Modelling and analysis improves critical services (e.g., high impact weather prediction and flood forecasting)
- Research to improve severe weather detection and prediction

Preventing and managing pollution

- Monitoring and modelling to strengthen Canada's negotiation position for international agreements
- Chemicals Management Plan
- Science to improve air quality, reduce impacts of air pollution, and provide Canadians with tools to make informed decisions to reduce exposure to air pollutants
- Research to inform emergency preparedness and response to oil spills, reduction of GHG emissions from oil sands tailing ponds, and provincial and municipal initiatives to implement nutrient reduction strategies
- Canada's Zero Plastic Waste Agenda

Conserving nature

- Research to enable risk assessments for endangered whales, support assessments of cumulative effects of Canada's oil sands, and inform identification and designation of new protected areas
- Wildlife impact assessments to inform regulation and enforcements under SARA
- Science advice and research to inform management and ecosystem health of federal protected areas
- Science to help mitigate environmental and potential health threats from virulent wildlife diseases
- Research to inform nature conservation, protection of endangered species, marine emergency preparedness and response, and provision of legislated departmental expert information (e.g., IAA, CEAA 2012)

STB SCIENCE ADVICE AND SERVICES

STB offers a number of activities that serve foundational information needs, including but not limited to:

Science Management and Other Supports

- Indigenous science knowledge exchange and Indigenous science-policy bridging
- Knowledge mobilization and science communications
- ECCC Open Science Action Plan
- Science capacity development (e.g., Youth Horizons Program)
- Science advice and input to policy
- Fostering domestic and international partnerships
- Accredited analytical support and systems to support inventory reporting
- Input to Budget, MC, and TBSub asks
- ECCC Policy on Scientific Integrity

Regulation and Enforcement

- Products and tools
- Testifying on non-compliance cases
- Regulatory authority (e.g., entry of new substances into Canadian commerce)
- Monitoring and surveillance of chemicals of concern
- Regulation development

Risk Assessment

- Ecosystem and wildlife impact assessments
- Ecological risk assessment of existing substances

Collection, Integration and Transmission of Data and Information

- Atmospheric monitoring of greenhouse gases (GHG) and air quality, including GHG inventories and data
- National Inventory Report
- Value-added long term atmospheric data sets
- Environmental and wildlife, long term water quality, and microbiological monitoring
- Habitat and ecosystem mapping
- Canada's Black Carbon Inventory
- Canada's Air Pollutant Emissions Inventory and pollutant data to the National Reporting Inventory

Research and Modelling

- Research on measurement technology, pollutant processes, climate processes, Arctic climate processes, air quality, wildlife, ecosystems, aquatic ecosystems, chemicals of concern, contaminated sites, and plastics
- Numeric modelling development and analysis
- Issue identification and emerging science
- Method development and innovation

STB SCIENCE ENABLES CLIENTS

STB science provides the critical foundations to inform and enable clients' programs, services, operations, policy, regulatory, and enforcement deliverables, including but not limited to:

Program delivery

- Oil Sands Monitoring Program to understand the effects of oil sands development on the environment and assess cumulative effects
- Freshwater Action Plan to conserve and enhance ecosystems
- Reporting on GHG emissions and storage
- Species at risk recovery strategies, action plans, regulatory development and legislation
- Long term monitoring for reporting on water quality and aquatic ecosystem health
- Assessing effectiveness to programs to reduce acid rain
- Chemicals Management Plan

Policy

- GHG and air monitoring inform adaptation actions
- Informed climate change policy domestically and internationally
- Wildlife research and monitoring inform policy and framework development (e.g., One Health, Cumulative Effects, SARA)
- Microplastics and nanoplastics efforts, genomics
- Contributions to national inventories and impacts to decision making on clean growth and climate change, preventing and managing pollution
- Science Integrity, Indigenous Science, Open Science, Labs Canada and others

Operations and Service

- Monitoring and research to deliver weather forecasting, the Air Quality Health Index, the UV index, Ice Services and Climate Services
- Contaminated sites
- Environmental emergencies

Regulation and Enforcement

- Research, accredited testing methods, defensible scientific evidence supporting enforcement actions
- Research to inform harvest management, bird-human conflicts, species recovery
- Research, advice and action planning for species assessment, recovery planning, and multi-species planning
- Long-term monitoring of aquatic environments

SPOTLIGHT: INDIGENOUS SCIENCE AT STB

STB's new Indigenous Science Division was created in January 2022 to advance reconciliation in ECCC's S&T activities

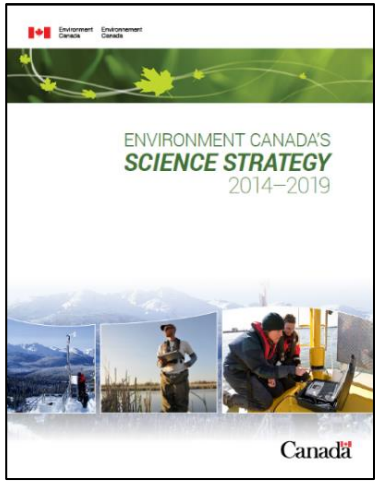
- Indigenous science is a **distinct, time-tested, and methodological knowledge system** that that provides a **long-term, wholistic approach** and can enhance and complement western science
- Under the leadership of **Dr. Myrle Ballard**, an Anishinaabe scholar from the University of Manitoba, the new **Indigenous Science Division (ISD)** in STSD is developing and applying an important **Indigenous lens** to ECCC science, policy, and programs through Dr. Ballard's new **Three-Eyed Seeing Framework**
- The mandate of ISD is to **bridge, braid, and weave Indigenous science with western science approaches** to inform and enhance decision-making

Dr. Myrle Ballard

- The establishment of ISD is part of the federal government's commitment to **walk the path of reconciliation** and follows a call to action from the Truth and Reconciliation Commission of Canada that Indigenous ways of knowing be included in both government and academia

STRATEGIC PLANNING FOR STB SCIENCE & ADVICE

- STB is updating the department's **Science Strategy** (2014-2019)
  - Aim to set and guide ECCC's next science vision, with cross-cutting science goals, priorities and core values. Will have clear links to the **Departmental Results Framework**
  - Rooted in ECCC's *Policy on Scientific Integrity*; STB's approach to bridging, braiding and weaving with Indigenous Science; and the STB *Action Plan on Diversity and Inclusion*
- Key to the Science Strategy, STB is advancing (in tandem) a **Science Advice Governance Framework** to facilitate strategic discussions of science advice and information needs, direction-setting, and triage of priorities
- The draft Science Strategy and Science Advice Governance Framework are being developed and socialized with departmental colleagues in winter/spring 2023



KEY TAKEAWAYS & NEXT STEPS

- Federal priorities demands foundational scientific information and new and innovative research
  - STB partners span the federal government, various sectors of the economy, and international efforts

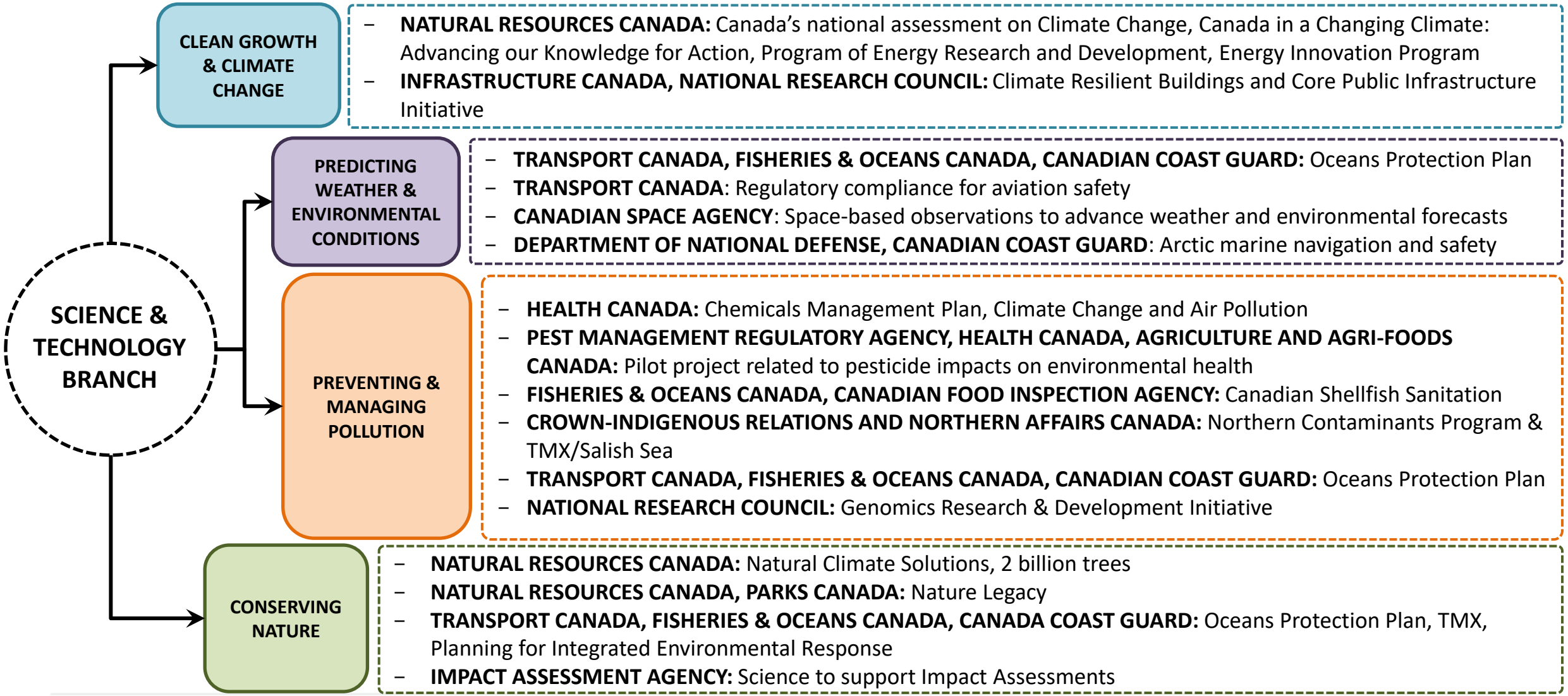
- STB is on the cutting edge of **new federal environmental priorities and research** including:
  - Kunming-Montreal Global Biodiversity Framework
  - National Adaptation Strategy
  - Climate Science 2050 Implementation
  - National Inventory Reporting (supporting Paris Agreement Implementation)
  - Freshwater Science Agenda
  - Circular economy for plastics science
  - Super-computing, AI/ML to support environmental
    - Pesticide management
    - Nature-Based Climate Solutions
    - Open Science
    - Weaving Indigenous and Western Science
    - Genomics
    - Federal Earth Observation Strategy
    - Renewed CEPA Implementation (Bill s.5)

- **ECCC's continued leadership** on foundational science to deliver Government's environmental protection priorities will be important for achieving goals and monitoring our progress

ANNEX

1. ADDITIONAL INFORMATION ON STB STRUCTURE AND ACTIVITIES

SCIENCE TO SUPPORT THE DEPARTMENTAL RESULTS FRAMEWORK AND OTHER DEPARTMENTS' INITIATIVES



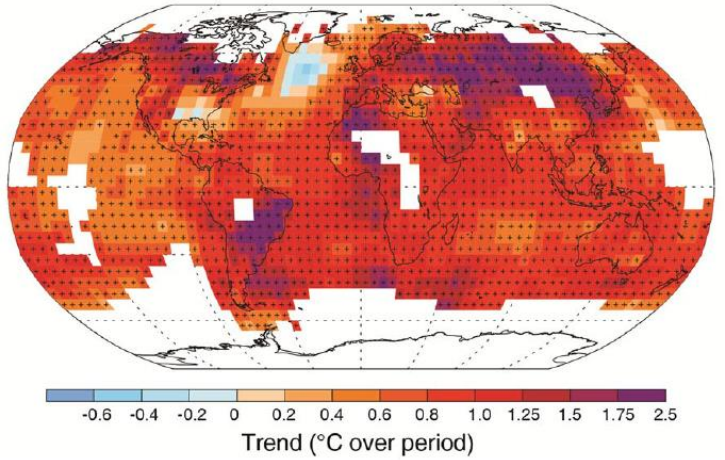
2. STB BUSINESS LINES

ATMOSPHERIC SCIENCE & TECHNOLOGY DIRECTORATE

Director General: Nathalie Morin

Activities focus on:

- **Atmospheric measurements** of the physical and chemical properties of the atmosphere, including the ozone layer, and long-term monitoring of air pollutants, GHGs and air toxics.
- **Vehicle and engine emission research and testing** in support of compliance verification and enforcement.
- Investigating **anthropogenic and natural emissions** impacts on climate and air quality, and affects on human and ecosystem health.
- Advancing the **understanding of the climate system and how changes will affect weather and air quality** to inform the development of **adaptation and mitigation** strategies.
- Increasing **knowledge of earth systems** (e.g., atmosphere, ocean, waves, ice, land) to improve weather and environmental forecasts and climate predictions and projections.
- Providing **scientific evidence** that underpins, for example, the 2030 Emissions Reduction Plan (ERP), Chemicals Management Plan (CMP), the Methane Strategy, Met Services for the Arctic, International fora and agreements (e.g., UNFCCC, IPCC, WMO, Gothenburg Protocol, Minimata Convention, Can-US Air Quality Agreement).

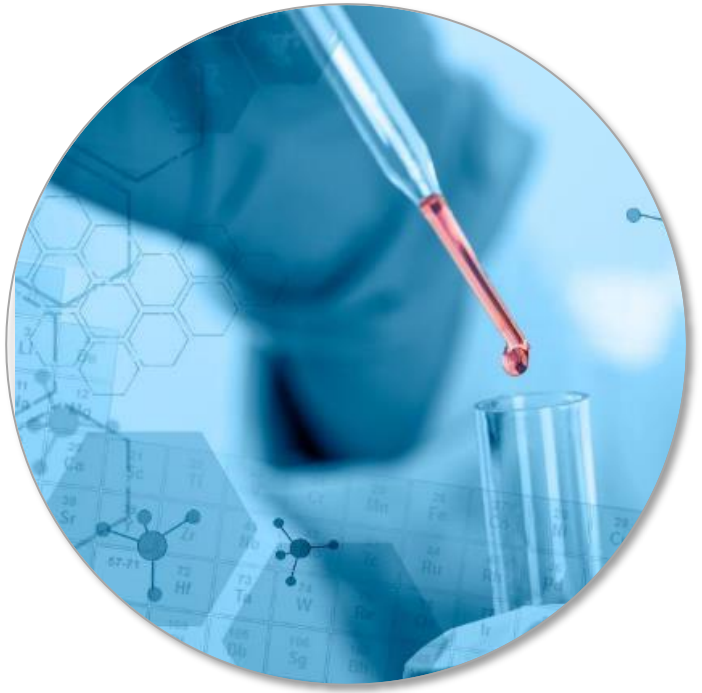


SCIENCE & RISK ASSESSMENT DIRECTORATE

Director General: Jacqueline Gonçalves

Activities focus on:

- Carrying out research, assessment and monitoring and information-gathering activities on **existing and new substances**
- Understanding, quantifying, collecting, analyzing and reporting on **environmental releases of pollutants, toxic substances, and emissions/sinks of greenhouse gases** by sources to monitor performance and inform policy
- Conducting activities to support CMP, PCF, the Air Quality Management System, the Federal Contaminated Sites Action Plan, multilateral obligations and compliance with international conventions
- Developing of **regulatory instruments** under CEPA



SCIENCE & TECHNOLOGY STRATEGIES DIRECTORATE

Director General: Matthew Cloutier

Activities focus on:

- Lead on science policy planning advice and strategies to ensure effective management of ECCC's S&T in alignment with government priorities (e.g., Emissions Reduction Plan, National Adaptation Strategy, Open Science, Scientific Integrity)
- Integrating and disseminating **ECCC's S&T knowledge** to facilitate its use by decision-makers and science users
- Applying an **Indigenous lens** to ECCC science, policy, and programs to inform and enhance decision-making through the work of the new Indigenous Science Division
- Advancing **strategic partnerships** with other Science-Based Departments and Agencies, academia, and international partners to enable collaborative science and policy initiatives in the service of shared mandates and priorities
- Convening science experts and users at national level to **advance multi-disciplinary collaborative science** across departments, including representatives from academia and the private sector (e.g., for Climate Science 2050 implementation)

WATER SCIENCE & TECHNOLOGY DIRECTORATE

Director General: Joanne Volk

Activities focus on:

- Water quality monitoring (physical, chemical and biological) to report on **water quality and aquatic ecosystem health** including Marine water quality monitoring as part of the Canadian Shellfish Sanitation Program
- Research to better understand, assess, and predict the fate, transformation and effects of contaminants, excess nutrients, climate change and hydrology changes on **aquatic ecosystems**
- **Laboratory support**, including specialized **chemical, biological, toxicological, and genomic analyses**, for research, monitoring, and enforcement investigations
- Research and “24-7” scientific **support to respond to environmental emergencies**, including fate and behaviour expertise and spill trajectory modelling
- Activities support ecosystem initiatives (e.g., Great Lakes, Lake Winnipeg, St. Lawrence River, Lake of the Woods); oil sands monitoring; Oceans Protection Plan; Northern Contaminants Program; Chemicals Management Plan; climate change and air pollutants studies; Canadian Environmental Sustainability Indicators; genomics; climate change adaptation; emergencies and enforcement
- Prioritize, align, and enhance **freshwater science** and knowledge in Canada

WILDLIFE & LANDSCAPE SCIENCE DIRECTORATE

Director General: Patrice Simon

Activities focus on research and advice on:

- **Species at Risk, migratory birds, climate change, cumulative effects, and protected areas** to support conservation and management decisions
- Development of **ecosystem assessment and prediction approaches** to support conservation, species protection, and responsible resource development
- Application of **Earth Observation and spatial analysis** in conservation and species protection
- Monitoring **ecotoxicology and wildlife health** to assess the impacts of contaminants and other stressors on wildlife and ecosystems
- Activities support the *Species at Risk Act*; Chemicals Management Plan; Federal Contaminated Sites Action Plan; adaptation; Great Lakes Action Plan; Northern Contaminants Program; Climate Change Action Plan; Oceans Protection Plan; *Canadian Environmental Protection Act*; environmental assessment; identification of protected areas (marine and terrestrial); and international agreements (e.g., Stockholm Convention on Persistent Organic Pollutants, Arctic Monitoring and Assessment Programme)