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The governance of climate change adaptation in Canada

By D. Bednar, J. Raikes and G. McBean

February 2018



The governance of climate change adaptation in Canada

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Executive Summary

The 2015 Paris Agreement on Climate Change, which has been ratified by Canada and 169 other countries, has two core commitments (United Nations, 2015, 3):

- (a) *Hold the increase of the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change; and,*
- (b) *Increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production.*

The first refers to climate change mitigation, the process of reducing greenhouse gas emissions to reduce future climate change. The second core commitment refers to **climate change adaptation**, defined by the Intergovernmental Panel on Climate Change (IPCC) (2014, 118) as: *“The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.”*

In March 2017, two expert workshops were held in Toronto and Ottawa with participants from government, academia, private sector, and non-governmental organizations on the topic of climate change adaptation and governance in Canada. Particular attention was given to Canada-wide strategies for adaptation, risk reduction, and the intersection between them. This report is the product of those workshops and deals with both adaptation as a set of actions and their governance.

Climate change adaptation is the process of preparing for actual, or projected, changes in climate averages and extremes. Climate change adaptation is considered here in terms of five cyclical stages:

1) identification of climate change hazards and their impacts; 2) assessments of risk exposure and vulnerability; 3) consideration and deliberation of adaptation options;

4) implementation; and, 5) monitoring and assessment of the implemented options. As will be seen, these stages overlap with the responsibilities and interests of a multitude of actors, making the adaptation process complex. Further, all stages of the adaptation cycle rely on interpretations and values pertaining to: what constitutes a hazard; how vulnerability is determined; what are acceptable interventions; and the determinants of success. These issues make adaptation both complex and political in nature. Adaptation is then a ‘cross-cutting’ problem, and the process of identifying the most effective roles for various actors, and the best policy instruments to use to reach certain goals, are not only value-laden, but complex and uncertain.



Recognizing the processes of policy development and program delivery within the structures of Canadian federalism has long been a focus of Canadian policy researchers. Questions surrounding such processes specifically regarding climate change adaptation in the Canadian system have been summarized by Dickenson & Burton (2011, 104): "When a new issue such as adaptation to climate emerges, there is almost always some uncertainty about how the needed policies and actions will be identified, developed, and shared. Important parts of the climate change adaptation (and mitigation) debate still remain unanswered and even unaddressed: who will pay what share of the costs for adaptation of different kinds, in different places and in relation to what risks." Our workshops engaged directly these same processes regarding climate change adaptation.

Broadly speaking, these processes are usually captured by the term 'governance' which denotes how a society attempts to coordinate a response to issues where there are multiple, government or otherwise, organizations that have some form of jurisdictional authority or responsibility. Many large-scale issues facing Canadians have established processes in the federal system, such as various issues in health care, law enforcement, and natural resources management. For these examples, there are relatively well understood 'governance modes' operating, made up of multiple actors across multiple jurisdictions. What is expected of an effective, or appropriate, governance process is that there is general agreement on the roles and responsibilities of actors involved, appropriate instruments, and desired outcomes. No such effective governance mode is currently clearly identifiable for adaptation at a broad scale. There are pockets of effective action, including efforts from numerous actors including Health Canada, the City of Toronto, the City of Mississauga and others, but an overall Canadian approach to adaptation remains unclear.

Review of the workshop data indicated two core findings:

- 1) Building on existing successes, even if presently not connected to one another, will be crucial to furthering effective adaptation governance; and
- 2) Barriers to effective adaptation governance are often structural, but not necessarily insurmountable. Effective coordination of efforts to reduce duplication, increase efficiency, and promote widespread action through all stages of the adaptation cycle are fully possible within current Canadian federalism. However, motivation and expectations in political and economic systems need adjustment.

Other key findings include that there is no single instrument or strategy that solves the climate change adaptation problem. The selection of instruments and strategies spanning across the entire system will, therefore, likely dictate the successes and failures of individual climate adaptation initiatives. Specific instruments and their potential uses are summarized in tables throughout the report. Also of note was that the semantics of adaptation terminology were a topic of significant discussion. Differences in use of words, as well as meanings for the same word (i.e., mitigation, risk, resilience), has led to communication and operational challenges according to workshop participants.

Regarding the various actors and their roles, it was noted that, despite overlap in some of the responsibilities and capacities of federal, provincial-territorial, and municipal governments, there are distinct, and bound, roles each order of government can play in climate change adaptation. The roles for actors outside of government range from acting as independent third parties, to providing cost-benefit analysis, to engaging in adaptation issues and processes as informed participants. These prospective roles are summarized in tables throughout the report.

Another key finding that emerged was the idea that effective governance of climate change adaptation will balance the need for action with the flexibility required to adjust to ongoing changes and unforeseen considerations.

Consistent, yet flexible, may then be an appropriate mantra for the ultimately desired state of Canadian adaptation to climate change.

In discussions of an overall Canadian approach to adaptation, the workshop participants envisioned an evidence-driven approach to adaptation governance that balances regional and sector flexibility with the needs for consistency and standardization, motivated in the Canadian political system of multi-level, multi-sector federalism (and further recognizing the reality of electoral cycles). It was concluded that by building from ongoing examples and success in 'pockets', effective, coordinated, and well-resourced adaptation is possible today. The question then becomes how to make it happen as barriers to such an effective adaptation regime exist, often in the form of unintended institutional limitations. It was stressed by participants that, foremost, adaptation requires justification. Through both sound scientific evidence and democratic mandates, adaptation can likely only move forward when its case is made effectively.

This is not to indicate that adaptation in Canada is not moving forward, however. Participants noted that examples of effective climate adaptation governance and implementation in Canada are growing in number. Municipal examples include the City of Vancouver's climate change adaptation strategy, ongoing efforts within Toronto Public Health in partnership with Health Canada, and consistent activity in the Regional Municipalities of both Peel and Durham. Provincial hotspots of adaptation activity also exist, such as the Pacific Climate Impacts Consortium (PCIC), Ouranos, and the Prairie Climate Centre. In December 2016, Canada's First Ministers agreed on the Pan-Canadian Framework on Clean Growth and Climate Change which includes actions to adapt to current and future climate impacts to help protect Canadians from climate change risks, build resilience, reduce costs, and ensure that society thrives in a changing climate. In October 2017, as this report was being written, the Expert Panel on Climate Change Adaptation and Resilience Results was created by the Federal Government.

In addition to these governmental actors, others are playing roles in the continuing maturity of adaptation governance in Canada. NGOs and arms-length organizations, such as The Federation of Canadian Municipalities (FCM), Institute for Catastrophic Loss Reduction (ICLR), the Intact Centre on Climate Adaptation (ICCA), and The International Council for Local Environmental Initiatives (ICLEI) Canada, play a key role in fostering networks, sharing information and experiences between actors, and even providing climate services in some cases. Industry associations and private sectors, along with non-governmental organizations (NGOs), provide tools or guidelines for vulnerability assessment and implementation, as well as basic information packages on adaptation. Internationally coordinated science is also contributing to our knowledge and practices of adaptation. As efforts in government, the private sector, and among researchers continue to provide more information and evidence of what does and does not work, visions of effective adaptation governance are taking shape.



In moving forward, it was also noted that climate change action needs to be understood as both the mitigation of greenhouse gases and the adaptation to impacts. For much of the past decades, a traditional approach prioritized mitigation while adaptation was addressed with some reluctance, in part, due to misunderstandings of adaptation's definition, who is responsible, and how to implement. As impacts increase and the need to thrive in their presence becomes more evident, adaptation is emerging as a formidable partner of mitigation in public discourse.

This report provides not only a state-of-play on adaptation governance in Canada, but also an effective introduction to the issues at its core. The insights of the expert workshop participants, as well as the additional research, provide a valuable reference document and resource for practitioners throughout Canada.

It is clear now that for Canada to adapt and thrive in the face of climate change, there is an onus, a shared responsibility, of all Canadians to do their part. As we move towards 2°C of warming, impacts will increase, surprises will emerge, and opportunities will present themselves. Hopefully, by that time, Canadians will have identified a best path forward.

Preface

Structure and Purpose of the Report

The Governance of Climate Change Adaptation in Canada examines issues of climate change adaptation and governance based on the outcomes of two expert workshops, held in March 2017, and associated literature reviews. It also provides Canadian adaptation practitioners an overview of adaptation governance through an introductory chapter on the subject. The rest of the report deals with the outcomes of the expert workshops as follows: Chapter 1 outlines ‘components’ of effective governance; Chapter 2 addresses barriers to adaptation; Chapter 3 explores the use of ‘instruments’ in climate change adaptation; Chapter 4 outlines the potential roles of various actors in Canadian climate change adaptation; and, Chapter 5 provides a short summary and conclusion. Where necessary, references are provided for context. Further, each chapter ends with a selection of readings that may interest adaptation practitioners and researchers.

Format of the Workshops

Workshops were convened in Toronto, Ontario on March 3, 2017 and in Ottawa, Ontario on March 6, 2017. Experts in the field of climate change adaptation were invited, as well as upper level officials from major adaptation-related ministries in the Ontario provincial government and the Federal Government. Fifteen of Canada’s leading adaptation practitioners took part in the workshops, representing decades of experience in the field and comprising some of Canada’s leading figures on the issues of climate change and environmental policy. Attendees included¹:

Toronto, Ontario, March 3, 2017

Carol Mee, Toronto Public Health

Chandra Sharma, Toronto Regional Conservation Authority

Ian Burton, University of Toronto

John Godfrey, Ontario Ministry of the Environment and Climate Change (former federal Minister and MP)

Kathleen O’Neill, Ontario Ministry of the Environment and Climate Change

Mel Cappe, University of Toronto (former Clerk of Privy Council and Deputy Minister of Environment Canada)

Paul Kovacs, Executive Director, Institute for Catastrophic Loss Reduction

Susanne Jakobsen, Ontario Ministry of the Environment and Climate Change

Ottawa, Ontario, March 6, 2017

Brian Kelly, Region of Durham

Devin McCarthy, Canadian Electricity Association

Ian Burton, University of Toronto

Mary-Ann Wilson, Natural Resources Canada

Meagan Brettle, Health Canada

Peter Berry, Health Canada

Ryan Schwartz, Environment and Climate Change Canada

¹ Invited participants from Aboriginal Affairs and Northern Development Canada were unable to attend due to unforeseen circumstances.

Workshops were facilitated by Professor Gordon McBean, Danny Bednar, and Jonathan Raikes. Brief presentations were delivered by McBean and Bednar on the impacts of climate change in Canada and adaptation governance, respectively. The discussion period included two components. The first component asked practitioners to build off their experience in order to visualize the effective governance of adaptation. The questions in Discussion 1 were as follows:



Question 1: Based on your experience and professional insight, in conceptualizing an effective form of governance for climate change adaptation in Canada, what components do you see as being present?

Question 2: Going through this list of the components of an effective form of governance for climate change adaptation, which actor(s) might be able to, or perhaps should, provide these components?

Question 3: Going through the list of actors we've discussed and the roles they may play in the governance of climate change adaptation, what kind of mechanism (tools, policy instruments, programs, projects, etc.) could be used to develop, or deliver components of effective adaptation governance?

Discussion 2 focused on barriers to the components of effective governance, as well as potential strategies for overcoming the identified barriers. The questions in Discussion 2 were as follows:

Question 1: In exploring the visions we have identified for effective forms of adaptation governance in Canada, in the instance that these components are yet to manifest, what barriers can be identified that prevent progress on effective governance?

Question 2: What strategies could be put forward to overcome these barriers?

Data from the workshops in the form of whiteboard images and notes were reviewed and coded in order to develop key themes. The Introduction, Chapter 1 and Chapter 4 are authored by Bednar, Raikes and McBean. Chapters 2 and 3 are authored by Raikes, Bednar and McBean. The draft report was then sent to all workshop participants and their comments requested. These comments were then used to prepare the final report along with comments from other adaptation practitioners. All authors (Bednar, Raikes and McBean) were involved in the editing and formatting process.

Introduction – Adaptation and Governance

Summary

- *Climate change adaptation is a complex process of preparing for actual or projected changes in climate averages and extremes. This process generally takes place in five stages. These stages overlap with the responsibilities and interests of a multitude of actors, making the adaptation process complex.*
- *Governance is the means by which a society attempts to coordinate a response to particular issues. The governance of climate change adaptation is complicated by the presence of multiple actors, uncertainty, and the relative novelty of anthropogenic climate change as a problem.*

What is Climate Change Adaptation?

Over the past two decades, the challenge of climate change adaptation has emerged as a complex set of issues facing public policy-makers. The most common definition of adaptation can be found in the Intergovernmental Panel on Climate Change's (IPCC) most recent assessment report:

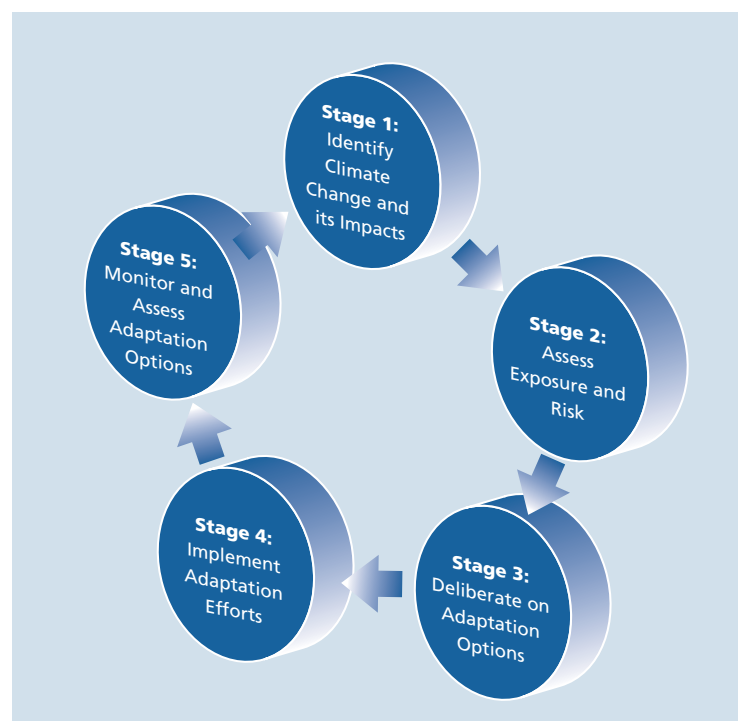
“The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects” (IPCC, 2014).

A changing climate is characterized by both variations in average climate conditions as well as climate-related extreme events. Were anthropogenic forces not at play, this process of human adaptation to a variable climate would still be undertaken, but due to the relative speed and intensity of current human-induced climate change, the need to identify and react to climate change has become paramount.

The Five Stages of Adaptation

Climate change adaptation can be viewed through a series of stages (Bizikova et al., 2008; Carlson, 2012; ICLEI, n.d.) (see Figure 1). The first stage is **recognizing climate change and its impacts**. The main goal of this stage is to identify relevant ongoing, and projected, climate change and its impacts over a given spatial area. Specific impacts may include altered seasonal temperatures, new precipitation averages, and events such as intense rainstorms, heat waves, drought, and sea level rise, among others. Such a stage then takes into

Figure 1: The Five Stages of Adaptation



consideration both changes in climate averages and climate-related extreme events in any one area. In Canada, national assessments of expected impacts have been conducted previously by Lemmen et al. (2008) and Warren & Lemmen (2014).

The second stage of adaptation is characterized by **assessments of vulnerability, exposure, and risk**. In this stage, the expected impacts of climate change on systems within a region or sector, as well as at the individual level, are assessed. For example, a health sector-specific approach has been used at the national level by Health Canada (Seguin, 2008), and at local levels by the City of Toronto (Gower et al. 2008), to identify how Canadians' health and health care systems may be vulnerable to climate impacts. Each actor in a society, from a national government to the individual citizen, interacts with systems to be impacted by climate change and various provincial, territorial and local governments in Canada have undertaken sector-specific or regional vulnerability assessments of some form (ICLEI, 2016). For a private firm, vulnerability assessment may include exploring impacts on supply chains, labour conditions, or consumer demand. Individual citizens can identify their own vulnerability, exposure and risk as well.

However, the capacity to identify impacts and assess vulnerabilities is not equal across actors. This stage of adaptation can be particularly expensive or resource consuming. Considerable funds or expertise are often required to acquire data and deliver products that can identify risk with some level of confidence. Further, even when vulnerability and exposure are effectively identified, those affected do not necessarily have the capacity to adapt by moving forward with that information. The issues of the relationship between vulnerable populations, those who assess vulnerability, and those who implement adaptation measures are key components of adaptation governance (i.e., who does what), and will be revisited throughout the report. Currently, multiple technical tools exist to help government and private practitioners alike identify vulnerability, exposure, and risk, depending on the sector, system or place being considered. For example, Engineers Canada's PIEVC tool deals specifically with infrastructure assessment (Engineers Canada, 2017).

The third stage of climate change adaptation is the **deliberation** of adaptation options. A single impact or vulnerability can be addressed in a multitude of ways. In policy circles, these can be understood as different 'policy instruments' (Henstra, 2015). For example, a local government that recognizes an increased likelihood of extreme hot days (days above 30° Celsius) could take a regulatory approach and invoke bylaws (a regulatory instrument) requiring landlords to provide means to keep homes below a specified temperature in the summer months. However, regulation is only one type of policy instrument; a more market-based approach could be invoked in which low-income homeowners and tenants are provided subsidies for implementing cooling strategies, such as tree shading, air conditioning, or window screens. In many instances, instruments may already be in effect but simply need updating to adapt to climate change. For example, in London, Ontario, building owners are required to maintain a minimum temperature of 20° Celsius between September 15 and June 15 (City of London, 2014). Currently, there are no requirements regarding cooling in the summer, but both the date ranges, and an additional focus on cooling in such bylaws may require review as municipalities face a changing climate and increased heat risks. Deciding which tools to use is a complex and value-laden process, and it is, of course, ideal if the deliberation process is as open and transparent as possible.

The fourth stage of climate change adaptation is **implementation**. This entails operationalizing the policy instruments identified in the deliberation stage. Implementation is the stage of adaptation that is traditionally the 'sticking point' for many actors (Dupuis & Knoepfel, 2013). Mimura & Pulwarty (2014, 871) note that 'institutional dimensions' can provide a significant challenge to an actor moving from planning or deliberation to implementation. As will be discussed below, these institutional dimensions, such as having requisite jurisdiction and necessary resources, are fundamentally questions of governance. Implementation, along with assessment, has long been under-represented in adaptation literature and practice (Berrang-Ford et al., 2011).

The fifth and final stage of climate change adaptation is **monitoring and assessment**. Monitoring implies that the programs operationalized are reviewed for their success in creating resilience to climate change impacts or reducing vulnerability to climate risks (depending on the lens). Few jurisdictions are at this stage, and globally there are limited examples of concrete adaptation programs evaluated for their success in either fostering resiliency or reducing vulnerability (terms themselves that are difficult to quantify) (Dupuis & Knoepfel, 2013). Assessment will necessitate further deliberative processes of identifying successful components of the adaptation initiative, as well as any needed adjustments. As in the case of adaptive management practiced in natural resources management, the climate change adaptation process will become both iterative (learning as you go) and cyclical (without a necessary end), as reviews of progress and new information on impacts may lead to new vulnerability assessments and deliberation stages.

Adaptation: Political and Complex

The stages of climate change adaptation, like most other problems in society, are defined via the prioritization of values, identification of harm, and the determination of solutions. As a result, adaptation is a political process. Here, two distinct uses of the term political should be clarified: 1) the use of the term in reference to the activities, and differences, of political parties; and, 2) the process by which differing values negotiate social order. Adaptation is referred to as political here in the second sense, in that it is linked to value-driven decisions. Identifying impacts and vulnerabilities both depend upon the perspectives and values included in the process, as well as how notions of resilience or vulnerability are measured (Noble & Huq, 2014, 841-2). Beyond financial enumeration, there are aspects of vulnerability and resilience in social and ecological systems that are not easily measurable. To be identified, many of these aspects require input from stakeholders who may or may not have, or be provided with access to the adaptation process.

Within the deliberation, or planning stage, the choice of instruments is also political (O'Brien, 2009). For example, in climate change mitigation governance there exist debates on regulating greenhouse gas emissions versus the use of economic tools such as taxes or cap-and-trade markets. Each tool is aimed at achieving the same goal, but they have differing consequences for different actors and values. This same discussion of regulation versus market measures is occurring in areas of adaptation as well, but it is arguably less documented and certainly more diversified given the wide-ranging processes labelled as climate change adaptation (Thompkins & Eakin, 2012). Nevertheless, challenges remain in addressing whether particular adaptation measures should be mandatory, voluntary, market-based, or some combination thereof. The implementation process is inherently tied to the deliberative process, as well as relies on financial support often at the behest of elected officials.

Finally, the monitoring and assessment stage depends largely on agreed upon metrics for either vulnerability or resilience performance. In the absence of such metrics, monitoring or reassessment are likely not possible. Such metrics, however, are also inherently political with defining progress in reducing vulnerability or increasing resilience being a highly value-driven process (O'Brien, 2009).

Adaptation then is a political process – it relates to questions of how we govern, as a society, a particular issue or problem (or more accurately a series of related problems). Adaptation can also be called a ‘cross-cutting’ problem with a need for some form of coordination. While coordination for policy matters is not new – many policy problems cross into the responsibilities of multiple sectors and ministries – the problem of adaptation itself is comparatively novel. In other cross-cutting problems, such as issues within health, economy, and law enforcement, there are identified lead organizations, relatively accepted roles of different actors, and agreed upon policy instruments. In many sectors, and pertaining to many impacts, adaptation lacks such clarity due to its novelty. In recent years, there has been considerable attention paid to such issues (values and coordination) by adaptation practitioners as they identify barriers and challenges to advancing through the adaptation cycle (Klein et al., 2014, 917).

Addressing both these issues of the political nature of adaptation and its complexity has led to the merging of the fields of adaptation and governance (or a growing discussion of adaptation governance). As Figure 2 denotes, answering questions of governance depend on the governing structure in place (such as federalism), as well as one’s values.

Figure 2: Basic questions of governance

Governance		
Who does what?	With which tools?	Through which kind of relationships?

What is Governance?

Like adaptation, the term governance itself can be ambiguous as it applies across various fields and contexts. Pierre & Peters (2000) identify two prominent ways in which the term governance is applied. The first refers to governance as an evolution of the political arena over the past 50 years in western developed nations. In this sense, the phrase ‘from government to governance’ is often evoked to imply that public policy now emerges from complex landscapes of both government and non-government actors. The second refers to the more historical use of the term, as simply ‘how a matter is governed’. This second use of governance is the one applied here. Governance, in this understanding, is often described as the ‘**coordination of social life**’, meaning the agreed upon means by which a society addresses a matter of public interest. Often, the coordinator in this ‘coordination of social life’ is a government, though this does not mean that in talking about governance one is simply talking about what the government does. Identifying how a matter is governed (its **mode of governance**) involves understanding the relationships of significant actors involved, as well as the instruments being used to try to achieve some sort of end. Nonetheless, even in a multi-actor world, the role of governments is still crucial to discussions of governance, as governments are the democratically accountable ‘rule setters’ for all other actors in the governance arena.

Governance is often presented as emerging and operating in four ideal forms (Table 1): hierarchy, market, network, and community, each with unique roles for actors, preferred instruments, and directions of authority (i.e., relationship between actors). In practice, only mixes tend to govern most issues, though predominant components of ideal types are often identifiable. Thus, the ideal modes do not tend to exist in exactness, but are used as conceptual tools for comparison and analysis.

Table 1: Ideal Modes of Governance (modified from Hall, 2011 & Bevir, 2012)

Modes of governance – Ideal types				
	Hierarchy	Market	Network	Community
Direction of authority	Top-down	Circular (supply and demand)	Horizontal	Bottom-up
Initiating actors	Federal government, Provincial government, Local government	Government and market actors	Governments, Private sector, Non-government experts	Citizens, Community groups, Neighbourhood associations
Dominant policy instruments	Regulatory and legislative instruments	Supply and demand – government market intervention	Negotiated agreements, Codes of practice, Voluntary programs	Self-regulation, Voluntary participation
Implementing actors	Federal government, Provincial government, Local government	Market actors	Governments, Private sector, Non-government experts	Citizens, Community groups, Neighbourhood associations

As will be discussed, the governance of climate change adaptation is in nascent stages around the world, as well as in Canada. Admittedly, all fields of public policy (or matters of governance) can suffer from ineffective, or confusing, governance at times, but many important issues with impacts as significant as climate change (communicable diseases, terrorism, or poverty) have evolved in fields of public policy to a point where actors know the ‘rules of the game’, even if fierce contention still exists regarding those rules (relations, roles, instruments). An effective consensus is lacking on issues such as modes of authority or relationships, actor roles, and policy instruments for climate change adaptation (Huitema et al., 2016). This has led to a discussion of **‘governance barriers’** to adaptation implementation (Klein et al., 2014, 916-917), the instance in which a lack of clarity, or consensus on governance features, limits the ability for adaptation initiatives to move forward. Questions which can emerge from this lack of clarity are presented on page 12.



Common questions surrounding the governance of climate change adaptation:

Relations & Roles

- Is the government the lead actor throughout all five stages of adaptation?
- If government is the lead, which level of government?
- Who should be involved in each stage of adaptation? If everyone, who does what?
- Can non-government actors lead adaptation?
- Who should coordinate adaptation efforts so they are efficient and non-duplicative across sectors, regions or impacts?
- Who should coordinate adaptation efforts so that they don't harm others' ability to adapt?

Instruments

- Should governments regulate our way to preparedness?
- Can market incentives address all vulnerabilities?
- Should adaptation be voluntary and based on best practices?
- Can we just do a mix of all three of the approaches above?
- What if the desired instruments of local, provincial or federal governments differ?
- In which sectors do we use which instruments?
- For which impacts do we use which instruments?
- Do different regions need different instruments for the same impacts?
- Do different regions need different instruments for the same sectors?

Conceptualization

- Do we approach adaptation by sector, impact, or region? Or all three?
- What if desired approaches of local, provincial and federal governments differ?
- What if the desired approaches of different sectors or industries differ?
- What if an approach works for one type of climate impact, but not another?
- If adaptation approaches vary by impact, sector and region, how will it be coordinated or standardized?
- Does adaptation in different sectors and regions need to be coordinated and standardized?
- If it differs on a case-by-case basis, should adaptation simply occur in pockets where it is needed without any coordination or 'grand strategy'?

International Research on Adaptation Governance

The state of adaptation governance was summarized in 2014, as part of the Fifth Assessment report of the Intergovernmental Panel on Climate Change in which the authors of Chapter 15 'Adaptation Planning and Implementation' stated:

"As adaptation activities progress, many challenges have emerged...the roles of multi-level governance [have] become an issue, such as horizontal coordination among different agencies and departments and vertical coordination of various stakeholders from regional, national, to local actors" (Mimura & Pulwarty, 2014, 873).

In order to better understand how this complexity became known, a number of key international case studies are summarized below.

Looking at adaptation from the local level, Amundsen et al. (2010, 285) conducted surveys with Norwegian municipalities and found that as the central actors of adaptation, municipalities were constrained by a lack of local expertise on adaptation issues and an unclear role for local institutions. The authors found a strong desire from local authorities to have responsibilities clarified by national authorities. In their conclusions, Amundsen et al. (2010) agree with the suggestions of a similar study by Measham et al. (2011, 903) who also pointed to a lack of direction from higher levels of government as making it difficult to prioritize local adaptation. Measham et al. (2011), in their analysis of Australian municipalities, found that among local governments, adaptation was not seen to be as important as mitigation. It was also identified that without the legal or political mandate to alter local planning efforts, adaptation interests were 'out-competed' by other local priorities (Measham et al., 2011). While these studies make the case for upper-level governments as having the capacity to remove barriers, Urwin & Jordan (2008) found, that neither a top-down or bottom-up approach of exploring policies fully explained the barriers to adaptation through what they call 'negative policy interplay' in the United Kingdom (when policies at other levels of government undermine adaptation initiatives). Thus, it may not be simply a matter of top-down clarification, but also bottom up efforts to influence, or synchronize with, higher levels.

When viewing adaptation at the national level, Juhola & Westerhoff (2011) identified that the different approaches by national level governments in Finland and Italy did not necessarily affect local activity on adaptation. Finland's national government applied a **mainstreaming** approach to adaptation via a 2005 National Adaptation Strategy (NAS), which identified responsibilities for each sector at the federal level (mainstreaming is the process by which adaptation is added to existing operations across an entire system) (Juhola & Westerhoff, 2011, 242). The Finnish NAS provided directions to the regional government's environmental agencies, but no legal or legislative mandate was attached. Further, the Finnish NAS did not extend to the local governments or address local responsibilities or adaptation measures (Juhola & Westerhoff, 2011, 242). As a result, some local Finnish governments were engaging in other adaptation networks not directly tied to the national strategy that they felt they had been left out of. In Italy, there was no formal national adaptation strategy in place, much like in Canada at the same time, and the national government focused more on adaptation research than programming. As was the case in Finland, local governments in Italy then sought out European and international networks of adaptation action in the absence of national level engagement. While the authors note the value of autonomous adaptation at the local level, they suggest a potential weakness in not creating formal structures at the national level to engage local governments (Juhola & Westerhoff, 2011, 245).

Adaptation governance literature also focuses on issues of coordination within large networks, especially when adaptation initiatives are characterized by many different actors beyond a simple national or local divide. Reflecting on the network mode of governance in Swedish adaptation, where tasks are decentralized and include numerous government and non-governmental partners, Carlsson-Kanyama et al. (2013) conclude the following:

“We encountered barriers caused by a wide array of decision makers: from those located at the local and regional level to those located at the national and international level. It seems that some of the developments in society, such as an increasing degree of out-sourcing, privatisation, specialisation and conglomeration, have the effect that tasks formerly managed by the municipalities are now taken care of by external decision makers. This is a challenge to local climate change adaptation and demands new strategies and improved competence in municipal planning as regards to procurement and negotiations” (17).

Questioning whether smaller local-level governments will have the capacity to steer these broad networks of non-state actors, Carlsson-Kanyama et al. (2013, 17) suggest that sub-national and national level governments will need to recognize the interdependencies found in local adaptation networks and play some role in fostering progress and coordinating efforts to reduce redundancy, maladaptation, or complete loss of local government autonomy.

As can be seen, the question of top-down vs. bottom-up, and the issue of complex networks have been explored around the world. However, there have been other insights in adaptation governance as well. In a recent special feature of the academic journal *Ecology and Society* dedicated entirely to the topic of ‘The Governance of Adaptation,’ Huitema et al. (2016) conclude the following ongoing and emerging trends:

- 1) It is unclear whether a broad/holistic approach to adaptation (whole of government) is more effective than targeted initiatives with specific goals (e.g., assure water quantity and quality in agriculture sector);
- 2) Much attention in research and policy has been on the local level, and more exploration is needed to understand the role of national and sub-national governments in adaptation;
- 3) Both governments and private firms appear to be favouring a ‘wait-and-see’ approach, with only limited interest in long-term visions;
- 4) A market approach appears to be the most common set of instruments applied to adaptation, and there is a need to explore the value of state intervention to avoid externalities and maladaptation in private sector driven adaptation;
- 5) Issues of procedural, distributional, and social justice are largely absent from adaptation processes, even when vulnerable communities are identified;
- 6) It is still unclear what successful adaptation looks like, and insights into the implementation stage are lacking empirically.

It is clear that the question of governance is central to the problem of climate change adaptation. The emergence of governance issues may, at the end of the day, come down to the realization that while impacts are local, adaptation is not (at least not entirely). What is known is that **adaptation is complex**. What is not known is how to move forward. The international research on adaptation governance also shows that the amount of empirical evidence and insights decreases along the stages of adaptation from impact identification to vulnerability assessment, to deliberation, to implementation, and finally to monitoring and assessment. In short, the further along the stage, the less evidence we have of what has worked.

Canadian Research on Adaptation Governance

One of the first explicit discussions of adaptation governance in the Canadian context was from Dickinson & Burton (2011). Through analysis of existing efforts at the time, the authors note a patchwork of adaptation taking place at local and regional levels, with no overarching approach from a national level. They describe adaptation governance in Canada as an “evolving mosaic” with unclear consequences. While much adaptation research in Canada had touched on issues of governance, Dickinson & Burton (2011) was unique for its unambiguous questioning of how the new problem of climate change adaptation would fit into Canadian federalism:

“When a new issue such as adaptation to climate change emerges, there is almost always some uncertainty about how the needed policies and actions will be identified, developed, and shared. Important parts of the climate change adaptation (and mitigation) debate still remain unanswered and even unaddressed: who will pay what share of the costs for adaptation of different kinds, in different places and in relation to what risks” (104).

While progress has been made on some of these questions since 2011, as evidenced by the above section on international research, it is possible that even more questions have emerged than answers. The rest of this section focuses on recent Canadian scholarship that has addressed various governance-related questions.

Exploring barriers to adaptation in three Lower Mainland municipalities in British Columbia, Burch (2010) interviewed adaptation practitioners and developed a typology of barriers to adaptation, as well as strategies for overcoming them. The three general categories of barriers identified by Burch (2010) are regulatory, structural, and behavioural. As does this report, Burch (2010) proposes strategies for overcoming these barriers. Most relevant to issues of governance are the strategies proposed to overcome regulatory and legislative barriers, such as higher standards imposed by provincial governments; recognition of regional planning by provinces; a federal role in removing market barriers to green technology; and funding for adaptation from provincial governments. Where Burch (2010) examined data only from municipalities in British Columbia, consistent findings have been identified elsewhere. Notably, Henstra (2012) found that adaptation efforts were limited by governance issues related to jurisdictional authority and funding in both Toronto and Halifax. Both studies suggest that adaptation planning needs to carefully consider the necessary roles of higher-level governments in facilitating local adaptation.

Analyzing the outcomes of the regional adaptation collaborative program operated by Natural Resources Canada (NRCAN), Bauer & Steurer (2014) argued that the federally led program represented, at the time, a novel approach to adaptation which facilitated opportunities and capacity. Through interviews with Canadian adaptation practitioners and analysis of key documents, the authors contrasted the Regional Adaptation Collaboratives (RACs) with national programs in England. The authors described the NRCAN RACs as ‘top-down’ in function and relying heavily on government actors, whereas they described the English program as more pluralistic and ‘bottom-up.’ Bauer & Steurer conclude that the Canadian experience with the RACs was a mix of hierarchical and network approaches to governance, meaning there was some plurality of input, within an overall ‘top-down’ structure. This mix of network and top-down approaches is perhaps the most commonly found mix in adaptation research. Related, much of the adaptation research community argues that network approaches are the ideal path forward (Baird et al., 2014), though there is little empirical evidence that network-dominated governance modes are any more effective than those more heavily influenced by hierarchy, market or community approaches.

Exploring the argument that networked approaches are how adaptation should move forward, Baird et al. (2014) argued in their case study of the Niagara region that adaptive co-management (ACM) (a form of, or precursor for, network governance) was potentially an ideal means of addressing adaptation issues. In ACM, local knowledge of vulnerabilities, values, and impacts are combined with technical analysis to foster an inventory of community needs for adaptation. Like many networked approaches, the process aims to engage local stakeholders and involve them in a continuing adaptive process. Baird et al. (2014) and Baird et al. (2016) describe the process by which networks of adaptation practitioners and stakeholders were facilitated in the Niagara region to identify if it would lead to effective adaptive actions through ACM. The authors conclude that a networking approach alone was not sufficient to lead to effective ACM and adaptation progress. The authors identified lack of funding as well as disparate interests and perspectives as the potential reasons for these results. Notably, these are known, and long discussed, limitations to network modes of governance (Bevir, 2012).

Finally, in reviewing both NRCAN's regional adaptation collaboratives (RACs) and National Adaptation Platform, Wellstead et al. (2016) identified both strengths and weaknesses in the programs from a governance perspective. The authors noted both programs were highly successful in generating information about impacts and vulnerabilities, as well as promoting adaptive capacity (adaptation stages 1-2). However, they point out that the real challenge for climate change adaptation in Canada is in furthering instrument choice, implementation, and assessment strategies (stages 3-5). The authors conclude a well-accepted reality in the climate change adaptation community, that climate change information and adaptive capacity does not necessarily lead to adaptive action.

There is still much to do regarding adaptation research in Canada. Notably absent has been significant advancement from scholars addressing Canada's Indigenous and First Nations communities, as well as remote northern communities. While effective research into impacts and vulnerability in First Nations communities has been undertaken (Ford et al., 2007; Ford & Pearce, 2012), an explicit exploration of adaptation governance in Canada and Indigenous communities is less advanced.

In October 2017, as this report was being written, it was announced that there had been creation of the Expert Panel on Climate Change Adaptation and Resilience Results, chaired by Dr. Blair Feltmate, Head of the Intact Centre on Climate Adaptation at the University of Waterloo. The panel will include representatives from academia, the private sector, non-governmental organizations, as well as Indigenous and youth organizations. The panel will engage with provinces and territories and help define how to measure progress on federal, provincial, and territorial adaptation efforts in building resilience to climate change. By spring 2018, the panel will propose a suite of indicators to measure progress on adaptation and climate resilience and will focus largely on developing adaptation indicators for assessment.

This chapter has introduced basic concepts of climate change adaptation and governance, as well as provided a background on international and Canadian research on the topics. The following sections provide descriptions of the insights gained from the workshop process regarding visualizing effective governance (Chapter 1), barriers (Chapter 2), mechanisms and instruments (Chapter 3), and actor roles (Chapter 4).

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Chapter 1 – Components of Effective Adaptation Governance

Summary

- *Effective governance of climate change adaptation will balance the need for action with the flexibility required to adjust to ongoing changes and unforeseen considerations. Consistent, yet flexible, may be an appropriate mantra for the ultimately desired state of Canadian adaptation to climate change.*
- *Adaptation requires justification. Through both sound scientific evidence and democratic mandates, adaptation can move forward when its case is made. Further, economic arguments about the costs of not adapting will be a driving component of effective adaptation governance.*

Explorations of what effective governance might look like were meant to address participants' experiences and engage their visions of the future.² This initial discussion was carried out as a sort of visioning exercise, a method used in many environmental and planning studies to identify preferences among experts or local stakeholders by describing a more idealized future (Dreborg, 1996). In exploring what the effective governance of climate change adaptation would look like, four broad categories emerged: motivations, resources, design process, and design outcome. These categories are not too distinct from traditional views of the policy development cycle of agenda setting, formulation and selection, implementation, and monitoring, or the five stages of adaptation discussed earlier. The purpose of this chapter is to present and describe the ideas that emerged from the workshops in order to further the engagement by Canadian adaptation practitioners in governance issues.



Highlighting how difficult of a term 'governance' can be, an initial discussion emerged as to whether governance necessitates coordination. As discussed in the introduction, governance is a distinct term from government. Governance reflects the conceptualization of how an issue is dealt with by a society. Some visions of effective governance may include little government action, and even little coordination from any authoritative entity. Discussion also emerged regarding whether all that fits under 'adaptation' could ever fit into an identifiable practice. It is important to note that from the governance perspective, whatever the role of various actors, how an issue is addressed by a society entails a 'mode of governance'.

Table 2 summarizes the components of effective adaptation governance that emerged from the workshop process. It is recognized that they may not be exhaustive. Through the remainder of the chapter, each entry is summarized.

² Some of the components of effective adaptation governance reported here may conflict with others reflecting the diversity of opinion at the workshops and within the adaptation community. This list, as with all the lists in this report, is meant as a reflection of considerations, options, and opportunities within adaptation.

Table 2: Components of Effective Adaptation Governance Identified in Workshops

Required motivations	Required resources	Process	Outcomes
Science-Based Evidence	Funding	Collaborative	Flexibility
Knowledge of Impacts and Vulnerabilities	Knowledge of Impacts and Vulnerabilities	Equitable	Avoiding Maladaptation
Budgetary Requirements	Knowledge Sharing Outlets	Informed by Experts	Bounded Objectives
	Access to Innovative Technology	Multi-sector	Communicated Responsibilities
	Public Support	Multi-level	Consistency
		Place-Sensitive	Coordinated Funding
		Non-Duplicative	Mainstreaming
			Political Resilience

Motivations

Science-Based Evidence

A general principle necessary for climate change adaptation is ‘evidence-based policy making’. Fundamentally, the communication of credible projections of climate impacts from major government, NGO, and academic scientists is needed in order to overcome a lack of awareness or complacency towards adaptation. All proposed or promoted adaptation options should be scientifically vetted whenever possible and appropriate. Empirical evidence needs to drive the adaptation process and be used to self-assess adaptation efforts. This can help avoid maladaptation by identifying the impacts of adaptation options themselves. Thus, suggestions about changes to infrastructure, natural systems, or behavioural actions should be consistent with current understandings in engineering, ecology, and health sciences, among others.

Knowledge of Risks

For there to be any visions for what adaptation may look like, as well as how to coordinate the achievement of it among various actors, the risks must be known. Risk here is defined as a function of the exposure to climate change, the vulnerability of peoples, and the degree to which society is engaged in managing the impacts of climate change (Uitto & Shaw, 2006). It is possible that individual actors, whether private citizens, industry firms, or even governments will be self-motivated to adapt once they are aware of their risk. An important caveat, however, may be that any actors must be aware of not only risk, but also the differential cost between adapting and not adapting (i.e., the risk of climate impacts and the risk of not adapting). Whether this cost is presented financially or otherwise, it is thought that actors will be most motivated by a known difference between adapting versus not adapting.

Budgetary Requirements

A relationship between budget approval for government departments and required attention to climate change may be a viable means to ensure that future climate impacts are considered in ministry or division activities. At the federal level, this may include adaptation being mandated as a key priority by a centralized agency such as the Treasury Board of Canada or the Department of Finance (discussed further in Chapter 4). The general notion here is that adaptation might be incentivized within government, or private firms, by mandating it in budgetary proposals across the system, or in relevant areas.

Resources

Funding

Effective adaptation, regardless of how it is organized (i.e., governed), needs both stable and adequate funding. Stability is particularly important where programs can go through difficult design and deliberation processes only to be altered or cancelled by new administrations. Currently, adaptation is often considered to be underfunded, reflective perhaps of its lack of presence within public and political discourse (though this is slowly changing). Entities producing impact scenarios and undertaking vulnerability assessments, at any level of government, require the funding to develop and run climate models, hire consultants or staff, and develop supporting products, including websites and documents. Similarly, governments require funding for the delivery of adaptation programs and initiatives that evolve from those impact scenarios and vulnerability assessments. In short, all stages of the adaptation cycle will incur costs and will need up-front funding. An important point of contention remains whether there ought to be a dedicated funding process for adaptation programs and agencies or, conversely, whether adaptation should be mainstreamed into existing agencies and funded through individual ministry budgets.

Knowledge of Impacts and Vulnerabilities

There is ongoing discussion as to how much information is needed to justify adaptive actions, especially because impacts will never be known with certainty (Vink et al., 2013). It is reasonable to expect practitioners to resist expensive or disruptive change in the face of ambiguity, and some level of confidence should be provided. Within this discussion, a major focus has been on the availability of so-called 'downscaled' data, meaning information about a city or region is extrapolated from regional or global climate models which are designed to show trends on a much larger geographical scale (Noble et al., 2014). While some larger cities, such as Toronto, can afford independent climate projections from private consultants, smaller municipalities do not have such resources (Raikes & McBean, 2017). Financial or human costs of climate impacts must be understood to some reasonable level in order for elected officials and the public to accept adaptation programs.

Knowledge Sharing Outlets

Access to information about climate change impacts and adaptation options is uneven amongst actors in Canada. Therefore, it is beneficial for knowledge sharing to be promoted between adaptation practitioners. On the climate impacts side, this is necessary given the aforementioned discrepancy between access to high quality or downscaled climate data. Further, while upper-level governments may be producing climate observations and projections, the interpretations of such information (such as turning it into useable products), or the application of it to particular local scenarios may require networking between local personnel and experts outside of government or at different levels.

Given the mosaic of adaptation initiatives in Canada (Dickenson & Burton, 2011) experiences with various programs or experiences need to be shared across the country to enable practitioners to repeat the success of others or to learn from their limitations. Knowledge sharing can take place within boundary organizations, government, or at conferences that include academics, industry, non-governmental organizations and government sectors. Boundary organizations are typically organizations *“associated with the deliberate mediation, translation and communication between the two social worlds of science and policy in order to produce legitimate, salient and credible knowledge to solve policy problems”* (Dannevig & Aall, 2015, 169). While boundary organizations are often non-governmental, there may also be value in a centralized, common governmental outlet in order to avoid duplication and silo adaptation communities. Current efforts to connect adaptation practitioners, such as the Prairie Climate Centre, the Pacific Climate Impacts Consortium, and Ouranos, have made significant strides in recent years and will be crucial to future adaptation governance.

Access to Technological Innovation

A number of climate impacts will create stress on existing physical systems and infrastructure. Participants noted that effective adaptation governance is able to identify and connect innovation with needs, specifically in the application of new technologies in order to address climate risks in infrastructure and physical systems. This may mean, for example, the development or use of new technologies for updating existing public infrastructure for electricity production and distribution. Adaptation may only be successful where there is active investment in the science and engineering tools needed to address new challenges, or access to recent innovations nationally and globally. Accordingly, those in the early stages of climate change adaptation should be encouraged to look to emerging technologies outside of the realm of traditional materials or means; pathways between emerging technologies and adaptation requirements should be nurtured.

Public Support

Adaptation does not occupy the same place in public and political discourse as climate change mitigation. While not a conventional resource in the way of funding or personnel, broader awareness of the issue amongst the public would be a valuable aid in effectively accessing other, more traditional, resources (such as funding or development of new technologies). Further, depending on the policy instruments used, adaptation will require significant public and stakeholder buy-in to be successful (especially where taxation or regulation is used). While it is necessary that credibly sourced risk information is made available to public servants and elected officials, it is equally important to ensure that the public is aware of the potential impacts of climate change.

Design Process

Collaborative

The desirability of a networked governance approach to climate change adaptation remains strong (Baird et al., 2014; 2016). As opposed to government command and control, or purely market approaches, adaptation is often thought to rely on networks in order to bring in a variety of perspectives to the design process (Huitema et al., 2016). The involvement of more actors increases the expertise involved and can allow for valuable relationships between governments, private sector, NGOs and the public. The general notion is reflective of calls for network modes of governance as ideal for ‘wicked problems’ due to their cross-cutting nature and their need for multiple actor input.

The strengths of a network dominated governance mode fits with many of the problems presented by climate change adaptation. Networks are well-suited for problems with ill-defined, or contested, outcomes as they allow for a diverse deliberative process to refine potential outcomes (Rhodes, 1997). Collaboration can bring in various actors with the above-mentioned motivations and resources, whereas individually the same actor's abilities may be limited. Further, a collaborative approach can lead to user-developed or co-developed strategies, which may reduce the likelihood of resentment from those being asked to implement change for the sake of adaptation (Measham et al., 2011).

Equitable

Adaptation needs to be designed via an equitable process (most notably in stages 2 and 3). It requires fairness and transparency in the process of identifying impacts, assessing risk, and designing adaptation strategies (Adger et al., 2005). The identification of vulnerabilities and strategies for resilience not only benefits from multiple perspectives, but also gains input-legitimacy through an open forum. Equity in the design process may, largely, be a matter of access to input for a variety of stakeholders. Therefore, public components of the early stages of adaptation need to be well-publicized, accessible, and documented. Mechanisms for input from individuals of the public (forums, town halls, presentations, etc.) are necessary to identify any unforeseen vulnerabilities in a system or region and provide valuable local insight. Ensuring that a principle of equity is prioritized at the design process, rather than only in the delivery process, allows for all stakeholders to feel invested in adaptation. Resentment can occur if communities, levels of government, businesses, or researchers feel they were involved only by requirement rather than via necessity and only in the latter stages (Few et al., 2007).

Informed by Experts

Along with an equitable process that includes the voices of local and vulnerable persons, adaptation will also need to be informed by experts in various fields. At its core, knowledge of climate change, its impacts, and many of our society's technical vulnerabilities are known through highly specialized expert fields. Some of this expertise is found in government at various levels such as climate modellers in Environment and Climate Change Canada or engineers within city governments. Most adaptation projects will relate to some technical fields and cannot be developed without the input of experts. Valuable expertise for the adaptation process also extends to non-STEM fields, and those involved in projects will benefit from recognizing and including researchers from social, cultural, political and economic fields.

Multi-Ministerial and Multi-Sector

It is evident that the impacts of climate change affect the operations and mandates of multiple ministries at the federal and provincial levels. No single agency is able to provide information on all the impacts of climate change, their ramifications, and strategies for adaptation. For example, while Environment Canada and Natural Resources Canada may have the necessary tools to project temperatures over the next 50 years, Health Canada would be a necessary partner in translating those new temperatures into operational programs to address heat-related illnesses and stresses on the health care system. Identifying relevant partners early in the adaptation cycle is imperative to effective governance, despite climate change not necessarily having a direct impact on every ministry or department.

Multi-level

The process by which adaptation initiatives are designed requires active involvement from multiple levels of government. In Canada, this traditionally means federal, provincial-territorial, and local governments. Many systems are governed by a mix of these various levels. Health, for example, which will be impacted by increases in local extreme heat events, is an extension of the national health care program with mandates and funding being partly influenced by federal officials. This process, however, also involves provincial-territorial governments and their individual health care systems. Further, in delivering health care, the provincial-territorial governments take the lead and provide services via regional health authorities that operate across multiple municipalities. Health is not alone in its complexity of involved actors. Energy, economy, transport, and public safety, as well as several others, also share jurisdiction over systems that will be significantly impacted by a changing climate. Therefore, any effort to identify vulnerabilities and develop responses requires an active engagement of all levels of government and at all stages of the adaptation process.

Place-Sensitive

While adaptation is collectively local, regional, and national, various aspects apply to different localizations. The outcomes of the ideal adaptation process should consider the reality of idiosyncrasies at the local levels. Thus, adaptation governance must not only be flexible to changes in our understanding of climate impacts, but also the nuances of communities across Canada. What works in one community, city, or even region, may not work in another. Inconsistency, however, should not come with flexibility. Therefore, place-based adaptation governance must balance the need to remain consistent with the reality of locational differences in political, cultural, economic, geographical, or climatological characteristics.

Non-Duplicative

The evolving nature of adaptation has led to a variety of different approaches. Whether it is due to unpredictable funding, new administrations, and/or staff turnover, adaptation efforts in both government and non-governmental agencies are prone to 'stops and starts'. This leads to scenarios where new initiatives often feel the need to start from scratch and run the risk of ignoring what was already done, either within, or by other actors. Successful adaptation governance requires actors to consider existing efforts, expertise, and experiences both internally and within the wider adaptation community.

Design Outcome

Flexible

Whatever plan or programming emerges from the design process (either as a single initiative or a broader strategy), it must be able to adjust to changes in natural and social conditions. This means having flexibility in the plan and the governance arrangement that creates it, especially if it includes regulatory or market approaches (most voluntary approaches are naturally flexible). Flexible mechanisms for dealing with environmental issues are not a new notion to climate change adaptation, and the concept of 'adaptive management' has been prominent in environmental governance fields for decades – specifically in water and forest management. Adaptive management relies on the continuous monitoring and reassessment of programming and implementation. Fundamentally, actors involved in flexible adaptation must understand that initial concerns and strategies may be altered based on changing information or the results of an assessment.

Non-Maladaptive

There is little value in adaptation that negatively affects the ability for others to adapt or mitigate (Noble et al., 2014). Maladaptation, however, should not be thought of as something that only limits other climate change policies. Any intended adaptation effort with negative externalities, such as negative social or economic outcomes, could be identified as maladaptation. This requirement is then linked to the need to include numerous perspectives into the deliberative and governing processes for climate change adaptation, as many instances of maladaptation may otherwise be unforeseen.

Bounded Objectives

One of the problems identified with adaptation has been its vagueness in terms of what an 'adapted' state looks like, and the challenges of measuring effectiveness has long been discussed in adaptation literature (Adger et al., 2005; Noble et al., 2014). Reducing vulnerability or enhancing resiliency requires some qualification or quantification in order to have progress. As one participant of the workshops noted, "You can't get somewhere if you don't know where you are going." Thus, adaptation programming needs to set attainable and realistic goals that can be demonstrated. They can be economic (quantitative), as well as social (qualitative), but they must be observable and reportable. This is not only important for the monitoring of adaptation, but for the entire process as it provides an end goal, a destination, and motivation for development and adjustments. While specific guidelines on how to do so may be limited, basic and realistic measurable goals can be built into any adaptation initiative.

Communicated Responsibilities

A central component of successful adaptation governance is internal and external communication. Actively networking and communicating adaptation initiatives is a requirement throughout all stages of adaptation. Effective governance for adaptation prioritizes ongoing communication and awareness building of initiatives underway. This is related to the reoccurring theme that communication cannot wait until the program is designed by one actor or level of government with the hopes of generating interest from other stakeholders, but it must be openly communicated from impact identification to implementation. This includes the continuation of communicating outcomes. A number of participants recalled instances of programs or partners slowly losing momentum and never being heard from again.

A further component of this is the clear and bounded responsibilities of various actors. While this will be contested and debated, the alternative is an 'I got it. You got it. No one's got it' scenario. In the end, a decision or agreement must be reached that identifies and communicates clear and bounded roles for levels of government, ministries or departments, as well as non-governmental stakeholders. Ideally, this is negotiated in the early stages of adaptation, perhaps during impact identification or vulnerability assessment. Governance arrangements that are too flexible and open-ended regarding participant roles result in stagnation – a fundamental critique of network governance (Bevir, 2009).

Consistency

When it comes to certain components of adaptation, both consistency and standardization play roles in assuring there are no significant differences in the preparedness of systems or communities. Consistency, more from a participation or funding perspective, provides assurance to levels of government and private firms that goals and priorities can remain in place throughout the program

and for long enough that programs could run through completion. Frustration can arise if partner interests or funding availability shift during the process. Accordingly, an effective outcome for the governance of adaptation is a coordinated process with some level of expected or binding commitment over a period of time.



Standardization applies more to the implementation component of adaptation, especially in sectors such as health or infrastructure. Some form of coordinating actor needs to assure that all communities have the same level of programming to avoid instances where some communities are prepared for climate change and others are not. For example, temperature standards for cancelling school were recently harmonized across the province of Ontario (Ministry of Health and Long-Term Care, 2017). In some sectors, such coordination is crucial as interactions and interdependencies are more common. As one participant noted in the workshops: if one province has elevated its highways 10 centimetres to avoid washouts from extreme rain events, but an adjacent province has not (or only elevated them 5 centimetres), then cross provincial transportation could be affected. Crucially, lower standards in one jurisdiction can undo the value of adaptations taken in an adjacent locale.

Coordinated Funding

Funding for adaptation can come from a variety of sources: governments, non-governmental agencies, arms-length or crown corporations, and private firms, among others. Some form of mechanism is necessary to assure funding is not provided through duplicative efforts. Instead, funders who identify similar proposals could network the applications into a joint initiative to maximize outcomes. Similarly, in the past, overlap has taken place within a single program, where similar proposals were both funded but operated completely separate from one another. Increased communication within funding agencies and between funders is necessary to avoid such issues.

Mainstreamed

Mainstreaming adaptation refers to a process by which climate impacts are to be considered by all affected components of an agency or firm. This is typically done by assimilating climate change into regular operations (Noble et al., 2014). For participants in adaptation governance, the issue needs to be more than 'on the radar' of all relevant ministries, firms, and governments, but immersed into their programming. Therefore, adaptation governance may not only take place as a process itself in relevant ministries, but extend into the daily operations of all affected actors.

Political Resilience

In an ideal governance scenario, ongoing adaptation programs are largely unaffected by changes in government or political orientation of governing parties. However, there is the foremost need to balance consistency and democratic accountability. A key tenet of representative democracy is that elected officials have the capacity to adjust government programs and direction as per their electoral mandate. Strategies for attaining political resiliency, yet remaining responsive and democratic, may vary, but it is expected that adaptation programs and governance arrangements that can demonstrate their effectiveness and value should be unaffected by political change.

Discussion

As mentioned at the outset of the chapter, it is recognized that the components identified here are sometimes conflicting. It may be difficult, in practice, to develop adaptation programming that has both 'flexibility' and 'consistency and standardization'. Overall, however, in identifying the components of effective governance, there is a continual emergence of two themes: flexibility and justification.

What workshop participants envisioned is an evidence-driven adaptation approach that balances regional and sector flexibility with needs for consistency and standardization. This may be the ultimate task of fostering an effective governance arrangement for adaptation issues – how do we stay on track when we know the track may change? That being said, the governance components presented, while challenging to existing Canadian federalism, do not require major shifts in constitutional matters. Instead, effective adaptation governance needs to be, above all, motivated before it can be truly immersed into the Canadian political system of multi-level, multi-sector federalism.

Of course, some challenges remain that require more transformational changes. For example, incorporating political resiliency into adaptation programming is difficult within the reality of electoral cycles. It is encouraging, however, that in envisioning effective climate change adaptation governance in Canada, there is no need to redefine or transform Canadian government. Effective, coordinated, and well-resourced adaptation is possible today.

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Chapter 2 – Governance Barriers to Adaptation

Summary

- *The semantics of adaptation terminology, institutional constraints on design and implementation, a lack of understanding of impacts, and difficulty presenting impacts in a convincing manner convolute adaptation governance.*
- *There are major issues in the understanding of climate change adaptation and how to adapt across Canada. It is imperative for adaptation success that those constraints are actively addressed in order to minimize the conditions that give rise to maladaptation.*

As it is understood, climate change adaptation is, and will be, a complex process for a number of reasons. The social, cultural, economic, environmental and political characteristics involved in planning, decision-making, and implementation make adaptation advancements multi-faceted and, in some cases, difficult to resolve. According to the Intergovernmental Panel on Climate Change (IPCC), adaptation constraints “restrict the variety and effectiveness of options for actors to secure their existing objectives, or for a natural system to change in ways that maintain productivity or functioning” (IPCC, 2014, 908). Such constraints often include institutional characteristics and a lack of resources that impede implementation and decision-making.

It is important that barriers being experienced by practitioners are identified and thoroughly discussed in order to develop strategies that may aid in overcoming them. This chapter focuses on three general categories of barriers to advancing climate change adaptation: conceptual, knowledge-based, and socio-political (Table 3). Some barriers have a direct relationship to governance issues, such as a lack of ‘jurisdictional clarity’, while others are evidently more general, yet might be resolved through effective governance (i.e., impact uncertainty). This chapter is intended to provide greater clarity on both what the barriers are, as well as, in some cases, how to address them.

Table 3: Barriers to Adaptation Governance

Conceptual	Knowledge-based	Socio-political
Semantics of Adaptation	Lack of Local Expertise	Jurisdictional Boundaries of Climate Change Adaptation
Temporal Scales	Lack of Behavioural Focus	Political Alignment
Adaptation as ‘Too’ Reductionist	Uncertainty of Impacts	‘Adaptation Bubble’
High Burden of Proof	Benefits Unclear	Absence in Political Discourse
		Impact Communication

Conceptual

Semantics of Adaptation

Different components of the adaptation community use terminology differently to discuss topics specific to their interests. There are varied uses of key terms associated with climate change adaptation, such as resilience, risk, impacts, vulnerability, mitigation, and adaptation itself. This brings an important question to the forefront of adaptation governance: is adaptation the most appropriate word for taking action on climate change impacts, given its use in other policy domains and its lack of specificity? For example, in the transport industry 'adaptation' can refer to addressing emissions and vehicle efficiencies.

Further compounding the problem is when climate change exacerbates existing socio-economic issues that themselves do not occur due to climate change. For example, individuals living in poverty or those with a lack of education are known to be more vulnerable to climate change impacts (Noble et al., 2014). Efforts to increase the standards of living through poverty reduction results in adaptation as a by-product of policy and practices designed for alternative motives (so-called secondary adaptation).

In practice, there is a need to understand not only what the impacts of climate change are, but also what constitutes 'adaptation'. How are existing problems around poverty, health, and security related to climate change adaptation efforts if complex initiatives already exist to address those areas? How do we account for adaptive actions that were taken for completely other reasons? The absence of a clear understanding of climate change adaptation can result in inaction or reduced action due to the uncertainties and confusion. Without more widespread acceptance of key terms, governance may be impeded by a lack of understanding.

Participants noted that using terms such as vulnerability or resilience to climate change instead of adaptation may reduce confusion in adaptation governance. The former focuses on risks and exposure rather than the impacts of climate change themselves, and the latter provides a desired state. Though heavily contested, such terms may provide a clearer direction to what adaptation is, the outcome of such action, and precipitate the actions necessary to achieve such outcomes.

Temporal Scales

Adaptation suffers from a temporal scale problem in two ways. The first is within the political system where Canadian elected officials are typically serving terms of three to five years. Regardless of which level of government, elected officials are prone to programming that can be reported as successful within the time frame of the electoral cycle. However, this is not to say that elected officials never engage in long-term planning. Efforts to reduce greenhouse gas emissions evidently show limited immediate benefits in the climate, but the public awareness of climate change supports action on mitigation. Conversely, adaptation has yet to reach a point where adaptive initiatives are commonly identified as 'accomplishments' by elected officials and voters alike.

Second, the impacts of climate change are extremely mismatched with the quarterly approach of large and medium-sized private firms that are profit-driven. While some firms see the value of long-term investment strategies to protect their assets or services, others have yet to recognize the threats to their long-term sustainability as they are not deemed as important in current business operations. Such a 'wait and see' scenario may problematically pass the cost onto governments in the event of costly impacts.

Adaptation Approach as 'Too' Reductionist

Adaptation governance has, at times, focused more on infrastructure and finance components, whereas social, cultural, political and individual components remain less central to adaptation policy planning and implementation. In part, this is due to a relationship between vulnerability and risk management – tangible measures that have the highest potential and direct impacts on adaptation to climate change. Incorporating social elements in adaptation planning, decision-making, and implementation needs to be fostered to broaden the reach of adaptation measures in managing socio-economic and political issues. The lack of inclusion of such elements results in a reductionist approach that may neglect adaptation in specific policy arenas and sectors.



High Burden of Proof

Adaptation continues to suffer from a high burden of proof for both attention and investment. This is more significant when actual changes to government structures or operations are required as opposed to resources alone – whether it is at the divisional, branch or ministerial level. Most people and governments are willing to accept that climate change is real, impacts in the future are inevitable, and mitigation is required, but adaptation is thought to lack the same degree of impact on behaviour. This makes it more difficult to acquire the necessary funding, resources, and public support to push the adaptation agenda forward.

Knowledge-Based

Lack of Local Expertise

While not the case in all municipalities, there is an imbalance in adaptation awareness and expertise at the local level. In many instances, larger municipalities benefit from having greater administrative capacities that allow access to expertise and financial resources that other municipalities do not. A challenge to climate change adaptation governance is providing local authorities access to expertise that can perform accurate vulnerability assessments and guide adaptation efforts. This is particularly challenging in smaller municipalities and rural or remote areas where staff may be few and interaction with neighbouring communities, or experts, limited.

Lack of Behavioural Focus

Though foundational academic studies exist (Grothmann & Patt, 2005), participants noted that research relevant to their positions remains limited on the behavioural components of climate change impacts on the daily activities of individuals and small groups. Adaptation planning and design sometimes overlook the way individuals think about climate change and how it affects their daily lives. The behaviours of individuals and groups have important roles in politics by identifying and influencing political agendas, promoting adaptation options, and ensuring that cultural values are taken into consideration. Traditionally, climate change research has focused on the impacts of climate change on infrastructure or communities as a whole; however, the characteristics of the impacts to the individual can offer insight into adaptation options available to address climate change impacts at the smallest scale.

Uncertainty of Impacts

The complex nature of climate change and the uncertainty in temporal and spatial outcomes make it difficult to identify the impacts and their severities. Therefore, in attempting to communicate the costs and benefits of adaptation, some actors may be bogged down by the inability to provide concrete answers. This uncertainty can lead to a reluctance to adopt adaptation options and opportunities at levels of government, particularly if adaptation options require large inputs of funding. The duties of care owed to person(s) and property in and across Canada require governments to focus on a large number of social, economic, cultural, political and environmental issues. Strategies for fostering adaptation while recognizing the uncertainty of climate impacts are needed to overcome any reluctance to act in the absence of certainty. In this regard, practitioners may look to other policy areas dominated by uncertainty, including public health and public safety.

Benefits Unclear

Adaptation governance suffers from a lack of awareness not only in its need, but also its benefits. The benefits of adaptation are sometimes poorly communicated, whether stated in financial, personal, or social terms. As one participant noted, 'It is interesting that many smaller localities are involved in mitigation when the impacts and benefits of return are largely moral rather than pragmatic.' Conversely, adaptation has direct local impacts that can be immediate or at least observed within a short period. Additionally, when adaptation benefits are presented they are often narrowed to a sector or individual actor. While this is effective and a valid approach, there may be a need to emphasize the role of adaptation as a social good that benefits the well-being of whole communities.

Socio-Political

Jurisdictional Boundaries of Climate Change Adaptation

While governments have recognized that climate change adaptation is multi-level and multi-sector, as mentioned, responsibilities are unclear due, in part, to multiple layers of actors with no delineation of who is responsible for what and to what degree. The standards for adaptation regarding key components, such as preparedness and resilience, remain unclear across and within levels of government. This is because, in Canada, climate change adaptation in governance can be understood to be a reflection of policy and not law. Federal and provincial governments gain jurisdictional authority through the *Constitution Act* (1867, 30 & 31 Vict, c 3). Obviously, at the time of its inception, legislation did not include jurisdictional authority for climate change adaptation. This has allowed federal and provincial governments to define their respective roles and responsibilities within climate change action only more recently. Local governments, on the other hand, are creatures of provincial statute; an absence of adaptation within provincial legislation often means that local governments must determine their roles and responsibilities for adaptation within their communities as well. Often, it is recognized as part of disaster risk management under provincial emergency management legislation. There is no legal obligation, however, to address climate change through adaptation under the law. To do so would be a voluntary commitment to take action through such measures (Raikes & McBean, 2017).

In addition, the broad scope of climate change impacts across multiple policy domains has led to issues of jurisdictional conflicts, as environments and impacts cross local and provincial/territorial borders. Further, impacts are not limited to single sectors, and implementing adaptation measures can have implications on other sectors, such as transportation or natural resources.

Political Alignment

Political platforms by different government parties and entities can enhance or inhibit action on issues. Participants noted that even if one party at one level of government recognizes the importance to take action on climate change through adaptation, there may be disagreement at other levels as to whether or not action is warranted, or the amount of action required. Having all three levels aligned to an ideological perspective on climate change, including alignment between mayor, premier, and prime minister, may potentially aid in establishing a more cohesive approach to adaptation. In the absence of such alignment, adaptation practitioners may face limitations on effective multi-level coordination.

The “Adaptation Bubble”

For a number of participants, adaptation to climate change is, in large part, not seen to be on the radar of many practitioners in other policy arenas. Those who are responsible to take action on climate change traditionally orient themselves to mitigation. Adaptation, in many ways, can be seen as a pocket of individuals attempting to influence a larger governing process nationwide or in their given locale. Adaptation is fragmented to specific individuals and groups. This has resulted in some jurisdictions making greater investments into adaptation while others neglect it entirely. Even within relevant sectors such as transportation, infrastructure, or public safety, there are still often only individuals with an interest in adaptation, as opposed to a ministry or sector-wide awareness of the issue. As several workshop participants noted, there is an “adaptation bubble”.

Absence in Political Discourse

Many politicians who are active champions of climate change can sometimes be narrowly focused on mitigation. In the early years of adaptation (1990s), it was sometimes viewed as a last resort or an admission of failure to stop climate change. While that narrative may persist in places, it should be more accepted now that adaptation is inevitable regardless of the amount of mitigation since the 1990s, due to locked-in changes from emission in the first half of the 20th century. While growing acceptance is occurring, mainstreaming adaptation within governance remains slow and lags other climate change action.

Impact Communication

When attempts are made to communicate the impacts of climate change, they are limited by the availability of broader forums. Boundary organizations, such as Local Governments for Sustainability (ICLEI) and the International Institute of Sustainable Development (IISD), provide valuable conferences and meetings for adaptation practitioners to interact with non-governmental organizations, government, and industry, but this too is sometimes limited to the ‘same old players’ of the ‘adaptation bubble,’ as referenced by workshop participants.

Further, communication of climate impacts to the public is often limited to relationships to extreme weather events or occasional opinion editorials. The public, media, government, and interest groups focus more on mitigation due, in part, to the results-based measurability of reducing greenhouse gas emissions. Extreme weather events often have a ‘focusing effect’ on the urgency of both disaster risk management and hazard mitigation. What is needed is effective communications of adaptation-related policy efforts and their relationship to both extreme events (where appropriate) and changes in climate averages.

Discussion

According to the IPCC, “Multiple constraints can significantly reduce the range of adaptation options and opportunities available to actors and therefore may pose fundamental limits to adaptation and/or drive actors toward responses that may be maladaptive” (Klein et al., 2014, 911). It is imperative for adaptation success that those constraints are actively addressed in order to minimize conditions that give rise to maladaptation. Further, climate change action requires the mobilization of resources, decision-making and commitment to implement policies and practices by appropriate institutions. Currently, it is often a voluntary commitment to act spurred by risk of climate change impacts.

While not all barriers identified here are present at all levels of government or to the same degree among governments, their presence in influencing design, decision-making and implementation persist for many practitioners.

This chapter has provided insight into the most commonly observed barriers to climate change adaptation and how they relate to governance. It is by recognizing these constraints that practitioners will be able to move beyond them, avoid maladaptation, avoid negative impacts, and maximize adaptation opportunities for the benefit of all Canadians.

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Chapter 3 – Instruments and Strategies

Summary

- *The ability to identify appropriate and effective instruments, or strategies, across the governance system – from local to provincial to federal and the organizations involved in design and implementation – will dictate the successes and failures of climate adaptation.*
- *A fundamental component of climate change adaptation is that proposed measures rely on their acceptability by constituents. Instruments cannot be decided upon and developed outside the view of key stakeholders. There are no objective instrument choices, only transparent ones.*

A fundamental challenge to adaptive actions is the identification of both appropriate (politically, socially, economically, culturally) and effective instruments. In addressing climate adaptation, there is no best approach. Instruments and mechanisms will be a combination of top-down and bottom-up approaches, with insights from multiple governance perspectives (Noble et al., 2014). This chapter focuses on instruments, mechanisms and guiding principles for climate adaptation as discussed in the workshops.³ Instruments and strategies are divided into four categories: communication strategies; resource investments; regulatory instruments; and design strategies (Table 4).



³ The proceeding sections are not an exhaustive list of all options available for climate adaptation governance and practice, but ones identified as possible 'next step' actions and necessary elements for advancing climate adaptation within Canada based on workshop discussions.

Table 4: Instruments and Mechanisms to Advance Climate Change Adaptation in and across Canada

Communication strategies	Resource investments	Regulatory instruments	Design strategies
Outreach Programs	Boundary Organizations	Legal Responsibilities	Mainstream Adaptation
Climate Information Services	Infrastructure Funding		Champions of Action
Cost-Benefit Case for Adaptation	User-pay Principle		Balance System-wide and Clustered Adaptation
Organizational Memory	Leverage Communities of Experts	Legal Liabilities	Integrate Adaptation within Departmental Funding Proposals
Link Climate Change with Disaster Risk Management	Risk Officers		Sectoral Funding
Link Climate Change with Security	Implementation Toolkits		Mandated Risk Assessments
	Risk Templates		
	Increase Modelling Capacity		
	Increase Funding		

Communication Strategies

Greater climate change communication can advance public understanding of the issues and inform potential solutions (Ockwell et al., 2009). Hagen et al. (2016) argue that people’s perception of climate change is influenced by how the issue is positioned in relation to other societal problems, what the author calls ‘political saliency.’ The question from communication perspective can then be, what does climate change adaptation mean in relation to other values people have? Accordingly, in successfully communicating adaptation, it is necessary to consider public perceptions of climate change as a whole, including its scientific legitimacy and political saliency (Moser, 2006). Successful communication can increase public awareness of the issue, as well as foster adaptive actions at the individual scale (Ockwell et al., 2009).

Outreach Programs

Developing an instrument to educate the public, industry, and governments on their vulnerability and exposure to climate change impacts and the reasoning for such vulnerability promotes the reality that adaptation is important and, ultimately, necessary. Such programs can take the form of advertisements, public gatherings, or school-based education campaigns, among others (See Example 1). Importantly, outreach programs can work to raise awareness amongst the most vulnerable populations and disseminate knowledge on adaptation options (Aakre & Rübbelke, 2010; Birkmann & Teichman, 2010). Outreach also provides information and opportunities to industry and governments on the importance of identifying risks to climate change that may otherwise be unavailable without the proper encouragement or necessary resources. Such programs offer a public space for education on climate change impacts where individuals, industry, non-governmental organizations, and governments can identify and understand the various impacts and their vulnerabilities that they are, or will be, exposed to.

Climate Information Services

Climate services typically refer to the products developed from raw climate data, including model projections of how water levels will affect a specific area or, commonly, geospatial products such as data-rich maps used in developing adaptation options (See Example 2). Those who provide climate services are sometimes called 'knowledge-brokers' as they mediate between raw data and decisions via support tools (Moser, 2009; Miles et al., 2006; DeGaetano et al., 2010). Workshop participants noted that well-designed climate services for both planning as well as popular consumption work to effectively connect scientific information with interdisciplinary audiences. Climate services and products should be thought of as useful for both policy making and awareness building.

Cost-Benefit Promotion

Respondents noted that, in governments, tangible metrics of cost or benefit most typically promote activity. Much discussion specifically focused on making more apparent the cost of not adapting, as well as the high cost of impacts. According to the IPCC (2014), it is important to recognize that economic thinking on adaptation has transitioned away from singularity cost-benefit analysis and to the multi-metric evaluations, which include risk and uncertainty. As it is stated in the IPCC Fifth Assessment report, "Economic analysis is moving away from a unique emphasis on efficiency, market solutions and cost-benefit analysis of adaptation to include consideration of non-monetary and non-market measures, risks, inequities and behavioural biases, and barriers and limits and consideration of ancillary benefits and costs" (Chambwera & Heal, 2014, 948). While it is important to include the monetary variables for adaptation, cost-benefit analyses for adaptation must work to also address the more difficult-to-quantify variables that have influence on decision-makers, such as ecosystem services and cultural values. While such costs may not be easy to identify to communicate, practitioners should not ignore them.

Maintain and Leverage Organizational Memory

Organizational memory involves the combined knowledge from an organization's past activities. It is the ability of the organization to take lessons from past activities and apply them to the present. Workshop participants made clear that it is important to recognize that new climate adaptation efforts do not have to 'reinvent the wheel.' Learning from past experiences, and even reproducing them, was identified as a crucial component to reducing cost and building upon best practices. Thus, communication within organizations, and over time, should be considered.

Example 1: Toronto's Future Weather and Climate Study

In 2011, SENES Consultants Limited conducted the *Toronto Climate Drivers Study* for the City of Toronto. The study focused on understanding climate projections and climate impacts in the City of Toronto. The premise was that large cities have high-density populations and critical infrastructure with high exposure to climate change impacts and extreme weather. The study provides readers with information pertaining to their current and projected future exposure; namely, what to expect and why.

As part of spreading the knowledge from the study, Toronto Public Health developed brochures highlighting current and expected changes to daily maximum temperature, number of hot days, extended heat waves, and maximum daily rainfall. This outreach educates Toronto residents and businesses on the impacts that they can expect by 2040-2050 so that they can put in place safeguards to protect themselves and their assets. It makes climate impacts tangible and urges residents to take action on climate change adaptation.

Source: SENES Consultants Limited (2011).

Example 2: Global Framework for Climate Services

The Global Framework for Climate Services (GFCS) is a program from the World Meteorological Organization that aims to "enable better management of the risks of climate variability and change and adaptation to climate change at all levels through development and incorporation of science-based climate information into planning, policy and practice" (World Meteorological Organization, 2009, paragraph 111). The principle mechanism of GFCS that archives, analyzes, models, exchanges and processes information about climate is the Climate Services Information System (CSIS). The CSIS bridges climate information to decision-makers at global, regional and national scales by providing user-relevant climate information and knowledge. In doing so, they attempt to foster rapid development and operational production and dissemination of climate information.

Source: GFCS (2014).

Link Climate Change with Disaster Risk Management

Despite observations indicating a growing trend of disasters in Canada and abroad, attention to disaster risk management is not necessarily an everyday concern of the public, media, interest groups, and political parties. Attention to public problems increases when events exploit failures in existing practices (Lindholm, 2017; O'Donovan, 2017; Birkland, 2013). Sudden unexpected events – also known as focusing events – highlight limitations and strengths of existing emergency management systems, causing increased attention to and advocacy for investment (see Moynihan, 2012).

Climate change exacerbates this phenomenon by influencing the occurrence and intensity of events. According to the IPCC, it *“is very likely that heat waves will occur more often and last longer, and that extreme precipitation events will become more intense and frequent in many regions. The ocean will continue to warm and acidify, and global mean sea level to rise”* leading to an increase in frequency and intensity of natural disasters (IPCC, 2014, 58). Linking climate change with disaster risk management promotes a co-management system through an appeal to the public and political parties to recognize the two fields' interlinkages. Adapting to climate change actively addresses disaster risk and vice versa.

Careful consideration, however, has to be made to avoid attributing climate change to all disasters or diverting attention away from non-climate related disasters. Kelman & Gaillard (2010) caution the role of climate change on the research and policy agendas, stating, *“Climate change as a distraction that ends up dominating much discourse means that other disasters, from overfishing to tsunamis striking vulnerable coastal settlements, are neglected and that root causes are buried”* (31). Linking adaptation and disaster management, where appropriate, can be an effective communication strategy for incentivizing attention towards the two issues.

Link Security and Climate Change

In 2008, the United Kingdom's National Security Strategy identified drivers of insecurity and security challenges and concluded that climate change is *“potentially the greatest challenge to global stability and security and therefore to national security. Tackling its causes, mitigating its risks and preparing for and dealing with its consequences are critical to our future security, as well as protecting global prosperity and avoiding humanitarian disaster.”* In 2016, the United States National Intelligence Council, in coordination with the US Intelligence Community, released a report on *Implications for US National Security of Anticipated Climate Change*. They similarly noted the long-term implications of climate change, including more extreme weather events and the greater stress on critical Earth systems, which they noted *“will almost certainly have significant effects, both direct and indirect, across social, economic, political, and security realms during the next 20 years”* (United States National Intelligence Council, 2016, 3). Climate change and security in the Canadian context was specifically addressed through *The Security of Canada and Canadians: Implications of Climate Change* (McBean et al., 2012), which examined issues of water security, food security, personal health security, and international stability. The report noted that climate change can be viewed as a “threat multiplier” to existing security concerns. That is, superimposing climate change on the wide range of other trends, such as globalization and an aging society, and other security issues, such as terrorism and pandemics, can result in a higher overall impact. The report had three action recommendations to address the issues: 1. Develop, adopt and implement a national energy-climate strategy; 2. Develop, adopt and implement a national adaptation and disaster risk reduction strategy; and 3. Build a stronger climate change research enterprise.

Given that past research has indicated such a link between climate change impacts and security, in communicating the need for adaptation, practitioners could benefit from addressing such links in presentations and public outreach. Climate change is not solely an environmental issue, but intertwined with issues around economics, security, and overall social well-being.

Resource Investments

Development and Funding of Boundary Organizations

As discussed earlier, boundary organizations are means of fostering collaboration and sharing information (Corfee-Morlot et al., 2011). Agard & Schipper (2014, 1759) define them as “a *bridging institution, social arrangement, or network that acts as an intermediary between science and policy.*” Biesbrock et al. (2010, 445) define boundary organizations as having four components: linking science and policy; fostering coordination; advise adaptation policy-makers; and providing policy drafts and reports.

In the case of Canada, organizations fitting these roles have been internal to government (Ouranos), arm’s length from government (Federation of Canadian Municipalities), or separate from government (International Institute for Sustainable Development, the International Council for Local Environmental Initiatives, and the Institute for Catastrophic Loss Reduction are examples). Typically, boundary organizations operate through conferences, workshops, reports, online resource hubs, webinar hosting, and interpersonal networking. The role of boundary organizations and whether they are necessary components of successful adaptation governance, is unclear empirically, but participants clearly presented that such groups hold value in knowledge translation and stakeholder participation, among other known roles (Mimura & Pulwarty, 2014, 888). Given that these institutions typically employ expert personnel, any adaptation practitioner ought to explore their potential in regards to aiding project goals.

Infrastructure Funding

It is fundamental for climate change adaptation that existing and future infrastructure be built with future climate projections in mind. The uncertainties in climate change shouldn’t excuse adapting infrastructure to potential extremes, and, ideally all merging infrastructure programs should have adaptation mainstreamed into relevant components.

User-Pay Principle

Less a resource itself than a means to develop resources, a user-pay principle calls for the user of a service or resource to pay directly for the amount that they consume. In this sense, adaptation is then seen as a service, with an identifiable user (which the instrument selection will need to address carefully). Workshop participants noted that a finance mechanism that feeds directly into adaptation services may prove to be a viable option for promoting adaptation initiatives within government or to lower, or higher, orders of government.

Leverage Communities of Experts

Establishing effective networks that build on existing formal and informal relationships with experts in public administration, academia, industry, and non-governmental organizations promotes a collaborative approach to managing climate change exposure and impacts. Although there are networks to which all these groups are a part of, it is important to both strengthen existing relationships within networks and establish new relationships (where appropriate) by branching out.

Currently, there is a vibrant community of excellent adaptation experts in Canada, and fostering strengthening opportunities for them to work together and in liaison with other experts can build resource capacity, and relieve pressure on individual(s), group(s), industry, non-governmental organizations, and government within the so-called adaptation bubble.

Risk Officers and Other Adaptation-Specific Personnel

Risk officers are individuals, or offices within an organization, whose position is to identify risk, vulnerability, and exposure to climate impacts. Recently, Canadian cities such as Toronto have created the position as part of the Rockefeller Foundation's 100 Resilient Cities goal. Risk officers are designed to enable effective and efficient governance on risk-related matters across an organization. Workshop participants noted that such a position is more common in private industry (not necessarily for climate change reasons), and will hopefully become a normal part of government bureaucracies.

Implementation Toolkits

Toolkits are a set of resources available to practitioners to guide policy development and practice. They often outline specific principles that need to be taken into consideration when practicing within the field (See Example 3). Ideal for climate change would be advanced toolkits that address the implementation stage. A set of templates and checklists that guide climate adaptation in different sectors and at different scales could provide practitioners and stakeholders with a tangible set of actions. Developing such toolkits can be a long-term project and require significant investment, and are among the most common requests of government and industry officials looking to start the adaptation process. While such kits exist and are valuable for other stages of adaptation (notably risk assessment), implementation specifically would benefit from such an investment.

Risk Templates

Risk templates are designed similarly to an implementation toolkit; risk templates are used more as a checklist of requirements that should be included in conducting risk assessments and acting on risk (for example, again see Engineers Canada's PIEVC program for infrastructure assessment as well as Example 4). Workshop participants noted that many private firms in various sectors from banking to agriculture to, of course, insurance manage risk as part of their regular oversight and operations. It is possible that investing in the development of climate change-specific risk templates, informed by private practices, could help establish broader methodological frameworks for governments and even individuals.

Example 3: Preparing for Climate Change: An Implementation Guide for Local Governments in British Columbia

Preparing for Climate Change identifies tools that local governments can use to adapt to climate change. It is premised on the grounds that climate change adaptation is required regardless of the success of mitigation efforts. The lifecycles of greenhouse gases already present in the atmosphere inevitably causes climate variability and, therefore, subjects impacts at present and in the future. This guide offers perspective into local governance in British Columbia on preparing for and responding to climate change impacts with the purpose of providing practitioners options for enhancing resilience.

In particular, this report engages the adaptation process through a local lens, contextualizing the exposure and vulnerabilities to climate change impacts, as well as adaptation principles and options for local practitioners to consider within the existing legislative framework defined by the *Local Government Act* (RSBC 2015, c 1).

Source: Carlson (2012).

Modelling Capacity

It is clear that governments at all levels, as well as private actors and individuals, require knowledge of climate impacts. Yet, the capacity to model climate change and its impacts currently exists, for the most part, in universities and within national governments. Further, climate modelling is typically conducted with macroscale results, with outputs providing information for global or regional projections. As a result, the value of these models for regional, sub-national, and local governments is sometimes limited. There are commonly instances where model resolution does not address the scenarios needed for local planners, nor does raw data or base projections answer practitioner questions specific to their jurisdictions. In order to develop a local strategy to address, say, 10 centimetres of rain in a short time period for a particular downtown core, local practitioners need local-scale projections. As discussed earlier, unfortunately these kinds of projections are not available to many local governments. Investment into data collection, modelling, and product creation should all be considered concurrently. Investment into acquiring or producing viable data products, depending on the level and type of practitioner, is undoubtedly one of the most important resource investments for climate change adaptation.

Regulatory Instruments

Regulatory mechanisms refer to the standards of practice imposed through legislative and regulatory bodies. They impose certain obligations to those operating in particular fields and include penalties for breaching those requirements. It is important that those standards allow for autonomy in practice in terms of meeting standards, but are not too lax as to compromise the safety and security of the individual and property. Workshop participants discussed a variety of potential regulatory instruments for adaptation, recognizing that the approach overall may not always be appropriate or viable.

Legal Responsibilities

Legal responsibilities for climate adaptation remain largely unexplored. The absence of legislative duties specifically aimed at climate change adaptation may result in inaction by an institution, company or individual (Raikes & McBean, 2017). Shared responsibility for adaptation – where the individual has responsibility for private property, companies have responsibility for their operations and products, and government has responsibility for adapting public spaces – may offer a clear, whole-of-society approach to managing climate change impacts in certain circumstances. While not a traditional approach to adaptation, it may be worthwhile for practitioners to review legal responsibilities in their jurisdiction related to climate change adaptation issues such as water treatment and delivery, infrastructure standards, and others.

Example 4: Ontario Climate Change and Health Toolkit

An issue in conducting a climate change risk assessment is the inclusion or exclusion of variables and their weightings. The interacting social, economic, environmental, and political characteristics comprising a system can be challenging to identify. As such, there are many risk assessment methodologies to choose from.

The *Ontario Climate Change and Health Toolkit* is “designed to support an adaptive and resilient public health system and anticipates, addresses and mitigates the emerging risks and impacts of climate change” (1). With climate change having profound impacts on individual and public health, it is important to have a methodological framework that assesses exposure and vulnerability. Understanding the risks and their scope helps identify options that actively mitigate the stressors on the system.

This toolkit is one example of standardizing risk assessment in the context of public health. The toolkit has three components, including a technical document, workbook, and modelling study report. They focus on the first three stages of the adaptation process: identifying climate change impacts; assessing risk and exposure; and, identifying adaptation options.

Source: Ebi et al. (2016).

Legal Liabilities

Legal liability refers to a finding made by a court where wrongdoing caused damage to someone else. It is driven by foreseeability. The question remains on whether or not risk to climate change is reasonably foreseeable as to warrant required action. Establishing credible, historical and scientifically backed standards, that are made clear to all parties, could promote an adaptation agenda as a form of addressing legal liability. Again, a largely unorthodox approach to climate change adaptation, exploration of legal issues and climate change adaptation is an emerging issue in Canada.

Mandated Risk Assessments

Risk assessments are designed to identify and analyze hazards and risk factors that may cause harm in order to develop and implement measures that mitigate and eliminate such harm from occurring (Canadian Centre for Occupational Health and Safety, 2017). Mandating climate change and disaster risk assessments would have regulatory implications on responsibilities and liabilities of ministers, governments or private firms. Were climate change risk assessments made mandatory, it would remain a challenge in developing standardized, yet flexible, risk assessments to provide to all users.

Design Strategies

Design strategies refer to the non-mandated options available in governance that may prove to advance adaptation in and across Canada's organizations and institutions operating at different levels and in different sectors. The design strategies discussed can be thought of as ways of conceptualizing adaptation programs or policies, with a sort of 'big picture' in mind.

Mainstreaming

Mainstreaming, as discussed before, is the process of incorporating adaptation system-wide into an organization's regular practices. This has occurred to some extent in the Canadian Federal Government, but is still in the early stages of development. In 2008, the *Federal Sustainable Development Act* (FSDA) was adopted, which mandated federal commitment to issues affecting sustainable development. It requires the Federal Government to adopt and update a sustainable development strategy every three years. Since its inception, climate change has been a priority in these strategies, but they have primarily focused on mitigation. However, the latest version, *Federal Sustainable Development Strategy 2016-2019* does specifically mention climate adaptation in several places (See Example 5). In a sense, the FSDA is a form of mainstreaming climate adaptation across sectors and levels of government as it seeks to advance adaptation through the everyday actions of relevant ministries. Workshop participants noted that prioritizing climate adaptation into strategies, projects, and plans across ministries promotes action and works to avoid some of the complexity of Canada's multi-ministerial, multi-level federal system.



Identification and promotion of champions of action

The role of central figures, or ‘policy entrepreneurs’ (Kingdon, 1984) in policy development has long been studied. Workshop feedback indicated that ‘champions of action’ are valuable assets for prioritizing adaptation issues across sectors, disciplines, and levels of government. A lack of commitment to environmental issues by political parties, media, interest groups, companies, and the general public could constrain adaptation or mitigation efforts by deterring attention and investments. It is in this role that so-called ‘climate champions’ can play a major role in issue awareness and policy development. Whether leadership comes from an individual, company, non-governmental organization or government, leaders are valuable in influencing administrations, corporate priorities, and even the general public, towards proactive and precautionary management of climate issues.

Balancing system-wide and independent clusters of action

While large-scale governance arrangements were the target of much conversation, workshop participants pointed out that significant and non-negligible progress had been made in ‘pockets’ of crucial activity throughout Canada. At the same time, most agreed that adaptation could not only advance in pockets, but needed to be part of a larger strategy as well. The conclusion then was the need to balance both approaches, as each have their merit. For example, the aforementioned *Federal Sustainable Development Strategy* (FSDA) is a system-wide strategy at the federal level. The FSDA does not prescribe specific actions to meet those objectives because the mandates and terms of references for each department are so different that a strategy that encapsulates each department’s day-to-day operations likely could not be prescriptive without impeding on the department’s ability to operate. Put simply, a prescriptive system-wide strategy with bounded and aligned objectives may work well for one department and not well for another. Finding the balance between a system-wide strategy and independent clusters of action seeks to optimize a mutual interaction with top-down guidance and bottom-up implementation.

One option that was discussed in regards to approaching a balance in this ‘micro’ and ‘macro’ level strategizing for adaptation, at least within governments, were the use sectoral working groups. Sector groups on transportation, energy, and public safety may benefit the development and implementation of sector- and department-specific plans of action as they rely on experts within those fields for measures that optimize effectiveness of such implementation. The strategy has been employed by the Canadian Federal Government in both the Adaptation Platform and the Pan-Canadian Framework.

Example 5: Federal Sustainable Development Strategy 2016-2019

The *Federal Sustainable Development Strategy* is the by-product of the *Federal Sustainable Development Act* (SC 208, c 33). It is the federal government’s commitment to address social, economic, political, and environmental issues affecting sustainable development in Canada. The strategies mainstream policy and practice across the federal government with subsequent ministerial strategies that align with the overall direction developed by Environment and Climate Change Canada.

Since its inception in 2008, Environment and Climate Change Canada has developed three strategies – the latest being the *Federal Sustainable Development Strategy 2016-2019*. In this latest version, the federal government’s position is long-term decision-making in accordance with the global sustainable development goals. It is a forward-looking approach emphasizing a resilient Canada through precautionary decision-making.

Adaptation to climate change is a priority within the *Federal Sustainable Development Strategy 2016-2019*. Target 13.3 of the strategy commits the government to improving “education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.” By this definition, the federal government is advancing action on sustainable development issues in accordance with the Sustainable Development Goals adopted at the *2030 Agenda for Sustainable Development*. They recognize the positive feedback system of social, economic, environmental and political issues impacting sustainable development.

Source: Government of Canada (2016).

Integrating adaptation into department funding proposals

Linking climate change adaptation to department funding proposals is another method to mainstreaming adaptation. Explaining how the terms of reference for departments reflects the institution's commitment to climate change adaptation allows such entities to evaluate and adjust existing practices to reflect the broader system's objectives. This is not to say that departmental funding has ear-marked funding specifically to climate adaptation; rather, departmental proposals should show some sort of reflection of climate change adaptation commitments. It shows how climate change is incorporated into the day-to-day practices of said departments.

Fostering nationwide dialogue

Current commitments at the international level, such as the *Paris Agreement*, *2030 Agenda for Sustainable Development*, and the *Sendai Framework for Action on Disaster Risk Reduction*, require some guidance from the Federal Government and its departments to those involved in implementation at the community level. Meeting these targets is challenged though the jurisdictional divide between the Federal Government who negotiates and ratifies international agreements and sub-national or local governments which may have lead jurisdiction on issues related to them.

As discussed previously, climate change adaptation involves both top-down and bottom-up approaches that mutually complement each other. While community climate adaptation implementation is usually the responsibility of local authorities, it is important to recognize the relationships and investments that higher levels have in influencing the effectiveness of such strategies. Participants noted that a federally led dialogue carries significant weight in promoting sub-national and local action. A number of early activities as part of the Pan-Canadian Framework on Clean Growth and Climate Change offer a strong example of what effective, nationally led dialogue could look like regarding climate change adaptation. The same can be said of the recently formed federal Expert Panel on Climate Change Adaptation and Resilience.

Discussion

There is no single strategy or instrument that solves the climate change problem. Nonetheless, risk awareness, effective investment into resource development, identifying legal responsibilities, liabilities and mandates, and strategic planning and implementation are components to advancing climate adaptation in and across Canada. While questions surround who should be responsible for what, how prescriptive can, or should, regulations be, and how to recognize the appropriate instrument, it must be recognized, and well understood, that top-down and bottom-up approaches to adaptation will likely complement each other.

Examples of climate adaptation program design in Canada are growing. In the Region of Durham, eight municipalities, and partner organizations – recognized a need to plan for changes to extreme weather and their impacts in a changing climate. In 2016, they produced a climate adaptation plan, which includes goals and implementation guidelines, objectives and proposed programs, roles and responsibilities, and a cost-benefit analysis of climate adaptation (Region of Durham, 2016). In many respects, the climate adaptation plan for the region is aligned to the descriptions above. It highlights the impacts of climate change and the risks to the area with links to disaster risk management. Focus is on mainstreaming adaptation with bounded and aligned objectives that are multi-sector.

In British Columbia, Metro Vancouver highlighted the trends and projections of climate change and their impacts to the area. Municipalities and local authorities are adopting adaptation plans that account for such change. The City of Vancouver, for example, adopted a *Climate Change Adaptation Strategy* in 2012 that is updated every five years. It recognizes that climate change is in a non-equilibrium state that requires adaptive plans and frameworks as additional information and conditions arise.

As these strategies, and their respective instruments, continue to move forward, undoubtedly lessons will be learned throughout the entire country. As climate change continues to put communities, regions, provinces and the nation at risk to immediate and impending impacts, the instruments and mechanisms spanning across the entire system – from local to provincial to federal and the organizations involved in implementation – will dictate the successes and failures to climate adaptation.

Further Reading

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Chapter 4 – Actor Roles

Summary

- *Despite overlap in some of the responsibilities and capacities of federal, provincial-territorial, and municipal governments, there are distinct and bound roles each order of government can play in climate change adaptation.*
- *Roles for actors outside of government range from acting as independent third parties to providing cost-benefit analysis to engaging in adaptation issues and processes as informed participants.*

As made clear in the *Paris Climate Agreement*, the *2030 Agenda for Sustainable Development*, and the *Sendai Framework for Disaster Risk Reduction*, climate change adaptation is a multi-sector and multi-level challenge. Adaptation requires involvement in decision-making and implementation at all levels of society – from the individual, to private companies, and throughout government. This is also recognized in recent assessments of the Intergovernmental Panel on Climate Change (2014), which identified the following key components for effective adaptation:

- Multi-level institutional coordination
- Leaders focused on mainstreaming and sustaining momentum
- Horizontal cooperation between sectors, actors, and policies
- Political consideration in planning and implementation
- Coordination between all stakeholders to increase efficiency, representation and support for climate adaptation

This report now turns to the potential roles of various Canadian actors in adaptation governance. Per the Canadian *Constitution Act* (1982, c 11), various sectors or issues are divided in jurisdiction between the federal and provincial-territorial levels. Further, provinces and territories can delegate authority downward to municipalities through statutes. The divisions of authority and responsibility are well accepted in Canadian politics, but, of course, are at the core of many past and ongoing debates in Canadian politics (see Horak & Young, 2012). Many of the responsibilities outlined in the *Constitution Act*, 1982 that relate to climate change adaptation are presented in Table 5. It is pragmatic to consider the ideal roles of actors with these accepted divisions of authority in mind. Within the right scope, however, it may also be reasonable to explore novel approaches to traditional federal relationships for the sake of adaptation. The following section discusses potential, and existing, roles of various actors in Canadian governance of climate change adaptation as discussed in the expert workshops⁴, which are summarized in Table 6.

⁴ These roles are not meant as exhaustive, but were those discussed in-depth during the workshops.

Table 5: Adaptation-Related Areas by Government Jurisdiction under Canadian Constitution Act, 1982

Federal government	Provincial–Territorial governments	Municipal governments
Agriculture	Agriculture	Building Standards
Environmental Protection and Monitoring	Cultural Services	Business Licensing
Fisheries and Oceans	Community Safety and Services	Community Services and Centres
Foreign Policy	Education Curriculum and Funding	Emergency Services
Health	Energy Development and Distribution	Fire Services
Immigration	Environmental Protection and Management	Land Use Planning
Indigenous Affairs	Indigenous Relations	Municipal Planning
Industry	Infrastructure – Highways	Parks and Green Spaces
Infrastructure – Bridges, Rail, etc.	Labour Laws & Regulations	Police Services
Intergovernmental Affairs	Municipal Governments	Public Education
International Agreements	Natural Resources Management	Public Safety
International Trade	Northern Development	Recreation
Labour Laws	Police Services	Roads
National Defence	Public Finance	Storm Water Management
Natural Resources Management and Development	Public Health	Tourism
Police Services and Law Enforcement	Public Safety	Urban Wildlife
Public Finance	Rural Development	Waste Management
Public Safety	Tourism and Parks	Waste Water Treatment and Disposal
Sea and Air Ports	Transportation	Water Delivery
Transportation	Wildlife and Conservation	

Table 6: Discussed Roles by Actor for Effective Canadian Adaptation Governance

Canadian Federal government	Provincial– Territorial governments	Local governments	Public	International organizations	Private sector	Non-governmental sector	Academic community
Provide resources and direction	Develop and support communities of practice	Act as liaison with local stakeholders	Be engaged	Provide frameworks	Be engaged and responsible	Conduct research & promote best practices	Conduct research & promote best practices
Provide key funding	Elected leadership and adaptation champions	Elected leadership and adaptation champions	Take action at the local and community level	Communicate and promote adaptation globally	Provide third-party data and projections	Foster networks to connect practitioners	Be engaged and communicate
Provide climate models and products	Provide key resources and funding	Match key funding		Identify similarities	Provide financial tangibility where relevant		
Develop a national framework and identify lead agencies	Provide policy direction and coordination for municipalities				Develop and promote industry standards		
Elected leadership and adaptation champions							
Foster knowledge translation							
Develop implementation guides							

Canadian Federal Government

Resources and Direction

In Canadian governance, it is a common for the Federal Government to take the role of resource provider to sub-national institutions responsible for implementation and oversight so to not infringe on the jurisdictional authorities of other orders of government. For example, in the Canadian health care system, the Federal Government provides general direction as well as funding and research via Health Canada. While there are programs operated directly from Health Canada, day-to-day health care is typically provided by regional health authorities under the direction of provinces allocating a mix of federal and provincial funding. A similar model may be of use for on-the-ground climate change adaptation with direction, funding, and research coming from federal ministries such as Natural Resources Canada and Environment and Climate Change Canada. While adaptation is a much more specific issue than ‘health’ writ large, more specific issues within health, infrastructure, and natural resources are often governed through these roles.

Provide Key Funding

Funding is not particularly a significant change to the existing roles that the Federal Government plays in governing other issues given its powers of taxation and significantly larger revenue than provinces, territories, and local governments. In many instances, this is done through cost-sharing agreements, where the Federal Government pays percentages of each dollar or matches funds allocated by provincial or local governments. Federal funding can come both actively and passively in the way of calls for projects and 'availability of funds', or through the request from a provincial or local government. The availability of funding from the Federal Government may act as an awareness building tool as provincial-territorial or local governments previously uninterested in starting the adaptation process may end up engaging through the application process.

Provide Climate Modelling and Promote Data Sharing

As discussed earlier, large-scale climate projections still require significant computational capacity and are typically carried out by expensive 'super computers' and expert scientists and technicians. Working with global datasets, climatologists and modellers can work with data from global models to downscale information for national and regional projections. Regardless of the methods used to develop future climate scenarios, there are high costs in expertise, equipment, and time. Therefore, the Federal Government is possibly the appropriate actor to carry out climate change modelling for provincial or local planning. Currently, the Canadian Centre for Climate Modelling and Analysis (CCCma) undertakes climate modelling at the national scale. This requires the continuation of an ongoing service as provincial and local governments have not had resources to carry out the same research to such a capacity.

While there are online means to access CCCma data and projections, a dedicated forum for easy access to climate impact projections may serve to benefit the adaptation community. In this sense, a focus on data products, rather than the data itself is what is needed. A consistent concern of local, provincial and private adaptation practitioners has been the lack of access to data interpretation. In the past, municipalities have looked to private companies to undertake an analysis of their future climate because federal or provincial governments lacked the personnel or expertise to provide information requested by local governments. In recent years, the CCCma's services have grown immensely, and this has been a massive step forward towards local governments having the information they need to develop an adaptation strategy. Further, involving the Canadian Space Agency and the Ministry of Innovation, Science and Economic Development to a greater extent in climate change adaptation, and making local and provincial practitioners aware of Canada's orbital assets and capacity, could aid in directing necessary expertise to adaptation governance across the country while leveraging existing resources.

Develop National Framework and Identify Lead Agencies

While it is evident that adaptation governance will be multi-ministerial, workshop participants noted some challenges to, or lack of clarity in, the existing division of tasks. Within the Canadian Federal Government, two departments have shared responsibilities for climate change adaptation. On the policy front, or at least in terms of national direction, Environment and Climate Change Canada (ECC) has been involved in developing a strategic policy. Throughout the past few years, ECC has led the Working Group on Adaptation and Climate Resilience within the Pan-Canadian Framework on Climate Change. Concurrently, much of the research on adaptation at the federal level takes place within the Climate Change Impacts and Adaptation Division (CCIAD) of Natural Resources Canada.

The CCIAD provides five key services: (i) convening the National Adaptation Platform; (ii) production of knowledge assessment reports; (iii) co-funding adaptation projects with external partners; (iv) facilitating regional initiatives; and, (v) publishing adaptation documents. However, it is unclear which agency is the lead on climate change adaptation as the division of tasks can lead to confusion on the parts of other orders of government and ministries regarding adaptation-related contacts.

An alternative arrangement could see adaptation directed by a central agency with more capacity to direct other ministries, since adaptation requires coordination across departments and multiple levels of government. Conversely, it could be pointed out that a ministry such as Public Safety Canada appears to have significant success directing other agencies on issues related to emergency response or national security despite not being a central agency. It would be worthwhile to explore the best fit for climate change adaptation within the Federal Government given the roles suggested for it. However, this is not to say that the existing scenario is without its merits.

Further, when it comes to relations between federal and local governments in Canada, the re-establishment of a ministry dedicated to local government relations may be worth investigating. While there is still much direct interaction between municipal-level actors and the Federal Government (especially through the Federation of Canadian Municipalities), a regular and formalized partnership could be said to be lacking. Though it is recognized that such a discussion ranges far beyond the issue of climate change adaptation.

Given the rising popularity of incorporating risk officers into federal ministries, or, alternatively, there may be a valuable role for a national risk office. In this role, the Federal Government could work to identify risks at all levels of Canadian government and public life. Currently, similar groups exist within Public Safety Canada's Emergency Management Divisions, Health Canada, Indigenous and Northern Affairs Canada, and NRCAN's Impacts and Adaptation branch. A national risk office could continue such and expand these activities with a focus on risk and the need to adapt. Lastly, and crucially, the Federal Government needs to continue and expand a fundamental link to effective, community, driven adaptation in northern and Aboriginal communities, as well as throughout Canada in regards to First Nation's peoples.

Elected Leadership and Adaptation Champions

The role of leaders and policy champions has been well-documented in policy research (Kingdon, 1984). Adaptation, like any issue, requires attention from elected officials and influential members of the private and NGO sectors. Adaptation is sometimes seen as suffering from a lack of interest, or as secondary to mitigation. Numerous elected officials and public figures, such as Glen Murray and David Suzuki respectively, have taken to advancing the public's understanding of climate change mitigation, while similar cases are lacking in regard to impacts and adaptation. With the presence of more climate champions who are ministers or members of parliament, especially at a federal level, a pro-adaptation discourse may emerge.

Foster Knowledge Translation Spaces

A key theme in adaptation research is the difficulty in not only accessing information about future climate impacts, but translating it in meaningful way for policy-makers. There is a key role for the Federal Government in providing such resources. Interpretations of how this might be delivered varies between ideas for online hubs, workshops, and personnel loaning, among others. Knowledge translation providers would need access to climate modellers and experts because much of the raw data for Canada's future climate is collected at the federal level. It may be ideal that knowledge translators be housed within divisions of government or research institutions that gather the data themselves, and have a strong relationship to the scientists involved.

Knowledge translation, however, does not need to relate only to modelled climate projections. Other activities related to climate change impacts take place at the federal level and could be translated to other levels of government and non-governmental actors. One such instance might be to provide information on Canada's international commitments, which include climate change adaptation under the Paris Climate Agreement, as well as disaster risk reduction under the Sendai Framework.

Develop Implementation Guides

Efforts to produce common implementation tools have evolved in Canada over the past decade. One notable example is ICLEI's (n.d.) *Changing Climate, Changing Communities* which identifies key components of implementation: training, pilot studies, internal communications, external communication, and marketing. The need for such guides, or tools, to be developed and provided by the federal level reflects the limited capacity at the local level and among some provincial-territorial governments. Workshop participants noted a need for guidance on the implementation stage, which is often singled out by municipalities due to there being fewer case examples to learn from.

Provincial-Territorial Governments

Develop and Support Communities of Practice

A key difference in the suggested roles of provincial-territorial governments amongst workshop participants was the closer relationship to regional and local experts. Provincial governments are viewed as having stronger relationships with non-governmental organizations, industry, and academics familiar with local circumstances. Provinces can play a significant role in advancing adaptation from this position by developing local communities of practice focused on provincial/regional conditions and needs. An example is the Quebec government's development and funding of Ouranos, which functions as a research hub and network for adaptation practitioners. Ouranos is effective in developing climate products, and it engages adaptation practitioners across the country thereby expanding the reach of Quebec-based practitioners involved in the program.

A similar success story has taken place in British Columbia through the Pacific Climate Impacts Consortium (PCIC), a successful regional/provincial hub of climate expertise. Likewise, there are also the Ontario Centre for Climate Impacts and Adaptation Resources, the Ontario Climate Consortium, and the Prairie Climate Centre in Winnipeg. Provincial involvement and funding varies by organization, but evidently there is an appetite for provincial-level, or regional, networks of expertise and communities of practice.

Elected Leadership and Adaptation Champions

Strategies of provincial ministries need to take place with awareness of the interests and activities of neighbouring provinces, and workshop participants suggested that such a scenario can be fostered by key elected officials. As with the federal level, there is a need for elected political leadership and climate champions within government at the provincial level. Provincial officials may be the best placed to leverage local concerns related to past hazards in order to highlight the role climate change will play in a province moving forward. Further, provincial champions can also promote adaptation specific to the needs and conditions of a population, such as drought in the prairies or urban resilience in southwestern Ontario. Participants noted the value of having adaptation on the agenda of the Council of Ministers of the Environment as well. It is hoped that such attention may spur progress. Further, such high-level political relationships can help address co-dependencies or interests, such as in the case of interprovincial watersheds or forests impacted by climate change.

Provide Policy Direction & Coordination for Municipalities

In the instance where a municipality wishes to begin an adaptation initiative, the province is often a natural first point of contact. Direction on local priorities, as well as contacts or information for other municipalities in the province, could be effectively provided by personnel in provincial governments. Most important might be a province's role in coordinating actions so to avoid maladaptation. For instance, in storm water management it is necessary for municipalities to be aware if adjacent actors have updated any infrastructure or landforms that may affect streamflow in their own jurisdiction. A common provincial framework for adaptation (stages, tools, goals, etc.) can enhance the likelihood that communities approach adaptation in consistent ways. The province can also work as a credible intermediary between municipalities looking for partners but with limited reach or relationships.

Local Governments

Act as Liaison with Local Stakeholders

In many cases, local governments are seen as having a closer relationship to members of the public than provincial and Federal Government. City councillors and municipal officials are often intimately familiar with local populations, environmental conditions, needs, and expertise. Therefore, the local government can act as a conduit for local input into broader provincial-territorial or federal actions, or as transmitter of federal and provincial-territorial activities (for example, through public forums). Further, organizations within cities and municipalities should be able to look towards their local government to voice their interest in adaptation with the expectation that this will influence discussions with provincial-territorial and national levels.

Elected Leadership and Adaptation Champions

Leadership and interest in climate change adaptation at the local level can ease concerns of provincial or federal officials hesitant to be viewed as imposing on local communities. Workshop participants noted that if local officials are also champions for adaptation, then adaptation resources and directions from other orders of government may be seen as more credible or well-intended. Further, championing adaptation often requires invoking local needs and impacts, in which case, local officials will be best positioned to provide such insights and lenses. It is clear that without some interest at the local level, it can be very difficult to spur adaptation programs unless they are essentially seen as free inputs (such as infrastructure updates, funding, etc.)

Provide Funding

The capacity to fund adaptation varies significantly among local-level governments (municipalities and cities). Major urban centres such as the Greater Toronto Area or Metro Vancouver are, in some cases, able to develop advanced adaptation initiatives largely through their own budgets. Smaller municipalities and rural communities, however, may lack the financial and administrative capacities to coordinate adaptation. Despite smaller budgets, a commitment to funding by local governments is needed, though it is recognized that this would not be of the same magnitude of provincial and federal governments. Instead, as is often the case, local governments could be expected to contribute to cost-sharing of adaptation initiatives.

Private Sector

Provide Third Party Data and Projections (Consulting Sector)

A trend in discussion of the private sector at the workshops was that such firms are of value to adaptation governance via two central means: third party credibility, and quantification of risks through experience in analysis of their own assets. Regarding the former, practitioners see value in having access to data and projections, especially in the event of a lack of government-provided resources. For example, in 2011 the City of Toronto hired a consulting firm (AECOM) to develop a 'future weather and climate driver study,' which was later used to influence adaptation efforts across multiple city departments. Several years later, the Regional Municipality of Durham successfully networked to work with an amended version of the data set for the development of their own adaptation strategy. In this instance, both local governments turned to private firms because availability of data from provincial and federal governments were limited at the time.

Provide Financial Tangibility (Insurance and Banking Sector)

A key role recognized for a particular component of the private sector, the insurance industry, in climate change adaptation, is the ability to provide a quantification for the cost of not adapting where relevant. Because of their existing expertise to identify risks and predict economic costs, industries have a natural role to play in the governance of adaptation by making clear the impacts of adaptation to their practices and the cost of adaptation and potential cost of not adapting for both public and private sectors.

Be Engaged & Responsible (Service Providers/Crown Corporations)

It was recognized that semi-private service providers, such as utilities corporations, are in an interesting position. These organizations are often publicly owned corporations instructed to operate with the profit mandate of a private firm. Respondents recognized that despite the political issues that often surround these entities, there is a need for them to be engaged in the adaptation process, most specifically through input on capacity and future impacts to key societal infrastructure. In the case of energy providers, for example, they are expected to best know their own infrastructure and will be key in the vulnerability assessment stage. Further, in the deliberation stage, service providers will need to be consulted on potential policy efforts such as new regulations, technological investments, or financial instruments.

Develop and Promote Industry Standards (Industry Associations)

There is significant capacity within industry associations to influence the activities of large portions of the private sector. For instance, where market tools or regulation may not be effective or desired in government to incentivize adaptation, industry associations can go the route of voluntary or mandatory requirements of their members in order to achieve adaptation goals. In areas such as building codes or power generation, these initiatives are already occurring. Engineers Canada, the national industry association for private engineers and engineering firms, has been a leader on this front through promotion of their public infrastructure engineering vulnerability committee (PIEVC) tool, as well as their resilience certification program, the Infrastructure Resilience Professional (IRP) (Engineers Canada, 2017).

Public

Be Engaged

While there are many Canadians aware of, and concerned about, the impacts of climate change on their lives, an increase in this recognition would be beneficial for spurring responsible investments into key infrastructure and avoiding investments into maladaptation. How this awareness can grow will vary, as referenced in the various roles discussed above. Government, private sectors, NGOs, and academics will all need to play a role in effectively communicating the risks produced by climate change and the value of adaptation. In order for adaptation initiatives to have credibility, and in order to even identify many risks, there is a constant need for meaningful and regular key stakeholder and general public input at all stages of adaptation. This may be most important at the vulnerability assessment stage, but will also be key in deliberation in order to select policy instruments that are democratically supported. Public engagement will also be key in recognizing potential maladaptation in the monitoring and assessment stages.

Academics

Conduct Research & Promote Best Practices

Academia is an important contributor to both empirical and theoretical work on climate change adaptation. Academics may have more freedom to explore components of adaptation not within the purview, or time frame, of government employees. Further, academics can engage in valuable critical research and assessment of ongoing government and corporate programs that may be difficult to carry out from within. Academia can also engage in long-term and sometimes well-funded research agendas that governments or private firms may have difficulty sustaining alongside their other activities.

Be Engaged and Communicate

Academics should not work only within academia but also should be engaged in community, regional, and national efforts on adaptation. An important component is the conduct and communication of high quality research and inputs in accessible forums such as policy reports, grey literature, and open access online portals. Publishing solely in peer-reviewed journals can limit the impact and value of academic work, especially when compared to explicit networking and collaboration with NGOs, private sector, and government practitioners. A noteworthy example is the

participatory community research of Ford et al. (2007) with Canada's Inuit community. Academics need to be active members of communities of practice at all scales, and work to become effective at communicating their work to multidisciplinary audiences and avoiding the jargon of much academic work.

International Organizations

Provide Frameworks

Adaptation efforts are taking place around the world, and while significant differences may exist in government structure, culture, politics, and situations, some processes may be universal, such as the need for effective communication and the five stages identified above (more or less). National governments may look to international actors to synthesize global knowledge on adaptation to inform climate change adaptation through non-prescriptive guidelines.

International organizations, such as the United Nations, have the capacity to provide expert-driven support by providing frameworks for action, such as the *Paris Climate Agreement*, the *Sustainable Development Goals*, and the *Sendai Framework for Disaster Risk Reduction*. For adaptation governance, international organizations need to continue to advance the agenda by integrating adaptation targets and output indicators into the international agreements. They can provide that framework needed to guide adaptation at national and sub-national levels while coordinating action between governments.

Communicate and Promote

Through non-governmental international scientific organizations, such as the International Council for Science (ICSU), there are internationally led scientific programs that provide the scientific basis for climate change adaptation and related actions. These include the international programs Future Earth: Research for Global Sustainability; the World Climate Research Programme (WCRP); Urban Health and Wellbeing; and the Integrated Research on Disaster Risk (IRDR) programs.

Non-Governmental Organizations in Canada

Carry Out Research & Promote Best Practices

As found in ICLEI's *Changing Climate, Changing Communities* and the reports of the Institute for Catastrophic Loss Reduction (ICLR) and the Intact Centre on Climate Adaptation (ICCA), non-governmental organizations active in Canada have provided a considerable amount of useful literature for governments, citizens, industry and academics. Often in partnership, these organizations either produce knowledge approaches or engage in actual adaptation initiatives themselves. Such knowledge synthesis and development of best practices is a valuable contribution to adaptation governance. The non-prescriptive nature of best practices from NGOs allows for flexibility as well as customization to local conditions. Whether it is vulnerability assessments or implementation tools, these documents or programs can be useful as they are often freely available for municipalities and private firms.

Foster and Connect Networks

Perhaps the most valuable role for non-governmental organizations is their work in developing networks through conferences, interdisciplinary projects, and communities of practice. Because these organizations often depend on a multitude of sources for funding, they are typically nested within well-connected networks. Non-governmental organizations can facilitate open dialogue in neutral forums, where there is not seen to be one government or one industry steering the discussion. Non-governmental organizations are also often driven by specific issues such as climate change adaptation or urban sustainability and can have a focused effort that can be more difficult within government ministries tasked with multiple objectives.



Discussion

While it is acknowledged that many roles are repetitive (funding, leadership, research) across actors, this reflects the need for shared responsibilities and multiple perspectives (necessary redundancy) in climate change adaptation. Workshop participants recognized that it is unlikely any one organization, or perspective, is going to be able to juggle the multitude of issues involved in a single adaptation initiative. Further, in some instances, such as projected climate impacts, duplication is not necessarily inappropriate.

While there is variation, as adaptation is maturing, we are seeing trends in Canada around certain actors. Notable NGOs and arms-length organizations, such as FCM, ICLR, ICLEI, ICCA and Ouranos, have played a large role in fostering networks, sharing information and experiences between actors and even providing climate products. Industry associations and private sectors (such as the insurance industry) have joined NGOs in providing vulnerability assessment tools, implementation tools or guidelines, and basic information packages on adaptation. Internationally coordinated science also contributes to our knowledge and practices of adaptation.

Activities within government vary across the country. Nonetheless, it is clear from our workshops that given the existing division of authority in Canada, and the expertise at each level, adaptation practitioners see a clear role for each level of government in climate change adaptation. As more local governments and provinces endeavour to carry out vulnerability assessments (where there has been the most activity), or develop strategies (some activity) and implement them (limited cases), we will continue to develop an understating for best practices and roles in adaptation to climate change.

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Conclusion – Moving Forward

Climate change action needs to be understood as both the mitigation of greenhouse gases and the adaptation to current and expected impacts. For much of the past few decades, a traditional approach prioritized mitigation while adaptation was addressed with some reluctance, in part, due to misunderstandings of adaptation's definition, who is responsible, and how to implement adaptation. As impacts increase and the need to thrive in their presence becomes more evident, adaptation is emerging as a formidable partner of mitigation in public discourse.

It is particularly important to recognize the potential roles and effective instruments in adaptation governance. As efforts in government, the private sector, and among researchers continue to provide more information and evidence of what does, and does not, work, visions of effective adaptation governance are taking shape. It is clear now that for Canada to adapt and thrive in the face of climate change, there is an onus, a shared responsibility, of all Canadians to do their part. As we move towards 2°C of warming in this century, impacts will increase, surprises will emerge, and opportunities will present themselves. Hopefully, in that time, Canadians will identify an effective, and equitable, path forward.



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