



## Results from the National Municipal Adaptation Survey

Since the Intergovernmental Panel on Climate Change (IPCC) issued its consensus reports on climate change, the global science and policy discussion has come to include a stronger recognition that we must now also plan for impacts.

Across Canada the effects of climate change will differ greatly by region and community.

Adaptation must include local efforts. As the IPCC notes, the impacts of change on infrastructure, communities, industry and economies will be substantial and global.

*Local planning must be at the forefront of helping to decide on the best adaptation and resiliency strategies.*

Gradual change and sudden events are especially troubling for municipal governments. Few may be prepared to deal with inconceivable consequences, in part because they have expected, and indeed hoped, that senior governments are preparing for such problems; but this may not be happening.

Climate change will stress local resources, impose new challenges on local governments, and will require innovation, flexibility and a new vision of planning.

Adaptation is the actions that help reduce the negative impacts of climate change, or even take advantage of potential new opportunities.

Adaptation measures can increase the resiliency of communities. Resiliency means supporting governance and infrastructure that are strategic and adaptive to environmental change, flexible in application, durable in change contexts, and responsive to regional economic, social and environmental challenges.

*There is an urgent need for new planning and infrastructure approaches that can respond to the reality of climate change.*

Many communities are beginning to understand that planning for the 100-year event may no longer be enough—instead local systems have to adapt to the possibility of 20 or even 5-year severe weather events, and anticipate interactions between existing planning and land use practices and future impacts. The severe events that at one time were infrequent may become our new normal.

*Environmental change is certain; we are only unsure about what it will look like. Adaptation planning requires new information, innovation and investment to protect Canadian communities.*

The National Municipal Adaptation Project (NMAP) is a university-based research group that works to assess the state of planning for adaptation and resiliency in Canadian local governments, develop case studies, and generate applied knowledge that can help advance adaptation planning.

NMAP is helping to fill a knowledge gap by completing a survey of Canadian municipal governments that provides a broad image of the state of municipal adaptation planning in Canada. This basic information is an important part of identifying local government needs and policy opportunities.

This report provides a summary of survey results for all of Canada. For more results please visit the NMAP website at [localadaptation.ca](http://localadaptation.ca) where you will find other provincial and regional reports.

*Ce rapport est disponible en français.*

## Response Rates

| Table 1. Responses by Province |                                 |
|--------------------------------|---------------------------------|
| Province                       | Number of responses (% Rounded) |
| British Columbia               | 69 (14)                         |
| Yukon                          | 3 (0.1)                         |
| Alberta                        | 54 (11)                         |
| Northwest Territories          | 3 (0.1)                         |
| Nunavut                        | 2 (0.04)                        |
| Saskatchewan                   | 55 (11)                         |
| Manitoba                       | 40 (8)                          |
| Ontario                        | 104 (22)                        |
| Quebec                         | 98 (21)                         |
| New Brunswick                  | 23 (5)                          |
| Nova Scotia                    | 9 (2)                           |
| Prince Edward Island           | 7 (1.5)                         |
| Newfoundland and Labrador      | 14 (3)                          |
| <b>All of Canada</b>           | <b>481</b>                      |

| Table 2. Canada responses by community size |                      |
|---|----------------------|
| Population                                  | Responses (% of 481) |
| Less than 5000                              | 256 (53.2)           |
| 5000+ to 10 000                             | 73 (15.2)            |
| 10 000+ to 50 000                           | 82 (17.1)            |
| 50 000+ to 100 000                          | 27 (5.6)             |
| 100 000+ to 500 000                         | 28 (5.8)             |
| 500 000+ to 1 million                       | 12 (2.5)             |
| 1 million+                                  | 3 (0.6)              |

***This Fact Sheet replaces the November 2013 edition.***

## The Survey Approach

*The NMAP survey contacted each local government in Canada.*

Our national mailing list of local governments was developed from the public information available from provincial governments. In 2012 we sent participation requests to the 3566 local governments in Canada.

From across Canada we received 481 responses (a 14% response rate, 95% confidence level). This is a good representative sample.

Over half of respondents were small communities. Small towns account for well over half of local governments in Canada. Each of Canada's large cities participated, and there is a good overall representation from midsize cities and towns. Ontario, Quebec and British Columbia provided the most responses.

Participation requests were sent to a mayor's office, except in those instances where we were able to identify a local government office or employee that was dealing with climate change issues, adaptation planning, or related environmental or infrastructure planning. In those cases the email request was sent to that office or individual.

The survey was provided in English and French. Three reminder emails were sent, one from NMAP and 2 from the Federation of Canadian Municipalities.

A website was used to collect responses to the survey. A digital survey form was also available and could be returned by email or printed and sent by post.

All respondents were able to respond to the first six questions. In question 6, if a respondent indicated that their local government did not have an adaptation plan or strategy in place and was not considering adaptation planning at this time then the survey ended. Only those engaged in adaptation planning, even if such activity was formative, were asked the questions that followed.

## Weather experiences and expectations

| Table 3. Has your community experienced any of the following weather or weather-related events within the last 10 years?    |                                   |
|---|-----------------------------------|
| <i>363 answered this question. Questions are edited here for space. Respondents could choose more than one.</i>             | Number of responses<br>(% of 481) |
| Flood requiring significant or uncommon protection measures or causing significant damage to public and/or private property | 186 (38.7)                        |
| Significant or uncommon storm-water discharges  | 108 (22.5)                        |
| High rainfall causing damages   | 222 (46.2)                        |
| High snowfall causing damages or entailing unusually high snow removal costs  | 137 (28.5)                        |
| Drought requiring significant or uncommon water restrictions  | 74 (15.4)                         |
| Forest fire that resulted in evacuations or an evacuation alert   | 32 (6.7)                          |
| High temperatures for a prolonged period of time, with temperatures well above the annual normal                            | 89 (18.5)                         |
| Severe cold periods, for a prolonged period of time, with temperatures well below the annual normal                         | 36 (7.5)                          |
| Unusual changes in local flora and fauna  | 36 (7.5)                          |
| Other events  | 61 (12.7)                         |

| Table 4. With respect to climate change, are there specific weather events that your local government expects will become more problematic in your community over the next 10 years? |                                   |
|--|-----------------------------------|
| <i>322 answered this question. Questions are edited here for space. Respondents could choose more than one.</i>  | Number of responses<br>(% of 481) |
| Drought  | 156 (32.4)                        |
| Higher than average rain or snowfall   | 200 (41.6)                        |
| Forest fires   | 57 (11.9)                         |
| High loss of vegetation (for example loss of trees)  | 47 (9.8)                          |
| Biodiversity change (changes to composition of vegetation and/or fauna)  | 61 (12.7)                         |
| Flooding   | 171 (35.6)                        |
| Other  | 54 (11.2)                         |

## The state of adaptation planning

### *Knowledge areas supported by the survey*

| Table 5. Where is climate change adaptation being discussed in your community?                                  |                                |
|---|--------------------------------|
| <i>449 answered this question. Questions are edited here for space. Respondents could choose more than one.</i> | Number of responses (% of 481) |
| City/town council   | 175 (36.4)                     |
| By local government staff   | 188 (39.1)                     |
| Community organisations   | 106 (22)                       |
| Business organisations  | 26 (5.4)                       |
| By community leaders  | 64 (13.3)                      |
| There is no notable community discussion about climate change adaptation  | 190 (39.5)                     |
| Other   | 40 (8.3)                       |

**Weather events.** Community experiences to date with severe weather?

**Planning activities.** What are local governments doing and how are they thinking about adaptation?

**Program support.** What programs have been used or developed to augment adaptation planning and what types of programs might be needed in the future?

**Data and information needs.** What types of information do municipal governments now use and need in the future to support adaptation planning?

**What are the funding needs** of municipalities and how might the federal and provincial governments develop programs to support these?

| Table 6. Which of the statements below best describes your local government's situation?  |                                |
|---|--------------------------------|
| <i>455 answered this question. Categories are edited here for space. Respondents could choose only one.</i>   | Number of responses (% of 481) |
| We have an adaption plan/strategy in place.   | 24 (5)                         |
| We are now in the process of developing an adaptation plan/strategy.  | 36 (7.5)                       |
| We do not have an individual adaptation plan/strategy, but we have incorporated adaptation into an existing plan or plans.                            | 36 (7.5)                       |
| We are now in the process of incorporating adaptation into an existing plan.  | 16 (3.3)                       |
| We are beginning to discuss adaptation, but are not at the stage of developing a plan or strategy, or incorporating adaptation into an existing plan. | 98 (20.4)                      |
| We do not have an adaptation plan/strategy and are not considering adaptation planning at this time.*   | 217 (45.1)                     |
| Other   | 28 (5.8)                       |

\*The survey ended for respondents who chose this option or if they did not respond to the question; 238 respondents went on to the following questions.

## Local resources and responsibility\*

| Table 7. Has your local government assigned a staff position(s) to adaptation planning?  |   |
|--|---|
| <i>110 answered this question. Only one option could be chosen. Categories are edited here for space.</i>  | Number of responses<br>(% of 481)(% of 238)** |
| One individual, adaptation planning accounts for more than half of their time.   | 6 (1.2)(2.5)                                  |
| One individual, adaptation planning accounts for less than half of their time.   | 22 (4.6)(9.2)                                 |
| Two or more individuals work on adaptation planning; it accounts for more than half of their work time.  | 4 (0.8)(1.7)                                  |
| Adaptation planning is not the responsibility of any one person or department, but it is shared amongst departments and staff. Overall it accounts for less half of their work time. | 48 (10)(20.2)                                 |
| We have an office that is dedicated to adaptation planning; this office has a staff of more than 2 people who work full time on adaptation planning.                                 | 1 (0.2)(0.4)                                  |
| There is no staff member responsible; adaptation planning is done on-an-as-needed basis by an external consultant(s).  | 29 (6)(12.2)                                  |
| Other  | 26 (5.4)(10.9)                                |

| Table 8. Which department in your local government is primarily responsible for adaptation planning? |   |
|--|---|
| <i>102 answered this question. Respondents could only choose one.</i>                                | Number of responses<br>(% of 481)(% of 238) |
| Planning   | 38 (7.9)(16)                                |
| Environment  | 20 (4.2)(8.4)                               |
| Engineering  | 10 (2.1)(4.2)                               |
| Transportation   | 1 (0.2)(0.4)                                |
| Fire and public safety   | 11 (2.3)(4.6)                               |
| Recreation/parks   | 0   |
| Disaster management  | 22 (4.6)(9.2)                               |
| Other  | 37 (7.7)(15.6)                              |

\*For Questions 7 to 17 a response was not required in order to proceed. If the respondent did not consider the question or categories relevant to their context and if they did not choose to enter information in the 'other' category, then they could leave the question blank and proceed to the next one. \*\*Two percentages are provided for Tables 7 to 17. The first is the percentage of all respondents (481) and the second is the percentage of those communities engaged in some form of adaptation planning (238). Crosstabs were also done to help develop the *Analysis* sections.

## Adaptation activities

| Table 9. What does adaptation planning in your local government include?               |   |
|--|---|
| <i>119 answered this question. Respondents could choose more than one.</i>             | Number of responses<br>(% of 481)(% of 238) |
| A campaign to provide public information and improve public knowledge about adaptation | 45 (9.4)(18.9)                              |
| Community engagement planning processes  | 46 (9.6)(19.3)                              |
| Seeking new internal revenue sources for adaptation                                    | 17 (3.5)(7.1)                               |
| Seeking new external revenue sources for adaptation                                    | 23 (4.8)(9.7)                               |
| Planning for new public infrastructure   | 60 (12.5)(25.2)                             |
| Improving existing public infrastructure   | 75 (15.6)(31.5)                             |
| Land use zoning changes  | 63 (13.1)(26.5)                             |
| Bylaws aimed at changing public behaviour (for example, water use restrictions)        | 36 (7.5)(15.1)                              |
| Risk management/risk assessment  | 81 (16.8)(34)                               |
| Examining insurance costs and other potential liabilities                              | 27 (5.6)(11.3)                              |
| Other  | 31 (6.5)(13)                                |

### *Analysis*

For all communities in Canada that do not have a plan in place and are not considering one at this time, 75% also report that there is no notable community adaption discussion. 46% of these communities have experienced a significant flood in the last decade and 56% have experienced a high rainfall event causing damage.

Fort those communities with a population under 5000 about 65% of do not have a plan in place and are not considering one at this time, and 56% of these report that there is no notable discussion about adaption.

Within the last decade flooding has affected about half of communities with a population under 5000, but only 7% have an adaption plan in place or are in the process of developing one.

**Table 10. With respect to infrastructure, has your local government taken any actions to ensure that any of the systems/services noted below are able to cope with more frequent extreme weather events?**

| <i>181 answered this question. Categories are edited here for space. Respondents could choose more than one.</i> | Number of responses<br>(% of 481)(% of 238) |
|--|---|
| Electrical services  | 39 (8.1)(16.4)                              |
| Freshwater works   | 65 (13.5)(27.3)                             |
| Public housing   | 4 (0.8)(1.7)                                |
| Services for the elderly (including housing designated for the elderly)  | 11 (2.3)(4.6)                               |
| Wastewater works   | 66 (13.7)(27.7)                             |
| Storm water systems  | 100 (20.8)(42)                              |
| Solid waste management   | 28 (5.8)(11.8)                              |
| Public transit   | 7 (1.5)(2.9)                                |
| Roads  | 75 (15.6)(31.5)                             |
| Health services  | 17 (3.5)(7.1)                               |
| Police services  | 21 (4.4)(8.8)                               |
| Fire protection  | 56 (11.6)(23.5)                             |
| Other emergency services/management  | 76 (15.8)(31.9)                             |
| Parks and recreation   | 28 (5.8)(11.8)                              |
| Urban forestry   | 34 (7.1)(14.3)                              |
| Other  | 48 (10)(20.2)                               |

*Recent floods and storms in Canada* have shown how vulnerable electrical, transportation, water and other services are to severe weather events. The latest flooding that caused severe damage in communities such as Calgary, High River and Toronto may be a forewarning of what climate change will bring in terms of intensity and frequency. The need for significant public and private investment to overcome the nation’s infrastructure deficit is immediate and essential. However, as local infrastructure is improved and expanded efficiencies can be realized by building-in adaption capacities to help protect Canadian communities from the impacts of climate change.

## Planning support

**Table 11. Has your local government accessed services from any of the following to help in adaptation planning?**

| <i>140 answered this question. Respondents could choose more than one.</i>                | Number of responses<br>(% of 481)(% of 238) |
|---|---|
| Engineering consultants   | 78 (16.2)(32.8)                             |
| Planning consultants  | 50 (10.4)(21)                               |
| Economic consultants  | 2 (0.4)(0.8)                                |
| Canadian Institute of Planners or its provincial affiliates                               | 13 (2.7)(5.5)                               |
| Your provincial municipal association   | 47 (9.7)(19.8)                              |
| Other non-government organisation such as environmental or city advocacy organisations(s) | 37 (7.7)(15.6)                              |
| University researchers  | 38 (7.9)(16)                                |
| Other   | 36 (7.5)(15.1)                              |

### *Analysis*

Based on the number of municipalities engaged in some form of adaptation planning or thinking, communities in British Columbia and Ontario may be the most forward-looking in thinking about adaptation.

All of Canada's larger cities (with a population of 500 000 and above) are engaged in adaptation planning—many at an advanced stage least, or they have initiated a discussion about adaptation.

With the exception of some large municipalities who have dedicated staff resources, adaptation tends to be a function that is shared amongst departments and staff.

For most communities in Canada planning, engineering and emergency management departments tend to have the primary responsibility for adaptation planning. In Canada's largest municipalities it is environment departments that are taking the lead.

Regardless of community size, building new infrastructure, improving existing facilities and land-use zoning changes are major adaptation planning activities. Risk management or assessment activities are also important adaptation actions for Canadian communities.

British Columbia has the highest number (6) of communities with an adaptation plan or strategy in place, followed by Ontario (5) and Quebec (4).

## Funding support

**Table 12. In the last 5 years has your local government received external funding for adaptation related physical infrastructure from any of sources noted below?**

| <i>101 answered this question. More than one option could be chosen. Categories are edited for presentation here.</i> | Number of responses<br>(% of 481)(% of 238) |
|---|---|
| The provincial government   | 79 (16.4)(33.2)                             |
| Federal stimulus funding (Canada's Economic Action Plan)  | 26 (5.4)(10.9)                              |
| Federal Excise Gasoline Tax Refund Program  | 37 (7.7)(15.6)                              |
| Other federal sources   | 16 (3.3)(6.7)                               |
| Federation of Canadian Municipalities Green Municipal fund  | 13 (2.7)(5.5)                               |
| Private sector  | 5 (1)(2.1)                                  |
| Other   | 24 (5)(10.1)                                |

**Table 13. In the last 5 years has your local government received external funding for adaptation related research or planning from any of sources noted below?**

| <i>65 answered this question. Respondents could choose more than one.</i> | Number of responses<br>(% of 481)(% of 238) |
|---|---|
| The provincial government   | 49 (10.2)(20.6)                             |
| The federal government  | 19 (4)(8)                                   |
| Federation of Canadian Municipalities Green Municipal Fund                | 6 (1.2)(2.5)                                |
| Private sector contributions  | 5 (1)(2.1)                                  |
| Other   | 28 (5.8)(11.8)                              |

### *Analysis*

For Canada's largest municipalities, local funding is the most important source of support for adaption activities. For smaller communities the sources are varied, but provincial and local sources were the most commonly cited. Federal sources were cited less frequently. This likely reflects the temporary nature of relevant federal infrastructure programs. Moreover, federal infrastructure initiatives that can support adaption activities may not actually be strategically aligned with adaption needs; the adaptation contributions of such programs can be incidental.

**Table 14. What funding sources for adaptation planning actions are presently being used by your local government?**

| <i>126 answered this question. Respondents could choose more than one.</i> | Number of responses<br>(% of 481)(% of 238) |
|--|---|
| Local government funds   | 115 (23.9)(48.3)                            |
| Provincial transfers   | 36 (7.5)(15.1)                              |
| Federal stimulus funding (Canada’s Economic Action Plan)                   | 11 (2.3)(4.6)                               |
| Other federal sources  | 36 (7.5)(15.1)                              |
| Federation of Canadian Municipalities Green Municipal Fund                 | 6 (1.2)(2.5)                                |
| Private sector contributions   | 5 (1)(2.1)                                  |
| Other  | 14 (2.9)(5.9)                               |

*Local governments want to know what they should be planning for.* The most frequently selected type of information sought by local governments was predictive data that indicates the types of change they are most likely to face (such as changes to rainfall or snowfall levels, extreme temperature events or changes to water levels). This was followed by “examples of adaptation planning in other Canadian local governments”.

## Information needs

**Table 15. What types of information has your local government sought out to help in adaptation planning?**

| <i>159 answered this question. Respondents could choose more than one.</i>  | Number of responses<br>(% of 481)(% of 238) |
|---|---|
| Predictive data that indicates the types of change we are most likely to face (such as changes to rainfall, snowfall, temperatures or water levels) | 103 (21.4)(43.3)                            |
| Examples of adaptation planning in other Canadian local governments   | 80 (16.6)(33.6)                             |
| Examples of adaptation planning in local governments outside Canada   | 35 (7.3)(14.7)                              |
| Technology and design alternatives for infrastructure   | 65 (13.5)(27.3)                             |
| Information about funding for infrastructure  | 64 (13.3)(26.9)                             |
| Scientific academic research  | 60 (12.5)(25.2)                             |
| Social and/or economic academic research  | 36 (7.5)(15.1)                              |
| Other   | 14 (2.9)(5.9)                               |

**Table 16. Has your local government consulted any of the resources noted below?**

| <i>98 answered this question. Respondents could choose more than one.</i>   | Number of responses<br>(% of 481)(% of 238) |
|---|---|
| Federation of Canadian Municipalities (FCM): Partners for Climate Protection information and case examples (a website)                                  | 82 (17)(34.5)                               |
| ICLEI and Natural Resources Canada: Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation (an online publication) | 52 (10.8)(21.9)                             |
| ICLEI: Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments (an online publication)                                     | 39 (8.1)(16.4)                              |
| ICLEI: Local Government Climate Change Adaptation Toolkit (an online publication)   | 42 (8.7)(17.7)                              |
| Natural Resources Canada (NRCAN): Case studies and adaptation planning examples (a website)   | 34 (7.1)(14.3)                              |
| Natural Resources Canada: Adapting to Climate Change: An Introduction for Canadian Municipalities (a booklet)   | 43 (8.9)(18.1)                              |
| Other guidebooks or templates   | 34 (7.1)(14.3)                              |

## Information sources

**Table 17. Has your local government sought adaptation information from any of the seven sources noted below?**

| <i>128 answered this question. Respondents could choose more than one.</i> | Number of responses<br>(% of 481)(% of 238) |
|--|---|
| Environment Canada   | 78 (16.2)(32.8)                             |
| Natural Resources Canada   | 39 (8.1)(16.4)                              |
| A provincial government  | 75 (15.6)(31.5)                             |
| A university research group  | 57 (11.9)(24)                               |
| Environmental group  | 29 (6)(12.2)                                |
| Business/industry group  | 16 (3.3)(6.7)                               |
| Private foundation   | 5 (1)(2.1)                                  |

### *Analysis*

83% (44) of those communities that have experienced a severe flood event in the last decade have used the FCM publication as a resource; 62% have used the joint ICLEI/NRCAN publication, whilst 52% have used NRCAN’s ‘introduction’ booklet.

## *Analysis*

Knowledge from science is valued by local governments. Just over a quarter of respondent communities had sought information about innovative technology for adaptation related infrastructure, information about funding infrastructure, and information from scientific research about change and potential impacts.

When we asked about guides, templates and publications that serve as adaptation planning resources, the most frequently selected was the Federation of Canadian Municipalities publication *Partner's for Climate Protection: Information and Case Examples*. Publications from ICLEI and Natural Resources Canada accounted for the next three most commonly accessed sources. 'Other' resources noted include university projects, provincial programmes, regional or local studies, and even the IPCC.

We also asked about agencies and other 'institutions' that serve as sources of information. The most frequently mentioned was Environment Canada, followed by provincial government sources.

University-based researchers provide important expertise about planning approaches, technology options and information about what climate change might mean for communities. University research groups were noted as an information source by a quarter of those local governments engaged in some form of adaptation planning

The survey suggests that the leadership provided by planners and local politicians can be a key determinant of action; especially when such community leaders are united in acknowledging the need for adaptation action.

Provincial and local governments are emerging as the main sources of funding support for adaptation actions, whilst the federal government mostly serves an information function. There is little evidence of a strong federal role beyond information provision; but this contribution is valued by local governments.

Commitment to adaptation planning is variable across Canada. Provincial governments are very influential. The survey indicates that the extent to which communities are engaged in adaptation thinking may well reflect the strength and consistency of provincial government policies. Steady provincial policy support not only for adaptation initiatives, but also associated areas such as reducing climate change contributions and alternative energy development, can be important determinants in local government adaptive capacities.

If a national adaptation strategy were to be developed it could be most effective if it was aligned with provincial initiatives, and focussed support on local planning and infrastructure needs and activities.

## National Overview

- We received 481 responses from local governments across Canada.
- The highest numbers of responses were from Ontario, Quebec and British Columbia.
- Over half of the communities that participated in the survey have a population of less than 5000 people.
- All of Canada's major cities participated.
- 75% of the Canadian communities participating in the NMAP survey have experienced severe weather events in the last 10 years.
- The most commonly cited severe weather events experienced by communities in the last decade were related to water (floods, drought, high snowfall and high rainfall).
- 10% had experienced a forest fire emergency.
- Adaptation planning is variable in Canada. The extent to which communities are engaged in adaptation thinking may reflect the strength of provincial policies.
- Provincial and local governments are emerging as the main sources of funding support for adaptation actions, whilst the federal government mostly serves an information function.
- Support and leadership from planners and other municipal staff and local politicians can be important factors in advancing adaptation planning.
- Nationally, Environment Canada was the federal agency most commonly mentioned as a source of adaptation information.
- Despite experience with severe weather, too many Canadian communities are not planning for adaptation. But many are either beginning to discuss adaptation, are developing plans or have plans in place.
- Smaller communities seem less likely to be planning for adaptation; but they may be the most vulnerable.

## Contact Us

You may contact the project leader by email at [Canada.adaptation@ubc.ca](mailto:Canada.adaptation@ubc.ca).

Funding for this research has been provided by the Social Sciences and Humanities Research Council. NMAP also thanks the Federation of Canadian Municipalities for its assistance with the survey.