



# Overview of Government of Canada climate adaptation Science and Technology (S&T) initiatives

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**Defence Research and Development Canada**

**Scientific Letter**

DRDC-RDDC-2017-L358

September 2017

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November 2017

DRDC-RDDC-2017-L358

Prepared for: Mark Williamson, Director General, DRDC, CSS

Scientific Letter

## Overview of Government of Canada climate adaptation S&T initiatives

### Background

Climate change holds many implications for the Canadian public safety domain, raising both catastrophic risks from extreme weather-related events and natural disasters, and day-to-day, stochastic risks due to upward trends in average daily temperatures as well as temperature fluctuations, leading to infrastructure wear-and-tear, exacerbating community vulnerabilities and increasing health vulnerabilities. As such, adaptation to climate change is a cross-cutting requirement across federal sectors, given that “a changing climate presents a wide range of risks and opportunities that cut across regions, sectors and disciplines”... impacting “economy, infrastructure, health and social well-being” and requiring “collaborative action to reduce vulnerability, manage risks, and prepare for potential opportunities.”[1]

Climate adaptation is also an intensely S&T-driven practice, as seen in the Government of Canada’s commitment to make “informed decisions” about adaptation measures. These decisions require significant Science and Technology (S&T) investment in order to develop scalable methods, strategies, and tools for assessment, analysis, and mitigation as well as for applying these methods and strategies at the community level.

The purpose of this scientific brief is to provide an overview of federal and national initiatives for the purpose of assuring public safety in Canada in the face of climate change risks, and in particular those oriented towards supplying S&T, some of which could hold potential relevance for Defence Research and Development Canada – Centre for Security Science (DRDC CSS) engagement strategies. These initiatives are grouped in two broad categories:

1. Ongoing federal and national climate adaptation policy frameworks and initiatives; and
2. New initiatives associated with the 2016 and 2017 Government of Canada budgets, reflecting increased priority and investment in climate change adaptation-post 2016.

As is indicated, the initiatives straddle numerous Canadian Federal departments and overlap with the work of Provinces, Municipalities, and non-governmental organizations.



## Statement of results

### I. Ongoing federal and national climate adaptation policy frameworks and initiatives

#### The Federal Adaptation Policy Framework (2011)

The Federal Adaptation Policy Framework (2011) was created in 2011 to guide domestic action by the Government of Canada to address adaptation to the impacts of climate variability and change, setting out a vision of adaptation in Canada, objectives, roles of the federal government, and provides criteria for setting priorities for action [2].

The policy framework established some very general objectives for Federal adaptation-related policies:

- Canadians understand the relevance of climate change and associated impacts on their quality of life;
- Canadians have the necessary tools to adapt to climate change effectively; and
- the Federal government, as an institution, is resilient to a changing climate.

#### Canada's Climate Change Adaptation Platform (2012) [3]

Canada's Climate Change Adaptation Platform was a national forum launched in 2012 under the auspices of Natural Resources Canada (NRCan) to bring together key groups in Canada to collaborate on climate change adaptation priorities, to more intensively investigate climate change adaptation measures required, and to clarify the role these entail for the Federal Government.

The working groups established were Agriculture; Coastal Management; Economics; Energy; Forestry; Infrastructure and Buildings; Measuring Progress; Mining; Northern; Regional Adaptation Collaboratives & Tools; Science Assessment; Water and Climate Information; and Enhancing Uptake. Most of these working groups appear to have been continuously active and have generated a large number of research and publications with funding from NRCan.

#### The Pan-Canadian Framework on Clean Growth and Climate Change (2017) [4]

In 2016, a Pan-Canadian Framework on Clean Growth and Climate Change issued jointly by the Federal Government and the first ministers of the Provinces and Territories was announced that included support for climate change adaptation investments to build climate resilience. This Framework described the need for S&T in five areas:

1. **Knowledge creation and dissemination:** Federal data, information and tools on climate change conditions and impacts accessible through a dedicated Centre for Climate Services, along with the development of regional and community-based adaptation expertise;
2. **Infrastructure:** Understanding how to reflect climate change conditions in infrastructure, codes, and standards and of how natural 'green' infrastructure such as constructed/managed wetlands and urban forests can inform adaptation;
3. **Health:** Enhanced risk assessment, surveillance, monitoring, modelling, diagnostics, professional education and public awareness on climate-related public health risks;
4. **Support for vulnerable regions:** Improvement of climate resilience in the North, in Indigenous communities, and in coastal regions;
5. **Reducing climate-related hazards and disaster risks:** Enhancement of disaster risk reducing infrastructure, protection, and support for communities in averting climate impacts.



## II. New targeted climate adaptation programs in the 2016 and 2017 budgets

In the 2016 budget, the Government of Canada acknowledged that “Canada needs to adapt to a changing climate and strengthen the resilience of communities to the impacts of climate change.” This budget committed especially to initiatives related to infrastructure, including assembling data on core public infrastructure assets; developing climate-resilient infrastructures codes; modernizing water and wastewater infrastructure [5]; and supporting municipal infrastructure asset management planning [6]. The 2017 budget, in turn, addressed the five themes outlined in the Pan-Canadian Framework on Clean Growth and Climate Change via its emphasis on “Communities Built for Change” [7]. Between the two of them, these budgets have enabled the proposal, launch, or perpetuation of the following 23 programs related to the Framework’s five climate adaptation themes:<sup>1</sup>

### 1. Knowledge creation and dissemination:

- The *Canadian Centre for Climate Services* with climate science, data, and information and regional climate resilience centres that can support climate adaptation decision-making (Environment and Climate Change Canada [ECCC]; TBA<sup>2</sup>);
- The *Building Resilience in Canada’s Natural Resource Sectors and Communities* program to deliver on Canada’s Platform on Climate Change Adaptation’s objectives by producing a comprehensive national-scale assessment of observed climate change impacts and of the current state of adaptation in Canada; and by funding projects for addressing knowledge gaps, establishing professional training programs, and disseminating adaptation knowledge, tools and best practices for building capacity to adapting to climate change, with a particular focus on communities, natural resource sectors, and industry (Natural Resources Canada (NRCan)).

### 2. Infrastructure:

- The *Climate-Resilient Building and Infrastructure Codes and Guides* program to lead the development of codes for climate-resilient buildings and infrastructures for residential, institutional, commercial and industrial buildings, and developing guides that integrate climate resiliency into the design and rehabilitation of public infrastructures, including bridges, roads, potable water, and wastewater systems (NRCan).
- The *Standards to Support Resilience in Infrastructure* program, to develop standardization guidance on weather data, climate information and climate change in support of infrastructure adaptation and to update existing infrastructure standards to climate change impacts (Standards Council of Canada);
- An updated *National Building Code of Canada* that will incorporate projected future climate data (National Research Council) [8];
- The *Disaster Mitigation and Adaptation Fund* to adapt Federal, Provincial, and Municipal infrastructure to climate change (Infrastructure Canada, TBA);
- The *Clean Water and Wastewater Fund* to modernize water and wastewater infrastructure for provinces, territories and municipalities (Infrastructure Canada);

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<sup>1</sup> This section primarily reflects information from the 2016 and 2017 budgets augmented with information in a background document supplied by the Adaptation Policy Development section of the Strategic Policy Directorate at Environment and Climate Change Canada (ECCC). Unless otherwise indicated, these three documents were the sources of information on the programs.

<sup>2</sup> TBA indicates that as of the drafting of this document, the program has yet to be formally announced.



- The ***Smart Cities Challenge Fund*** to encouraging innovation in city planning and in implementation of clean, digitally connected technology including greener buildings, smart roads and energy systems, and advanced digital connections for homes and businesses (Infrastructure Canada);
- A ***Data Initiative on Canadian Infrastructure*** that will help all levels of government better track, collect, use and share the data needed to measure the impact of infrastructure investments (Infrastructure Bank of Canada; Statistics Canada; TBA);
- New funding for the ***Green Municipal Fund*** to fund innovative municipal green infrastructure priorities (Federation of Canadian Municipalities);
- ***Investing in Green Infrastructure*** (Infrastructure Canada, TBA);
- The ***Northern Infrastructure Standardization Initiative*** to invest in new standards to support Northern infrastructure (Standards Council of Canada);
- The ***Northern Transportation Adaptation Initiative*** to support the development and implementation of knowledge, innovation, and capacity-building to enhance the climate resilience of existing and future Northern transportation infrastructure and operations, including a large-scale initiative to adapt to evolving permafrost conditions in the construction and rehabilitation of transportation assets (Transport Canada).

### 3. Health:

- The ***Heat and Health Risk Assessment Program*** to support provinces, territories, municipalities, and public health units in responding to extreme heat, the integration and mainstreaming of heat-health risks into existing emergency management systems, and advancing science and understanding of health risks and adaptation measures (Health Canada);
- The ***Infectious Diseases and Climate Change Program*** to identify and respond to the threat posed by infectious diseases exacerbated by climate change through enhanced surveillance and monitoring, risk assessments and risk modelling, improved laboratory diagnostics, health professional education, public awareness activities, and public health decision making tools and guidance (Public Health Agency of Canada);
- The ***Climate Change and Health Adaptation Program for First Nations*** to create opportunities for local and regional discussions, monitoring, research, and vulnerability assessment and the development of local health action plans (Health Canada);
- The ***Climate Change and Health Adaptation Program for Northern First Nations and Inuit Communities*** to create opportunities for local and regional discussion, monitoring, research and vulnerability assessment, the development of local health action plans, and investment in selected technical projects (Health Canada and INAC).

### 4. Support for vulnerable regions:

- The ***Climate Change Preparedness in the North*** program to support vulnerability and risk assessment of climate change impacts and the development of hazard maps, adaptation plans, and adaptation options (INAC);
- The ***First Nation Adapt*** program to provide communities with information on how climate change impact will affect their infrastructure; decision support tools to guide the assessment of climate change impacts and the identification of cost-effective adaptation measures; and



direct funding support to improve infrastructure and emergency management in communities encountering repeated impacts related to flooding, forest fires, and winter roads (INAC);

- The *Aquatic Climate Change Adaptation Services Program* to support the assessment of climate change risks, vulnerabilities, and impacts associated with the acidification of oceans; to support the development of climate change vulnerability indexes for the management of fisheries and Small Craft Harbours; to improve forecasting of ocean conditions; and to communicate risks to stakeholders and Canadian at large (Fisheries and Oceans Canada).

## 5. Reducing climate-related hazards and disaster risks:

- Renewal of the *National Disaster Mitigation Program* that funds disaster-related risk assessments, hazard mapping, mitigation planning and investments in non-structural and small-scale structural mitigation projects, especially in relation to floods (Public Safety Canada);
- The *National Risk Profile* to provide analysis of disaster risks across Canada in support of evidence-based decision making in disaster risk mitigation efforts across a wide number of public safety domains (Public Safety Canada) [9];
- New funding for *Building Capacity in Municipalities to Address Climate Change* to support municipality-led projects assess local climate risks, and the integration of these impacts into asset management plans (Federation of Canadian Municipalities).

## Discussion of results

As can be seen in this scan of prominent climate adaptation initiatives and in the 2016 and 2017 budgets, at least thirteen Federal departments' agencies as well as several non-governmental organizations are formally engaged in Government Canada climate adaptation-related activities and S&T creation, namely:

1. ECCC
2. NRCan
3. Infrastructure Canada
4. Public Safety Canada
5. Transport Canada
6. Health Canada
7. Indigenous and Northern Affairs Canada
8. Public Health Agency of Canada
9. Fisheries and Oceans Canada
10. Statistics Canada
11. National Research Council
12. Federation of Canadian Municipalities (FCM)
13. Standards Council of Canada

Climate adaptation activities at once aligned with the assurance of the well-being of Canadians, with principles of risk management governing the delivery of federal and national programs [10], and also with Canada's international commitments, such as to the Paris Climate Change Agreement, the United Nations Sendai Framework for Disaster Risk Reduction, and the United Nations Sustainable Development Goals [11]. As Canada's Federal Adaptation Policy Framework describes, climate adaptation is a



complex initiative requiring federal organizations to “respond actively to [climate] change and uncertainty by using risk-based information to enable more effective decision-making” [2]. As the Framework further explains, to achieve these goals and commitments, climate change considerations will ultimately need to be thoroughly integrated into federal policy, programs, and operations, a massive task that will involve “building internal capacity, disseminating information, and developing new knowledge” on climate-related risk conditions across all Federal government domains [2].

Given DRDC CSS’s robust experience and history of developing and implementing methodologies for extracting and aggregating risk-based information and knowledge, the Centre can prospectively play a strong role in enabling Federal organizations with diverse mandates to build innovative risk-related awareness and tools for adapting their policies and programs to climate change [12].

## Conclusion

Climate adaptation evidently stands to a major policy-spanning and departmental-spanning goal over coming years. Given the significant basis of climate adaptation in risk analysis and risk mitigation planning, the ongoing need for the innovation of evidence-based methodologies in this emergent domain, and DRDC CSS’s unique strengths and history in this area, there is a prospectively strong role for DRDC CSS to play in contributing to innovation in climate change adaptation across the federal landscape.

**Prepared by: Suzanne M. Waldman (DRDC – Centre for Security Science).**

## References

- [1] Environment and Climate Change Canada, "Adapting to climate change in Canada," 12 August 2016 [online]. Available: <https://www.canada.ca/en/environment-climate-change/services/climate-change/adapting-climate-change.html>. [Accessed 1 November 2017.]
- [2] Environment and Climate Change Canada, "Federal Adaptation Policy Framework for climate change," 12 August 2011/2016 [online]. Available: <https://www.canada.ca/en/environment-climate-change/services/climate-change/federal-adaptation-policy-framework.html>. [Accessed 1 November 2017.]
- [3] Natural Resources Canada, "Canada’s Climate Change Adaptation Platform" [online]. Available: <https://www.nrcan.gc.ca/environment/impacts-adaptation/adaptation-platform/10027>. [Accessed 1 November 2017.]
- [4] Canada's First Ministers, "Pan-Canadian Framework on Clean Growth and Climate Change," [online]. Available: <https://www.canada.ca/content/dam/themes/environment/documents/weather1/20170113-1-en.pdf>. [Accessed 1 November 2017.]



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- [5] Infrastructure Canada, "Clean Water and Wastewater Fund Program Overview," [online]. Available: <http://www.infrastructure.gc.ca/plan/cwwf/cwwf-program-programme-eng.html>. [Accessed 1 November 2017.]
- [6] Minister of Finance, Government of Canada, "Growing the Middle Class: Budget 2016," [online]. Available: <http://www.budget.gc.ca/2016/docs/plan/budget2016-en.pdf>. [Accessed 1 November 2017.]
- [7] Minister of Finance, Government of Canada, "Building a Stronger Middle Class: Budget 2017," 22 March 2017 [online]. Available: <http://www.budget.gc.ca/2017/docs/plan/budget-2017-en.pdf>. [Accessed 1 November 2017.]
- [8] "Updating building codes in response to climate change," 1 March 2017. [Online]. Available: <https://www.constructioncanada.net/updates-building-codes-in-response-to-climate-change/3/>. [Accessed 1 November 2017.]
- [9] Public Safety Canada, "Public Safety Canada Departmental Plan 2017-18," [Online]. Available: <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/dprtmntl-pln-2017-18/index-en.aspx>. [Accessed 1 November 2017.]
- [10] Environment and Climate Change Canada, "Federal Adaptation Policy Framework," Government of Canada, Ottawa, 2011/2016.
- [11] Public Safety Canada, "Sendai Framework for Disaster Risk Reduction (DRR) 2015-2030," 11 July 2017 [online]. Available: <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgn/pltfm-dsstr-rsk-rdctn/snd-frmwk-en.aspx>. [Accessed 1 November 2017.]
- [12] Waldman, S., Friesen, S. and Verga, S., "Risk assessment methodologies and tools developed at Defence Research and Development Canada's Centre for Security Science," Defence Research and Development Canada, Scientific Letter DRDC RDDC 2017 L205, Ottawa, 2017.

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