

Shifting Mandates and Climate Change Policy Capacity: The Canadian Infrastructure Case

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Abstract. Responsive policy-making on climate change issues requires both sophisticated policy analysis as well as an institutional structure which allows problems to be dealt with on a multi-level and multi-sectoral basis. Designing such policies requires a high level of policy capability in relevant government departments and agencies matching changing organizational mandates in the area. This paper examines Infrastructure Canada's evolving mandate over the past decade and assesses whether or not its resource allocation has matched any shifts in government expectations for the agency due arising from climate change challenges. Provincial data are also examined in a similar light.

Keywords. Infrastructure, Climate Change Adaptation, Policy Capacity, Canada

Introduction

A government's overall ability to adapt to climate change pressures is a function of how it and society is organized and the extent to which both are capable of altering their behaviour towards sustainable practices congruent with the dynamics of climate change (Lyll and Tait 2004; Innes and Booher 2003). This study examines the existing infrastructure development system in Canada and seeks to understand the nature of the policy and governance systems in this area in terms of their ability to discern and implement appropriate directions for change (Monni and Raes 2008), as well as what resources are required in order to move existing arrangements towards more sustainable orientations or mandates (Igielska 2008).

Infrastructure is a good area for case study on this subject. In her May 2011 parting speech, outgoing federal auditor general Sheila Fraser singled out infrastructure as a major sector involved in climate change adaptation in Cana-

Résumé. La prise de décisions réceptive au changement climatique exige à la fois une analyse des politiques sophistiquée et une structure institutionnelle qui permette de résoudre des problèmes sur une base multi-nivelée et multi-sectorielle. Concevoir de telles politiques demande un haut niveau d'aptitude d'élaboration des politiques dans des départements et agences gouvernementaux pertinents qui va de pair avec les mandats de changement organisationnel du secteur. Cet article examine l'évolution du mandat d'Infrastructure Canada au cours de la précédente décennie et interroge la manière dont l'allocation des ressources de cette agence fédérale a pu correspondre à des attentes gouvernementales nouvelles, en raison des défis posés par le changement climatique. Des données provinciales sont examinées dans une perspective similaire.

Mots clefs. Infrastructure. Adaptation au changement climatique. Elaboration des politiques. Canada.

da. In her speech, Fraser noted the "extreme impacts" of climate change are most readily apparent in Canada's North.

"Melting permafrost is undermining roads, buildings and pipelines," she said, adding that climate change is also affecting wildlife migration patterns.

"Canada needs a national long-term climate change strategy -one that will allow us to mitigate and adapt to changes to cover the costs and to engage Canadians in adjusting both their attitudes and their activities."

She further took aim at the nature of existing infrastructure in this country, saying it suffered from age and obsolescence and required major upgrading.

"Over the past decade, many of our audits have shown that government will need to repair or replace a wide range of infrastructure -from mail handling facilities and equipment at Canada Post, to research facilities and equipment, and the government's IT systems, to bridges, ferries and the Parliament buildings." (Kennedy 2011)

As Fraser noted, climate change adaptation will involve large-scale changes to the technical structures that support a society, such as roads, water supply, wastewater, power grids, flood management systems, communications (internet, phone lines, broadcasting) (Harchaoui, et al. 2002). In Canada these infrastructure systems have typically been owned and managed by local or central governments and governments will be key players in any modernization efforts.

Infrastructure assets generally have the following attributes: (1) they are large networks constructed over generations which are not often replaced as a whole system; (2) the system or network has a long and indefinite life because its service capacity is maintained in perpetuity (by continual refurbishment or replacement of components as they wear out); (3) the system components are interdependent and not usually capable of subdivision or separate disposal, and consequently are not readily disposable within the commercial marketplace and (4) the assets have a high initial cost and a value which is difficult to determine. Changing such systems is a large and expensive task requiring extensive policy capacity.¹

As the federal Commissioner of Environment and Sustainability highlighted in 2006, however, policy capacity in infrastructure, although a significant issue affecting Canadian climate change adaptation efforts, has not been well developed:

“The federal government has supported the development of knowledge through impacts and adaptation research and initiatives that involve working with decision makers on adaptation solutions. There is sufficient information for adaptation to proceed. However, the federal government has not yet organized its activities in climate science to make sure that the federal departments and others obtain needed information. For example, there is a lack of up-to-date climate information for use in adapting the designs of infrastructures such as storm sewers, and limited information is available to the public on possible climate conditions in their area”(Environment and Sustainability Commissioner, 2006:2)

The overview for this special issue has argued that many such gaps between policy needs and performance in the climate change area can be explained by examining the state of policy capacity in the policy areas concerned. It defined capacity as a multi-faceted concept extending over at least three levels: the subsystem level, the organizational level and that of the micro-level behaviour of policy workers. This article looks at the meso-organizational level and extends the framework for analysis set out in the overview article to the infrastructure case - one of five cases examined in the project.

More specifically, the article examines the organizational mandates and resources of Infrastructure Canada and assesses them in the context of the challenges brought on by a focus on climate change mitigation and adaptation over the past decade. The study examines existing governance arrangements and policy analytical capacity in Infrastructure Canada both in terms of ‘internal’ capacity and in terms of the ability of alternative arrangements to address some of

these issues (English and Skellern 2005). This study, as with the other sectoral case studies included in this special issue, tests the following hypotheses:

- (H1): *That the main impact of climate change has been to expand the mandate of existing Departments and agencies. But that the extent to which this has occurred will vary by policy sector;*
- (H2) *That as the mandate increases for a unit, more resources will be needed to retain existing levels of policy capacity, so that,*
- (H3) *Those agencies most affected by climate change concerns will require additional resources if capacity is to be increased to meet new challenges.²*

Following the logic set out in Figure 1 below, the case study examines both shifts in departmental mandates and resources over the period in question and answers the question(s) of (1) how these have changed, (2) if these changes are related to climate change concerns and (3) whether or not observed changes in mandates have been matched by changes in resources, thus allowing policy capacity to match new challenges taken on in the sector in response to climate change concerns.

Figure 1 - Evaluating Departmental Policy Capacity in the Context of Altered Mandates

		RESOURCES	
		<i>Match or Exceeds Changed Mandate</i>	<i>Mandate - Capacity Gap increases</i>
	<i>Department or Agency Retains Nodal Position in Policy System</i>	Department Retains or Enhances Existing Policy Capacity	Department Experiences Some Resource-Based Capacity Losses
MANDATES	<i>Loss of Nodality</i>	Department Experiences Network-based Capacity losses	Department Experiences Significant capacity losses

The Infrastructure Canada Case

Infrastructure Canada is part of the Transport, Infrastructure and Communities portfolio of the Government of Canada. Established in August 2002, Infrastructure Canada was formerly associated with the Treasury Board Secretariat, the Privy Council Office, Industry Canada, and Environment Canada. It exists to lead the Government of Canada’s efforts in addressing Canada’s public infrastructure challenges (Infrastructure Canada, 2010). The Minister of Transport, Infrastructure and Communities is responsible for the department. In Budget 2007, Infrastructure Canada was charged with developing the comprehensive \$33 billion Building Canada Infrastructure Plan. This plan covered infrastructure investments in water, wastewater, public

transit, and other key national priorities and was intended to deliver sustainable infrastructure such as highways, water treatment and wastewater plants, public transit, and green energy (Infrastructure Canada 2010).

Planning in the infrastructure area is problematic since due to climate change, as the former Auditor-General noted, Canada's infrastructure will likely be forced to withstand more frequent and more extreme weather events, more climate variability and changes in the average conditions in which most major infrastructure operates. Increased rainfall, cold, warmth and intensity of storms can all raise havoc with existing and planned infrastructure projects. These trends are all expected to worsen over time, but the impacts will be felt differently in different regions, from higher temperatures in the north affecting permafrost and other similar conditions, to changes in river flows and ocean levels in other areas of the country. Problems with port facilities, electrical dams and transmission lines, highways and roads, and sewer and water lines, among other impacts, are forecast (Infrastructure Canada 2006). Climate change is also expected to increase the frequency and magnitude of many natural disasters, and this will inevitably affect Canada's infrastructure. It could also necessitate the need to design, build and maintain infrastructure differently in order to adapt to future changes. The country has already experienced a rise in mean temperature, heavier rainfalls and more severe winter storms. These changes are all projected to accelerate over time and have consequences for infrastructure design and maintenance.

Canada thus needs to protect its critical infrastructure assets from adverse climate change impacts and ensure communities can continue to provide vital services, especially when natural disasters occur (Infrastructure Canada, nd). This involves government agencies in increased planning and project management activities requiring additional resources in terms of budgets and personnel. The term 'projectification' has been used in the management studies literature to refer to efforts to better design major government projects and refers to "the increasing amount of work being organized through projects," as well as to "the processes through which an individual project is created" (Smith and Winter: 2004).

Besides changes in government project management practices, another key issue has been the management of public consultation exercises in this area. As Christenson (2009) has argued "perhaps the greatest challenge has been not only to integrate systems to support coordinated care across the continuum, but to manage different stakeholder interests." It is the multi-stakeholder nature of most public sector projects that makes their governance complex; along with the need to often deal with projects from "the center" of "vast federated enterprise" - that is, with the provincial governments (Norrie 2008; Crawford BCPSA 2009).

Such considerations relate directly to the issue of governance integration raised in the introductory article to this issue as a key component of governance capacity. A good example of this concerns recent experiences with public-private partnerships (PPP's or P3's)³ which are becoming a

common tool to develop infrastructure as governments around the world have increasingly searched for new ways to finance projects, build infrastructure and deliver services (Daniels and Trebilcock, 1996; Grimsey and Lewis 2004). In addition to involving private enterprise, PPP's can help provide much needed capital to finance government programs and projects, thereby freeing public funds for other core economic, environmental and social programs (Trujillo et al 2003; Zarco-Jasso 2005). However their successful management also requires high levels of government expertise and oversight which may not always be forthcoming.⁴

Methodology and Operationalization

The key variables in Figure 1 which require operationalization are 'mandates' and 'resources'. In her discussion of the Australian railway case, Edwards (2009) devised five measures which can be used as criteria to identify and assess changes in state policy capacity. These include:

1. The discursive construction of the Departmental mandate,
2. The nature of the network in which the Department is embedded,
3. The nature/quality of the information the Department has,
4. The nature/quality of the personnel the Department has,
5. The range of policy tools at the Department's disposal to implement its plans.

Edwards first measure relates to mandate, while her measures no. 2, 3 and 4 relate to resources. In a developed country context most tools (no. 5) are available to a Department and will not be examined here. Since measuring 2, 3 and 4 directly is very difficult, budgetary resources are used as a surrogate or proxy measure.

As Figure 1 suggested, the general axioms of organizational structure and behaviour supported by most existing literature in organization and network studies towards capacity endowments is that the more narrow and precise the mandate, the fewer resources (budgets/personnel) needed to have high capacity. Conversely, the greater the mandate, the more resources are required to retain a high level of policy capacity. In what follows below, the specifics of the Canadian infrastructure case are examined.

Preliminary Findings

Mandate Change

A review of Infrastructure Canada's (IC) official reports over the last ten years reveals a clear shift in departmental activity related to IC's role in policy coordination and management (see Table 1). The department has seen significant change related to the development of expertise, seeing a shift

from a focus on departmental capacity building to one of knowledge and research generation and mobilization.

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Table 1 –Thematic Program Activity 2000-2010

Fiscal Year	Managing/ Advice/ Co-ordination	Developing Expertise/ Capacity	Financing	Sustainability	PPPs ⁵	First Nations
Pre 2000 ⁶	Coordination of existing infrastructure programs across government and Provide advice and support via Infrastructure National Office (INO) - Treasury Board)	Department capacity building				
2002 ⁷	Managing Infrastructure Investments	Centre of expertise, focal point for cities & communities	Leveraging Infrastructure investments: i. community based ii. strategic	Healthy & sustainable communities		
2004 ⁸	Managing Community and Strategic Investments	Research, Knowledge and Outreach	Leveraging community & strategic Infrastructure investments	Sustainable cities & communities		
2007	Supporting Canada's economy, environment & quality of life.	Policy, Knowledge & Partnership Development	Sun setting of existing programs, shift to Long term infrastructure funds ⁹	Modernizing infrastructure, environmental & economic sustainability	Public Private Infrastructure fund	First Nations Infrastructure fund
2010	Managing economic stimulus and green infrastructure	Knowledge & Research	Long term infrastructure funds & expedited infrastructure Stimulus Fund	Strengthening economy delivering modern & greener public infrastructure	Public Private Infrastructure fund	First Nations Infrastructure fund ¹⁰

Moreover, the department has seen a growing emphasis on community based infrastructure programming and horizontal interdepartmental partnerships. Recent and notable changes in department program activities listed in official departmental reports underscore the impact of implementing the 2009 Government of Canada's post-financial crisis Economic Action Plan; including increased infrastructure 'stimulus' funding and a new \$1B green infrastructure fund. Overall, the department has shifted from an initial emphasis on capacity and expertise development to a focus on downstream infrastructure projects, and has become a vehicle for economic stimulus expenditure.

In the years leading up to the creation of the department, infrastructure programming and policy were coordinated through the Infrastructure National Office (INO) located in the Treasury Board. The emphasis during this period was on the provision of infrastructure policy and program related expertise to various infrastructure programs housed under different program activity lines across government. While significant programs such as the Canada Infrastructure Works Program (CIWP) existed, they were managed by different departments across government. As shown in Table

1, the period leading up to the creation of Infrastructure Canada can be characterized as one dominated by depart-

ment level capacity building and significant coordination of existing programs and activity across government. The official formation of the department in 2002 marked a concerted effort to centralize all of the existing policy and program activity in one unit. Infrastructure Canada's first departmental report filed in 2002-2003 noted that the organization assumed responsibility for the large volume of existing infrastructure programming and established itself as the focal point for the government of Canada's various involvements in infrastructure development. The department began to work as a centre of expertise and as the focal point for a growing emphasis on cities and community-based infrastructure programming. With a variety of existing and new infrastructure programming, Infrastructure Canada's activity was largely conducted under the two principle rubrics of community and strategic based infrastructure programs (e.g. local water or waste projects, border and security related infrastructure). The 2002 Speech from the Throne also signalled the prioritization of an approach focused on healthy and sustainable cities and communities,¹¹ a focus that would remain in place for the first half of the decade.

This focus on leveraging strategic and community infrastructure investments was further underscored by organizational and policy shifts in the 2003-2005 period, notably around a growing emphasis on sustainable cities and communities and the formalization of infrastructure specific research and policy development activities. Official departmental reports underscore this shift beginning with the transfer of the Cities Secretariat from the Privy Council Office to Infrastructure Canada in 2004 and subsequent policy work around the *New Deal for Cities* policy initiated in the 2004-05. Together, these two organizational and policy shifts served to further orient the department's policy and program work towards the cities and communities level.

Table 1 further shows that the 2003-04 and 2004-05 periods were dominated by a community-based and city centric infrastructure investment and programming strategy. Several existing programs under the department's community and strategic infrastructure investment program activities lines continued to receive funding. Initial departmental reports highlighted the importance of Infrastructure Canada playing a lead role on the policy and research expertise front and initial efforts towards this end were realized through departmental capacity development. The 2003-04 period represented a formalization of research and knowledge based programming under the program activity priority area of 'Research, Knowledge, and Outreach'. Community based infrastructure programming reached its zenith with the 2005 federal budget 'A New Deal for Canada's Communities'. In February 2006, Infrastructure Canada and Transport Canada became part of a new portfolio, Transport, Infrastructure and Communities (TIC) reflecting further efforts to better integrate infrastructure planning with similar and overlapping policy work.

Recent shifts in the key program activity areas and mandates

infrastructure programming via the First Nations Infrastructure Fund (2007). Both are managed by departments outside of Infrastructure Canada (Finance and Indian and Northern Affairs respectively) but are indicative of the overarching inter-departmental infrastructure approach flowing out of the large-scale, long term, Building Canada Plan. Additional shifts related to knowledge and policy type of activities are reflected in the emergence of 'Policy, Knowledge, and Partnerships' as a stand-alone program activity in the department's 2006-07 Departmental Performance Report, a trend which has continued since then.

Both streams of funding emphasize community and national-based projects that have an economic stimulus effect, but a search of the Departmental Performance Reports for 2009-10 yields no results for projects explicitly tied to climate change adaptation. Inspection of these reports reveals that over the last decade the departmental mandate has included six key areas: managing/advice or co-ordination activities; developing expertise and capacity, sustainability, PPPs and First Nations issues. The 2009-10 official report underscores the most recent shift towards expedited infrastructure spending, and an emphasis on the sound management of EAP related infrastructure and 'green' infrastructure funds without a clear climate change agenda.

Resources

The aforementioned discussion reveals substantial changes to the department's overarching mandate and program activity areas in recent years. The second key metric related to governance arrangements and climate change adaptation relates to the ability of the department to effectively match or meet these mandate changes with the requisite level of financial and human policy resources. The following section outlines this second key component of climate change capacity and provides an overview of the changing nature of Infrastructure Canada's human and other resources over the 2002-2010 period. It provides a snapshot of the various trends in allocations within the department as well as the amount of resources deployed for explicitly-stated departmental policy efforts related to the 'research and knowledge' program activity area cited above. From this review some general conclusions can be drawn related to the program activity areas mentioned above.

As Table 2 illustrates, a review of Infrastructure Canada's Departmental Program Activity reports (2002-2010) reveals that the department has seen its budget increase steadily. A clear spike in activity is detectable in recent years due to the additional funding of infrastructure projects through the EAP and the \$1B Green Infrastructure Funds. These increases in department wide funding are mirrored by steady growth in departmental human resources, which are tracked on a Full Time Equivalent (FTE) basis.

Both the departmental wide budget and human resources spiked in 2009-2010 in response to the imperatives generated by economic stimulus funding. The figures as reported in the most recent versions (2006-2010) of Industry Canada's Departmental Performance Reports provide for particularized staffing figures along Program Activity lines.

Table 2 – Combined Fiscal and Human Resources: Infrastructure Canada 2000-2010

Fiscal Year	Overall department spending (Actual, \$ thousands)	Infrastructure specific spending ¹²	Full Time Equivalent Staff numbers
Pre 2000 ¹³	n/a	n/a	n/a
2002-03 ¹⁴	12,118	11,793	35
2004-05	253,163	217,913	179
2007-08	1,956,427	1,943,381	217
2010-11 ¹⁵	8,182,658	7,313,261	428

of Infrastructure Canada demonstrate a clear shift toward large scale and longer-term infrastructure projects via the initiation of 'sun-setting' of existing programs and the introduction of the \$33B Building Canada Plan (2007). The Building Canada plan included greater use of the newly created federal crown corporation *Public Private Partnership Canada* (2007) and greater emphasis on Aboriginal

Table 3- Infrastructure Canada 2000-2010 Policy Analytic Capacity Spending¹⁶

Year	2006-07	2007-08	2008-09	2009-10	2010-11
Infrastructure Canada 'policy' related Program activity category	Policy, Knowledge and Partnership Dev.	Policy, Knowledge and Partnership Dev.	Policy, Knowledge and Partnership Dev.	Economic Analysis and Research (EAR)	Economic Analysis and Research (EAR)
Actual Spending \$ Thousands	13,773	12,714	8,199	4,142	15,498 ¹⁷
FTE's ¹⁸	Planned: 73 Actual: 63	Planned: 93 Actual: 73	Planned: 62 Actual: 53	Planned: 36.5 Actual: 17	Planned: 29 Actual: n/a

As Table 3 makes clear, while organizationally the department has captured its analytical and research work under various titles, a clear shortfall exists of planned versus actual staff for policy related program activity lines.

That is, at the federal level we find an increased mandate, not all of which is related to climate change, and a consistent shortfall in resources. *Prima facie*, then, one would expect Infrastructure Canada to have experienced significant capacity losses in recent years. This finding is supported by a recent audit by the Federal Commissioner of Environment and Sustainable Development, which concluded:

The government has developed knowledge through research on impacts and adaptation; however, without identified expected results in adaptation, it is difficult for the federal government to determine where to focus adaptation research efforts and how it should plan to contribute. Access to information and technical expertise on adaptation varies considerably across the country (Environment and Sustainability Commissioner, 2006:22)

The most recent Infrastructure Canada Departmental Performance Reports underscore the increased use of the department as a part of the Government of Canada's Economic Action Plan (EAP). The EAP (2009) was introduced in light of deteriorating global economic conditions and includes two key elements of importance for IC programs. The EAP confers the additional responsibility of delivering new infrastructure stimulus and green infrastructure funds. IC 2009-10 Departmental Performance Report (p.3) elaborates that:

The department has played a leading role in delivering Canada's Economic Action Plan (EAP), rolling out an unprecedented amount of infrastructure investment in record time. We have developed and implemented \$5.5 billion worth of new infrastructure funding programs for construction-ready projects, and accelerated funding under the government's \$33 billion Building Canada Plan (BCP) announced in Budget 2007.

The additional \$5.5 billion is principally composed of a \$1 billion Green Infrastructure Fund (GIF) and \$4 billion Infrastructure Stimulus Fund (ISF). The GIF provides program funding for municipal and community based environmental

projects related to cleaner air or greenhouse gas emission reductions. Any improvements to local or regional policy capacity with respect to climate change are likely to be incidental to one-time improvements in air quality. Likewise, although stimulus spending on infrastructure is expected to be in accordance with the latest environmental standards, the short-term employment goals of the ISF are unlikely to be conducive to the development of strategic management or greatly improved project governance.

Provincial Climate Change Adaptation and Infrastructure

Canada's federal system allows for asymmetrical levels of collaboration and partnership between levels of government and can sometimes offset capacity losses at one level of government with gains at another; or can compound the problem. In general, infrastructure spending and specific programming around environmental or 'green' infrastructure programs by the federal government saw significant provincial involvement. Provinces were notable partners particularly related to the major infrastructure programs included in the Building Canada Plan and more recent green/infrastructure stimulus programs. Assessing capacity gains or losses in the sector, therefore, requires examination of the situation at both levels of government.

A review of provincial climate change plans and strategies as well as infrastructure ministries' departmental plans and yearly reports found limited programming and funding explicitly related to infrastructure climate change adaptation. As per Annex A – Provincial Infrastructure and Climate Change Adaptation - each province did have a strategic plan or policy related to climate change (e.g. Climate Change Adaptation Framework Strategy (2008); Towards a Greener Future: Nova Scotia's Climate Change Plan (2009)). These plans have little specific infrastructure focus however and largely deal with carbon emissions reductions and energy efficiency writ large. References to adaptation generally lack

specifics regarding the nature of anticipated impacts or steps taken to invest in adaptation related to infrastructure.

In general, most of the provincial infrastructure-related adaptation programming is led by ministries of transportation, environment, and agriculture rather than a specific agency like Infrastructure Canada at the federal level. Such sector specific adaptation approaches have focused on coastal erosion, agriculture, transportation, or water and wastewater infrastructure, for example. Provincial infrastructure departmental reporting and 'action plans' however report little if any direct program specific funding related to infrastructure climate change adaptation. Typical mentions focused on water resources (watersheds, treatment facilities, sewers and pipes etc.) and on transportation (road conditions, highway, and bridges). In the British Columbia public sector, for example, there has been a significant move to new management techniques like projectification, which has been "deep and broad", at least in those ministries with substantial IT and infrastructure components (Plecas 2012). Yet clear progress in enhancing policy analytical capacity has been slow. Prior to 2007, critics complained that there had been too many projects, with various inconsistent methodologies, lacking in over-all strategic co-ordination. Most ADMs and Directors in government lacked a background in "programme management" (i.e. expertise in implementing projects) and "portfolio management" (i.e. skill at prioritizing and selecting projects), and the private sector vendors certified and promoted by organizations such as the provincial Project Management Institute only had this experience in a private sector context and a vested interest in promoting as many projects as possible (Crawford 2009). One Ministry in 2006 had 89 projects in its portfolio, and 10 different vendors with a disparate collection of project management methodologies, making comparison and coordination difficult (Christenson 2009).¹⁹

The experience in British Columbia confirms the findings of a recent major international study on Researching the Value of Project Management, which indicated that techniques for achieving strategic goals through temporary projects *do* generally add value, although in large organizations such as governments (where the ultimate product or service is not usually delivered through projects), the value of project management is likely to be viewed as tactical rather than strategic—often causing a lack of pro-active investments in ongoing systems of project governance (Thomas and Mulally 2008). This raises important research questions for provincial ministries involved in infrastructure development because they are often expected to show tangible benefits from the application of Project Management techniques such as cost-savings. The potential for intangible benefits from investment in project management (improved culture, accountability, management skills, or climate change adaptation etc.) is often not a focus of current project management activities.²⁰

Conclusion

In the Canadian infrastructure case, as in any other, adaptation capacity is a function of the nature of the economic and production system, but also of regulatory, property rights and other legal components or policy regimes, and of the policy system itself (Fussell and Klein 2006).

At the federal level, the recent evolution of Infrastructure Canada's mandates and resources reveals a three phase development over the last decade. This pattern is:

Phase 1 (pre2000-2002) – development of startup capacity building

Phase 2 (2002-2006) - extension to financing and sustainability

Phase 3 (2007-2010) - extension to PPPs and First Nations and development of economic stimulus role.

This has not been a smooth process as the history of the agency also includes its possible planned phase-out in 2004 followed by the abandonment of this plan and its resurrection in 2007-2010 as a dispenser of stimulus money after the financial crash of 2007.

Overall, discounting the one-time increase in infrastructure funding occasioned by the global financial collapse, none of the last several years has seen the planned policy or analytical needs of the lead federal department for infrastructure match its actual staff levels as reported in Departmental Performance Reports. While such findings could be argued to stem from an overestimation of departmental policy staff need, audits of the departmental human resources practices do not support this line of argument. A recent audit conducted by the Public Service Commission of Canada (2009:19), for example, concluded:

Infrastructure Canada did not have adequate systems and practices in place to manage its public service staffing activities. We are particularly concerned about its weak human resources (HR) planning and monitoring activities. The department had a significant shortage of staff which had not been addressed and its HR plan did not provide direction to management on how to deal with the shortfall. The Deputy Head's monitoring of staffing systems performance lacked rigour. Its Human Resources Committee was approving staffing activities based on erroneous data, an uncoordinated approach and without a detailed plan. Vacancies appeared to be staffed as expeditiously as possible rather than integrated into the department's business objectives.²¹

Based on publicly available Departmental Performance Reports, therefore, it appears that human resources explicitly tied to analytic or policy work is lacking in the infrastructure area and capacity in this area at the federal level and is not keeping up with challenges such as those caused by climate change.

At the provincial level, a review of provincial plans and infrastructure ministry documents also reveals infrequent mentions of climate change adaptation efforts related to infrastructure specifically. Two key findings flowing from our review of provincial climate change action plans were the clear regionalization of adaptation plans and 'strategies', and secondly, a very uneven pattern of formal institutional policy analytic capacity building related to climate adaptation.

Partnerships between sub-national levels of government and/or federal-provincial regional partnership agreements to facilitate adaptation and climate change strategies, however, were common and may have offset some of this gap. The Ontario government in collaboration with Natural Resources Canada and the Toronto and Region Conservation Authority, for example, form part of the Ontario Regional Adaptation Collaborative (Ontario RAC). The Prairie Adaptation Research Collaborative (PARC), to cite another example, is mandated to pursue climate change impacts and adaptation research in the Prairie Provinces. The Climate Change Adaptation Strategy for Atlantic Canada (June 2008) is another regional partnership between several Atlantic provinces with Natural Resources Canada, and supplements the province's specific stand-alone climate change action plans. This collaborative regional planning effort is indicative of the need for multi-jurisdictional and multi-level adaptation planning at the strategic level in order to even begin to address capacity deficits in the area.

As shown in Annex A, several provinces also have formal organizations conducting research or had joined collaborative efforts related to the development of strategic or integrated research for climate change adaptation. These research and knowledge investments were however focused on adaptation more generally with limited mention of infrastructure adaptation which remains very much a federal initiative. Although central coordination and governance of project management has been improved in recent years, at least in the larger provinces, there is little evidence the results of such improvements will lead to similar improvements for either long-term policy analytical capacity or more integrated governance arrangements related to climate change adaptation. Thus at the provincial level while strategic plans related to climate change are prevalent, actual on-the-ground programming and spending related to infrastructure is generally operationalized in the various provinces through other departments, notably ministries of environment, transportation, and agriculture.

The need for more efforts to develop capacity in the infrastructure area in Canada, however, is paramount. As the Environment and Sustainability Commissioner reiterated in 2010 with respect to federal efforts in general:

The government has not established clear priorities for addressing the need to adapt to a changing climate. Although the government committed in 2007 to produce a federal adaptation policy to assist it in establishing priorities for future action, there is still no federal adaptation policy, strategy, or action plan in place. Departments therefore lack the necessary central direction for prioritizing and coordinating their efforts to develop more effective and efficient ways of managing climate change risks (Environment and Sustainability Commissioner, 2010:1)

The Commissioner argued that efforts of individual departments would continue to flounder without an overall strategy to "provide direction in their efforts on adaptation". As the Commissioner pointed out, having such an adaptation strategy at both the federal and provincial levels is critical because it could help:

- outline a government's overall priorities, objectives, and goals with respect to adaptation;
- provide direction on incorporating adaptation into policy making and operational planning;
- provide direction to departments to prioritize and coordinate their adaptation efforts;
- communicate to external parties what support they can expect from the government;
- identify research that meets the needs of the government and its clients, partners, and stakeholders; and
- address capacity and growing demand for information on climate impacts and adaptation."(Environment and Sustainability Commissioner 2010:25).

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Annex A - PROVINCIAL INFRASTRUCTURE AND CLIMATE CHANGE ADAPTATION²²

Province	Provincial adaptation strategy?	Dept responsible for infrastructure and its mandate re: climate change	Infrastructure Ministries Programs related to climate change adaptation	Infrastructure funding explicitly related to adaptation (\$)	Policy Analytic Capacity
British Columbia	Preparing for Climate Change: British Columbia's Climate Change Adaptation Strategy (2010)	Ministry of Transportation and Infrastructure ²³	General inclusion of planning/codes for infrastructure builds to include adaptation and resistance to climate change Objective 4.2: The main highway system is rehabilitated on a lowest life-cycle cost basis Integrate climate change adaptation considerations into rehabilitation design and cost. Building codes and standards reflect historical experiences; therefore some B.C. infrastructure may require repairs, retrofits and upgrades to ensure that initial investments are resilient to climate change. ²⁴	\$441 million between 2011/12 and 2013/14 on the main highway system (roads and bridges) to maintain and mitigate the onset of deterioration in ways that maximize the return on infrastructure investment; ²⁵	PAC part of Climate Change Adaptation Plan (Strategy 1: Build a strong foundation of knowledge) Unplanned Events and Conditions Reducing GHG's
Alberta	Climate change adaptation framework strategy (2008)	Alberta Ministry of Infrastructure	None found	None found	Infrastructure used to assess adaptive capacity ²⁶ Prairie Adaptation Research Collaborative
Sask.	Bill 126, <i>The Management and Reduction of Greenhouses Gases and Adaptation to Climate Change Act</i> . ²⁷	Ministry of Highways and Infrastructure	None found	None found	<i>Partner with Prairie Adaptation Research</i>
Manitoba	The Climate Change and Emissions Reductions Act (2008); Kyoto and Beyond - Manitoba's Green Future (2008)	Ministry of Infrastructure and Transportation	Integrated watershed management plans, flood protection is being improved throughout the province. ²⁸	No funding figures available for these initiatives	Manitoba Climate Research Table. ²⁹
Ontario	Climate Change Action Plan (Ministry of Infrastructure	The Ministry of Energy and Infrastructure modified its Infrastructure Planning Guidelines to require that ministries consider the impacts of climate change on infrastructure ³⁰	\$32.5 billion commitment for general infrastructure, & \$3.2B in funding related to innovative and green 21st century economy. ³¹	Expert Panel on Climate Change Adaptation (2007). ³²
Quebec	2006-2012 Climate Change Action Plan	Ministry of Infrastructure	Program reports indicate work related to 'at risk' infrastructure and related to mass transit funding ³³ March 2010 budget also included a series of other transportation & road infrastructure initiatives. ³⁴	\$55 million will have been invested to support municipalities for climate change risk mitigation (increased coastal erosion, flooding, landslides, etc.). ³⁵	Research program on adapting transportation infrastructure to the impacts of climate change \$3.9 million and address the vulnerability of transportation infrastructures in Nunavik due to thawing permafrost, and maritime infrastructures. Research re: vulnerability of road infrastructures in the Gulf of St. Lawrence and marine estuary regions. ³⁶
Nova Scotia	Towards a Greener Future: Nova Scotia's Climate Change Plan (2009)	Nova Scotia Department of Transportation and Public Works	A memorandum of understanding that will address climate change mitigation and adaptation. ³⁷ Design standards and plans for new provincial construction reflect projected climate trends ³⁸	None found	Adaptation Fund for research & development. ³⁹

Annex A (cont.)

Province	Provincial adaptation strategy?	Dept responsible for infrastructure and its mandate re: climate change	Infrastructure Ministries Programs related to climate change adaptation	Infrastructure funding explicitly related to adaptation (\$)	Policy Analytic Capacity
New Brunswick	Climate Change Action Plan (2007-2012)	Ministry of Transportation and Infrastructure	<p>Implement a regulatory framework to help protect the coastal environment, infrastructure and public and private property.⁴⁰</p> <p>Programs such as the recently announced Eco-Trust, the Canada/NB Infrastructure Program and the Canada/NB Municipal Rural Infrastructure Program are also essential and can assist in achieving the Action Plan commitments. The most recent (2007) federal budget also included a number of other initiatives that could be explored as funding opportunities for some action plan elements.⁴¹</p>	No funding figures available related to specific infrastructure re: adaptation, see figures for other programs and PAC	<p>Atlantic Climate Adaptation Solutions Project</p> <p>Atlantic provinces, municipalities and Natural Resources Canada collaboration with approximately \$8.4 million between 2010 and 2012⁴²</p> <p>N.B. Environmental Trust Fund, \$311,800 for studying adaptation⁴³</p>
Prince Edward Island	P.E.I & Climate Change ~ A Strategy for Reducing the Impacts of Global Warming (2008)	Minister of Transportation and Infrastructure Renewal	None found	None found	None found
N.L.	Climate Change Action Plan (2005)	Office of Critical Infrastructure Protection and Emergency Preparedness (OCIPEP)	Government will require that infrastructure projects receiving public funds meet a standard set of criteria with respect to climate change. ⁴⁴	None found	Funding for community-based process of climate change planning Studies related to selected communities risks from flood events. ⁴⁵

Endnotes

- 1 This is similar to the concept of an “infrasystem” put forward by Frantzskaki & Loorbach (2010) These can be principally distributive (with an emphasis on capacity for centralization/decentralization), accumulative (with corresponding emphasis on demand curbing and alternative design) or communicative systems (concerned with efficiency improvements and/or alternative design). IC’s policy capacities may vary with respect to each of these kinds of system
- 2 This discussion does not deal at all with whether or not outputs are of high quality or not.
- 3 Public-private partnerships span a spectrum of models that progressively engage the expertise or capital of the private sector. At one end, there is straight contracting out as an alternative to traditionally delivered public services. At the other end, there are arrangements that are publicly administered but within a framework that allows for private finance, design, building, operation and possibly temporary ownership of an asset (http://www.pppcouncil.ca/aboutPPP_definition.asp)
- 4 Three countries stand out as world leaders in the number and scale of PPP’s - the United Kingdom, Australia and the United States (primarily in water & wastewater), although many other countries have successfully implemented PPP projects and are benefiting from the results. What tends to distinguish the leader countries (UK and Australia) is that PPP activity is conducted through a comprehensive government program rather than on a one-off basis, as has tended to happen in Canada and the USA (Hodge and Greve, 2007). Compared to other countries with vibrant P3 activity, governance arrangements in Canada, especially, are often seen as barriers to development of innovative policies in this sector (Gomez-Ibanez 2003). Especially in such areas as healthcare and when delivering such “public goods” as water, Canadians remain suspect of partnerships that put “shareholder” value above public interest. Public-private partnerships are often seen by organized labour as resulting in job loss, poor quality and lack of oversight (Boase 2000; Vining et al 2005). These issues must be overcome if use of such alternate tools is expected to deal with significant climate change infrastructure challenges.
- 5 Both PPP and First Nations funds are examples of a trend towards interdepartmental agreements flowing from the 2007 building Canada plan.
- 6 Note: This is ‘start-up’ phase - mainly capacity building
- 7 Note: This is first major phase with addition of financing and sustainability goals **N.B** shift from overall existing infrastructure coordination to strategic + cities and communities focus (broader and large scale infrastructure + gas tax/ municipal and regional infrastructure programming)
- 8 Note: This was planned phase out stage with sunset provisions **N.B:** the sun setting began in 2007 (and is ongoing) under the Conservatives they phased out the longstanding stream model (strategic/border/ community infrastructure) and introduced the \$30B “building Canada plan”
- 9 Sunsetting here reflects the end of several existing programs once committed spending runs its course.
- 10 The PPP and First nations items are managed by other ministries (finance and INAC) but are part of the Building Canada INFRC plan. The write up as is keeps them under a horizontal inter-departmental multi-actor policy coordination theme.
- 11 See the Infrastructure Canada 2002-2003 Department Performance Report: http://www.collectionscanada.gc.ca/webarchives/20060120095531/http://www.tbs-sct.gc.ca/rma/dpr/02-03/infra-infra/infra-infra03d01_e.asp#Anchor-Ministerxs-47857
- 12 The infrastructure specific spending figures represent program spending and do not include crown corporation or department administration costs
- 13 For a good overview of recent GOC infrastructure spending prior to creation of INFRC portfolio see Table 1 – from the 2002-03 INFRC Departmental Performance Report (DPR) http://www.collectionscanada.gc.ca/webarchives/20060120095531/http://www.tbs-sct.gc.ca/rma/dpr/02-03/infra-infra/infra-infra03d01_e.asp#Anchor-Ministerxs-47857
- 14 Figures for 2002-03 are based on the 2004-05 Departmental Performance Report historical figures http://www.collectionscanada.gc.ca/webarchives/2006012007014/http://www.tbs-sct.gc.ca/rma/dpr1/04-05/inf-c-infc/inf-c-infcd45_e.pdf
- 15 These figures are drawn from the 2010-2011 Report on Plans and Priorities (RPP): <http://www.tbs-sct.gc.ca/rpp/2010-2011/inst/inf/inf-eng.pdf>
- 16 This is just to capture the ‘policy’, ‘knowledge’, ‘research’ and other analytic spending figures listed in DPRs/RPPs – NOTE: some departmental reports don’t include these types of figures/breakdown
- 17 This figure is listed as ‘Planned’ spending in the 2010-11 Departmental Report on Plans and Priorities (RPP): <http://www.tbs-sct.gc.ca/rpp/2010-2011/inst/inf/inf-eng.pdf>
- 18 Figures are drawn from annual Departmental Performance reports, however prior to 2006-07 FTE’s for ‘research’ equivalent activities was not provided.
- 19 Some deficiencies in project management know-how and strategic co-ordination have been ameliorated in recent years by both the existence of a Project Management Centre of Excellence from 2007 to 2009, which was housed in the B.C.Ministry of Labour and Citizens’ Services (Crawford 2008), and by the strong project management orientation of the new deputy minister to the Premier since 2011 (Plecas: 2012)
- 20 One notable example of a successful initiative is in the area of building standards: the Ontario Ministry of Municipalities and Housing Building Code revisions; the BC Ministry of Energy and Mines’ Green Building Code; and the Alberta Ministry of Infrastructure’s environmental initiatives relating to sustainable building design have all led to identifiable improvements in energy efficiency and resistance to extreme weather conditions. How much they have contributed to an optimal over-all program of adaptation, however, is an open question.
- 21 Audit of Infrastructure Canada: A report by the Public Service Commission of Canada, October 2009: p.19 <http://www.psc-cfp.gc.ca/adt-vrf/rprt/2009/ic/ic-eng.pdf>
- 22 Based on a review of the various provincial ministries of infrastructure yearly reports for 2008-2010 and provincial climate change plans and/or strategies or their yearly reports

- 23 2009/10 – Annual Service Plan Report, p.11
- 24 See BC climate adaptation strategy, 2010:1
http://www.livesmartbc.ca/attachments/Adaptation_Strategy.pdf
- 25 Includes language around climate change adaptation being included in costing of infrastructure
<http://www.bcbudget.gov.bc.ca/2011/sp/pdf/ministry/tran.pdf>
- 26 Alberta Climate Change Adaptation Framework, p.20 Based on: Smit B. and O. Pilifosova. 2001.
- 27 Gallagher, Lin (2010)
- 28 See:
http://www.gov.mb.ca/asset_library/en/beyond_kyoto/adapting_to_climate_change.pdf, p.47
- 29 See:
http://www.gov.mb.ca/asset_library/en/beyond_kyoto/adapting_to_climate_change.pdf, p.49
- 30 Climate Change Action Plan Annual Report 2008-09, p.45
http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079210.pdf
- 31 Climate Change Action Plan Annual Report 2008-09, p. 6
http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079210.pdf
- 32 Ibid, p.45
- 33 Four of the 2006–2012 Climate Change Action Plan, 2010:5,7
http://www.mddep.gouv.qc.ca/changements/plan_action/bilans/bilan4-synthese.pdf
- 34 Ibid, p.17
- 35 Ibid, p.17
- 36 Ibid, p. 37
- 37 Towards a Greener Future, 2009: 28
<http://climatechange.gov.ns.ca/doc/ccap.pdf>
- 38 Ibid, p.40
- 39 Ibid, p.2
- 40 New Brunswick Climate Change Action Plan 2007-2012, p.24,
<http://www.gnb.ca/0009/0369/0015/0001-e.pdf>
- 41 Ibid, p.32 <http://www.gnb.ca/0009/0369/0015/0001-e.pdf>
- 42 2009-2010 Progress Report - Making Real Progress, p.27,
<http://www.gnb.ca/0009/0369/0018/0011-e.pdf>
- 43 2009-2010 Progress Report - Making Real Progress, p.29
<http://www.gnb.ca/0009/0369/0018/0011-e.pdf>
- 44 Newfoundland Climate Change Action Plan, 2005:v
http://www.env.gov.nl.ca/env/climate_change/govt_action/climatechangeplanfinal.pdf
- 45 Ibid, p.17