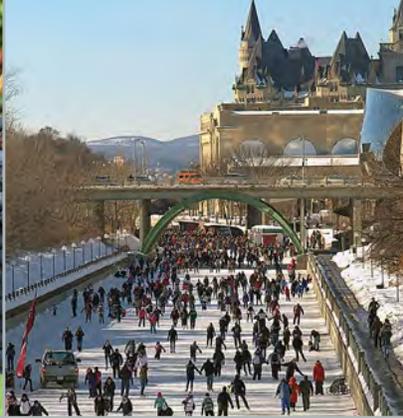


# Recommendations to improve the climate resilience of homes, communities and public infrastructure in Ontario



## Advisory Panel on Climate Change

November 2021

Reporting to  
**The Honourable David Piccini,**  
**Minister of the Environment, Conservation and Parks**



**November 28, 2021**

The Honourable David Piccini  
Minister of the Environment, Conservation and Parks  
777 Bay Street, 5<sup>th</sup> Floor  
Toronto, Ontario, M7A 1N3

Dear Minister,

We appreciate the opportunity to serve as members of the Advisory Panel on Climate Change. The Panel identified practical, meaningful and cost-effective solutions to establish a more prosperous and climate-resilient Ontario as set out in our mandate to "... provide advice to the Minister of the Environment, Conservation and Parks on implementing the climate change resilience commitments" of the *A Made In Ontario Environment Plan*.

Given this important mandate, the Panel posed a simple question to guide its discussions, engagement with stakeholders and approach to our interim and final reports: What specific actions and policies will reduce the likelihood of negative impacts caused by climate change to the lives and livelihoods of Ontario residents by making their homes, their communities and the infrastructure that supports them more resilient?

We found large gaps in our preparedness for extreme climate hazards as renters, homeowners, communities and owners of public infrastructure in Ontario experience significant challenges each year from flooding, wildfires, wind, extreme heat and other climate-related events. Moreover, climate change is expected to increase the frequency and severity of many hazards and this will further increase the damage unless protective action is taken.

We believe there is considerable opportunity to enhance the resilience of homes, communities and public infrastructure in Ontario and reduce the risk to lives and property from climate-related hazards. People across the province can benefit from implementing measures that have proven effective in other jurisdictions that are adapting to climate change. While discussions are ongoing about how jurisdictions around the world will reduce their GHG emissions as part of a longer-term effort to address climate change, the scientific consensus is clear: more severe climate events will occur with increasing frequency in the coming decades even as we work to reduce GHG emissions.

Importantly, we find that most losses are preventable. Proven actions can be scaled up to better protect Ontarians. We believe there is considerable opportunity to enhance the resilience of homes, communities and public infrastructure in Ontario to reduce the risk of damage from climate-related hazards. The Advisory Panel offers recommendations to protect people, property and businesses across the province.

The risks are clear. And the time for protective action is now.

...over

Seven of the actions we recommend should be implemented immediately include:

- **HOME FLOOD PROTECTION:** Launch a campaign to promote basic home flood protection measures.
- **CLIMATE RESILIENT NEW HOMES:** Introduce a pilot program for home builders to test new approaches intended to prevent damage to homes from climate-related extremes.
- **LAND-USE GUIDANCE AND RESILIENCE:** Evaluate the degree to which current provincial land-use policies contribute to the resilience of communities to climate hazards and the degree to which existing Ministry guidance documents support local implementation.
- **NATURAL INFRASTRUCTURE AND RESILIENCE:**
  - Harness the power of natural infrastructure (wetlands, trees, etc.) to build community resilience by enhancing the support, expertise and resources available to municipalities to update their official plans.
  - Develop planning and policy guidance to ensure that as communities grow, existing natural infrastructure is protected and connectivity is restored to achieve the best climate and biodiversity outcomes.
- **RESILIENT INFRASTRUCTURE:** Assess all new and replacement infrastructure to determine its degree of vulnerability to severe climate events during the asset's lifetime; those assets with increased risk should be built to a higher, more resilient standard.
- **ONTARIO'S FLOOD STRATEGY:** Advance the delivery of Ontario's Flooding Strategy in collaboration with Conservation Authorities, municipalities, indigenous communities, conservation organizations and others, and ensure it has climate resiliency as a central goal.

Our full package of recommendations will be best realized in collaboration with other stakeholders, including home builders, insurance companies, realtors, non-governmental organizations, the research community and individual citizens themselves. Several areas can be led by the Ministry of Environment, Conservation and Parks, while some will involve other Ministries.

The members of the Advisory Panel on Climate Change thank you for the opportunity to share our recommendations about how the Government can build the climate resilience of homes, communities and public infrastructure across Ontario.

Paul Kovacs (Chair)

Lynette Mader (Vice Chair)

Katherine Balpataky

Keith Currie

Blair Feltmate

Alex Gill

Todd Jerry

Patricia Koval

Georjann Morriseau

John Riley

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# A principles-based approach

The Province's *A Made in Ontario Environment Plan* provides direction to address the challenges of climate resilience to help guide municipalities, property owners, planners, developers and others to increase resilience to climate change.

A principles-based approach to these challenges is best supported by clear rules and enforcement, public trust and transparency, and a focus on local solutions. Building on this foundation, the Advisory Panel on Climate Change offers advice and suggestions to the Minister where the potential courses of action embody the following principles:

- There is a clear need and authority for action by the Province;
- Actions are reasonably expected to significantly address the adverse impact of climate change on Ontario communities, infrastructure and households;
- The advice is grounded in the science of addressing climate change impacts and provides clear economic, environmental and social benefits; and
- Actions would lever, where appropriate, collaboration with community volunteers, financial services, private industry and other partners.

As we began our work, we recognized that climate change poses a serious threat to the lives, livelihoods and communities of Ontario residents. This recognition and sense of urgency became even more evident over the course of our two-year mandate. As we met to discuss the steps our province could take to adapt to the climate change threat, we witnessed wildfires rage across northern Ontario and in other parts of Canada with smoke impacts over large portions of the province, extreme heat and rainfall events in British Columbia and elsewhere, severe flooding, crop losses, drought and a range of other serious challenges that drove home the importance of our mission.

The sudden emergence of the COVID-19 pandemic provided an unfortunate example of how easily the assumptions upon which we base our personal lives, our economy and our society can be disrupted – adding enormous and unexpected costs in terms of money, time and – most importantly – human life.

Through our discussions and engagement with stakeholders we found reason to be optimistic. We heard from a broad range of parties that practical, coordinated action is necessary and there is a willingness to take steps now to avoid, to the extent that is feasible, the coming future pain of climate-induced disruption.

Over and over again, stakeholders reinforced the message that there are practical things we can do now and they shared many ideas with the Panel to consider. When we had received a significant amount of feedback, we determined how different ideas could complement each other and then assessed them according to our principles, narrowing the field to those that fit within the climate resilience mandate of the Advisory Panel.



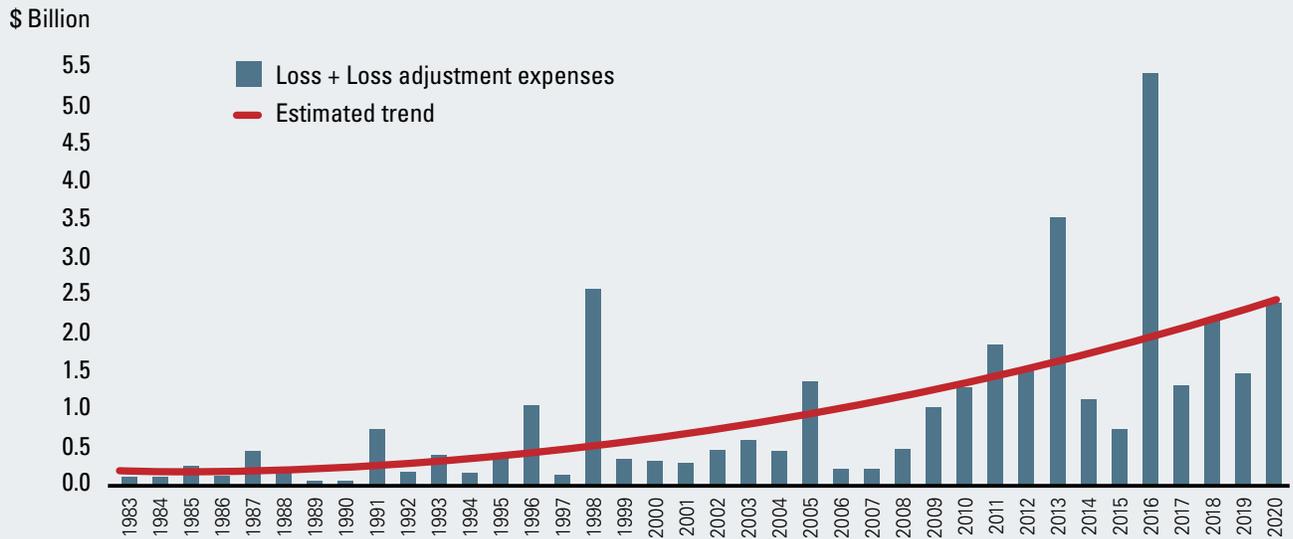
# The need for action now

Each year, natural hazards result in tens of billions of dollars of loss and damage in Ontario and around the globe. Most direct damage involves homes, buildings and public infrastructure.

Most indirect damage is a result of disruptions due to direct physical damage. While climate hazards disrupt the lives and livelihoods of many Ontarians, fortunately, they result in very few fatalities and injuries in the province. Major loss events consistently provide evidence that most of the direct damage from natural hazards involves structures that were not designed and built with current resilient construction knowledge.

Damage to homes, communities and infrastructure is increasing at an alarming pace. Many factors are contributing to this trend including more people and property located in areas of risk, aging infrastructure, and the increasing frequency and severity of extreme weather events. Climate-related damage to homes, communities and infrastructure has been doubling every 5 to 10 years.

## Canadian insured disaster damage



Source: Insurance Bureau of Canada/PCS Canada/Swiss Re/Delloite/CatIQ

Over the past ten years, insurance companies paid more than \$5 billion in climate-related damage claims to owners of homes, vehicles and businesses in Ontario. Extreme rainfall and extreme wind were the two largest drivers of damage. Uninsured losses and provincial disaster assistance add billions more to the total.

Extreme rainfall contributed to basement flood damage in Toronto, Ottawa, Hamilton, London, Oakville, Windsor, Burlington, Thunder Bay, Binbrook and other communities across the province. Tornadoes resulted in damage in Leamington, Angus, the National Capital Region, Goderich, Barrie and other areas. The May 4, 2018 windstorm that crossed southern Ontario resulted in more than \$600 million in property damage.



# Resilient homes, communities and public infrastructure

## Understanding climate risk

In 2020, the Ministry of the Environment, Conservation and Parks launched the province's first *Provincial Climate Change Impact Assessment*. The Advisory Panel views this as an important initiative that will inform and compel action based on up-to-date information about where and how climate change has and will continue to impact Ontario. This will include an assessment of the issues facing Indigenous Peoples in Ontario. Effective action needs to be based on a sound understanding of the risk.

While this assessment is underway, Advisory Panel members believe there is an urgent need to initiate early action to promote resilience in Ontario. For example, the *A Made in Ontario Environment Plan* identified actions to help homeowners reduce the risk of basement flooding and invest in nature-based solutions through wetlands, grasslands, forest restoration and other green infrastructure to enhance climate resilience. This type of work can begin immediately and does not need to wait until the *Provincial Climate Change Impact Assessment* is completed.

## Goals

The Ministry of the Environment, Conservation and Parks working with partner Ministries should establish climate resilience goals for the Government and its partners. Some goals for resilient homes, communities and infrastructure may include:

- Encourage homeowners to protect existing homes and ensure new homes are resilient
- Establish and maintain a rigorous community strategy for climate resilience
- Minimize health and safety risks in the community from climate hazards
- Maintain reliable performance over the entire service life of buildings and infrastructure
- Minimize interruption and reductions to service resulting from extreme weather events
- Minimize repair, retrofit and replacement costs for buildings and infrastructure
- Maintain detailed information about public assets and their climate resilience
- Maintain, restore and expand natural infrastructure

## Resilient homes

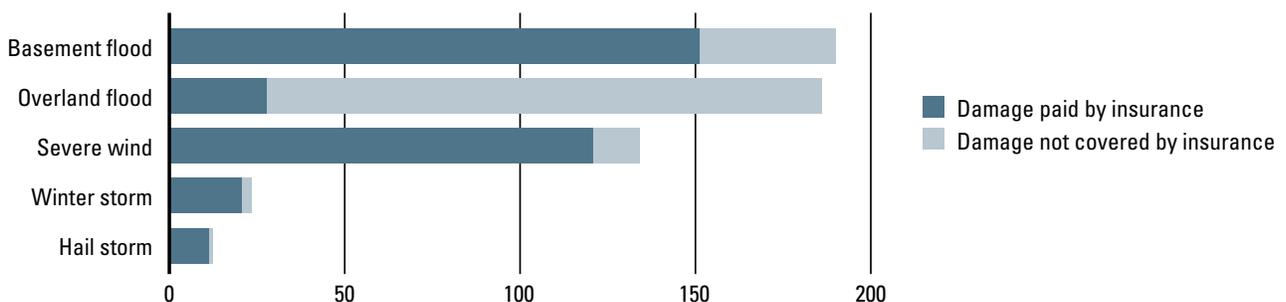
The damage to property due to climate events is disturbing and unsustainable. The *A Made in Ontario Environment Plan* observes that severe weather damage to homes has been increasing since the 1980s. The Panel finds that renters and homeowners in Ontario experience more than \$500 million a year in direct damage from climate-related hazards. Basement flooding/sewer backup, overland flood, severe wind and winter storms accounted for most of the damage over the last ten years. Moreover, climate change is expected to increase the frequency and severity of hazards with the potential to damage homes.

But there is good news. There is significant opportunity to reduce the expected damage to homes. This requires actions to improve the resilience of existing homes and change how we build new homes.

Significant improvement is possible through the application of proven knowledge and there would be little or no additional cost for the homeowner or tenant. The Government of Ontario can inform and empower homeowners, renters and builders to improve the climate resilience of homes.

## Climate-related damage to homes in Ontario

Annual average, 2011-20, millions of dollars



Source: Institute for Catastrophic Loss Reduction, based on insurance claims data provided by CatIQ

## Resilient communities and infrastructure

Climate related damage to communities and infrastructure in Ontario has been increasing for several decades. Climate change will increase the frequency and severity of many hazards and action to enhance climate resilience is needed now to prevent further increases in loss, damage and disruption.

The Province works with 444 municipalities and other partners, including 133 First Nations communities. The communities and their residents are vulnerable to damage from extreme climate hazards. The Province owns more than \$265 billion in public infrastructure. This includes roads, bridges, hospitals, schools, transportation, and other buildings and assets. The 2021 Ontario Economic Outlook and Fiscal Review announced plans to invest \$148 billion over the next ten years in transportation, hospitals, schools and other infrastructure. The Province also provides funding to support local governments with an additional \$1 billion from the Ontario Community Infrastructure Fund over the next five years to be invested in sewers, roads, community centres, fire halls and other public infrastructure.

Moreover, Ontario's natural infrastructure provides positive and direct natural climate benefits. Overall, natural infrastructure largely remains in an exemplary and near-continuous state of natural, naturalized and regenerated ecosystems, with the exception of the 10 percent of the province south of the Canadian Shield, which is home to 90 percent of the population, infrastructure and industry; yet it has only one-third of its original natural, naturalized or restored landscapes intact.

There is significant ability to reduce the expected climate-related damage to communities and infrastructure. Significant improvement is possible through the application of proven knowledge. The Ministry of the Environment, Conservation and Parks and the Government of Ontario can inform and empower communities to improve their climate resilience.

Communities across Ontario have experienced losses due to flooding, tornadoes, wildfire, winter storms, droughts, heatwaves and other climate-related hazards. Escalating insurance damage claims provide evidence of an alarming increase in property damage and demonstrate that we are not fully adapted to our current climate. Climate impacts will further increase unless we successfully adapt and build more resilient communities, including in the north and for First Nations peoples.

Community leaders and advisors told us that they are ready and willing to do more to build community resilience to climate risk. They acknowledge the need for increased action and report considerable support for measures that will increase community resilience. Local leaders invite and welcome support. Proven tools to limit risk – in the form of guidelines, standards and codes – are available to support action now.

The Province is planning to invest billions of dollars in public infrastructure renewal and expansion. It is important that investments in transit and transportation, storm water and sanitary systems, power generation and transmission, flood protection and other infrastructure reflect knowledge about Ontario's historic and future climate. Established tools can help infrastructure managers assess data on climate risk to support planning for new infrastructure and maintenance of existing systems. Awareness of these tools needs to be raised with decision-makers to ensure that physical and green infrastructure provides lasting service with minimized risk of disruption or damage from climate extremes.



Making connections and coordinating between engineered infrastructure and green infrastructure is increasingly important. While we are conscious of the resilience benefits provided by engineered infrastructure, we need to develop a similar recognition of the importance of nature-based infrastructure solutions as a sustainable approach to climate change adaptation. Academic research and in situ projects show that wetland/grassland/forest maintenance and restoration and permanently undeveloped lands can act as buffers and contribute to resilience to flooding and other climate hazards.

Public infrastructure designed and managed to anticipate change in the climate is more cost effective than the high cost of building, repairing and retrofitting infrastructure that fails to anticipate change.

Provincial actions to support recovery from the COVID-19 pandemic provide an opportunity to accelerate planned provincial investments in public infrastructure and increase their contribution to climate resilience. This may include implementation of flood and wildfire damage reduction actions, including habitat restoration, natural cover through wetlands, grasslands and forest restoration and flood defense infrastructure.



# Climate-resilient homes

## Recommendations: Protect existing homes

The risk of loss from basement flooding is the leading cause of preventable climate related damage to homes in Ontario. Many collaborators are working to promote action by homeowners and tenants to reduce the risk of loss from basement flooding. Many local governments and insurance companies provide financial incentives to install risk reduction devices. Local governments, insurers, realtors, public utilities, home inspectors and others are promoting homeowner awareness of proven actions to reduce the risk. Experience to date, however, finds that more is needed as most homeowners are not yet aware or protected.

The *A Made in Ontario Environment Plan* included a commitment that “Ontario will work with the real estate and insurance industries to raise awareness among homeowners about the increasing risk of [basement] flooding.” The Plan included graphics to demonstrate actions that homeowners can take to mitigate basement flood risk, consistent with the figure below.

## Members of the Advisory Panel recommend for immediate implementation:

That the Ministry of the Environment, Parks and Conservation, working with the Ministry of Northern Development, Mines, Natural Resources and Forests, act on the following to build homeowner resilience to the risk of damage from basement flooding.

- *Launch a campaign to promote home flood protection.*
- *Encourage MPPs to share home flood protection advice with constituents.*
- *Assist local governments that promote home flood protection with tax notice mailings.*
- *Work with public utilities to share home flood protection advice with homeowners.*
- *Require home inspectors and real estate agents to complete flood protection training.*
- *Support local governments that provide financial incentives to homeowners.*

Additionally, to address other hazards:

- *Support efforts to promote homeowner action to improve resilience to wildfire, severe wind, winter storms, heat waves, drought and other climate related hazards.*

### THREE STEPS TO COST-EFFECTIVE HOME FLOOD PROTECTION

Complete these 3 steps to reduce your risk of flooding and lower the cost of cleanup if flooding occurs. For items listed under step 3 check with your municipality about any permit requirements and the availability of flood protection subsidies. \*Applicable only in homes with basements

#### Step 1: Maintain What You've Got at Least Twice per Year

Do-it-Yourself for \$0



Remove debris from nearest storm drain or ditch & culvert



Clean out eaves troughs



Check for leaks in plumbing, fixtures and appliances



Test your sump pump\*



Clean out your backwater valve

#### Step 2: Complete Simple Upgrades

Do-it-Yourself for Under \$250



Install window well covers (where fire escape requirements permit)\*



Extend downspouts and sump discharge pipes at least 2 m from foundation



Store valuables and hazardous materials in watertight containers & secure fuel tanks



Remove obstructions to floor drain



Install and maintain flood alarms

#### Step 3: Complete More Complex Upgrades

Work with a Contractor for Over \$250



Install window wells that sit 10-15 cm above ground and upgrade to water resistant windows\*



Disconnect downspouts, cap foundation drains and extend downspouts to direct water at least 2 m from foundation



Correct grading to direct water at least 2 m away from foundation



Install backwater valve



Install backup sump pump and battery\*

Note: Not all actions will be applicable to each home. Completing these steps does not guarantee the prevention of flooding.

Source: Intact Centre on Climate Adaptation

## Recommendations: Climate-resilient new homes

Design and construction practices have been identified to build homes resilient to damage from basement flooding, severe wind, wildfire and other climate related risks. In particular, the *Pan-Canadian Framework for Clean Growth and Climate Change* included a commitment in 2015 of “\$40 million over five years to integrate climate resilience into design guides and codes. The funding will support national building codes by 2020 for residential, institutional, commercial and industrial facilities.”

This collaborative effort involved home builders, the building science community, manufacturers of building products and researchers. A path forward has been identified to ensure that the next generation of homes are resilient to severe weather and climate change.

### Members of the Advisory Panel recommend for immediate implementation:

That the Government of Ontario, including the Ministry of the Environment, Conservation and Parks, work to accelerate the introduction of the new climate-resilient design and construction practices by home builders in Ontario.

- *Collaborate with home builders, insurers, NGOs, researchers and others to champion proven practices to improve the climate resilience of new homes.*
- *Introduce a pilot program for home builders to test implementation of new approaches to prevent damage to homes from climate-related extremes.*
- *Introduce an awareness program to inform buyers and builders about new practices to reduce the risk of climate-related damage to homes.*
- *Ensure that the emerging consensus about resilient construction best practices results in timely revision to provincial building codes and standards.*



# Resilient communities and public infrastructure

## Recommendations: Climate-resilient public infrastructure

The Government of Ontario has committed to make a significant investment in public infrastructure over the next ten years. It is important to provide a tangible financial accounting benefit to municipalities and provincial ministries that improve asset resilience. Public infrastructure should be designed, built and maintained to be resilient to current climate hazards as well as to the expected increase in frequency and severity of extreme weather due to climate change.

Established tools, like the Climate Lens and the PIEVC Protocol, can be used to support design and construction practices to ensure climate resilient infrastructure. Public sector accounting standards should be modernized to recognize climate resilience. However, a 2018 survey by the Ministry of Infrastructure found that most asset managers do not consider climate resilience due to a number of constraints including cost and lack of guidance on how to incorporate climate resilience into asset planning. Resilient public infrastructure provides longer service, less disruption, reduced maintenance costs and other savings over the life of the asset.

## Members of the Advisory Panel recommend for immediate implementation:

That the Ministry of the Environment, Conservation and Parks ensure that the *Provincial Climate Change Impact Assessment* provides climate risk and impact data, information and resources to support asset management work by the government and its partners, including guidance on the availability and use of historic and projected climate data.

That the Minister of the Environment, Parks and Conservation urge the Ministry of Infrastructure to integrate climate resilience into its asset management good practices guidance for provincial ministries, agencies and municipalities.

That the Government of Ontario should assess all new and replacement infrastructure to determine whether it will experience increasingly severe weather during the asset's lifetime and those with increased risk should be built to a higher, more resilient standard.

### **Members of the Advisory Panel recommend for near-term implementation:**

The Province should deliver more infrastructure that has the opportunity for a positive operational cash flow through the public-private partnerships (P3s), utilizing the Canada Infrastructure Bank where possible. This will allow a larger share of government funded infrastructure to go towards infrastructure that supports climate change resiliency and adaptation, such as storm and wastewater infrastructure that helps protect against flooding.

That the Government of Ontario should encourage the Public Sector Accounting Board to modernize the current accounting standard which depreciates physical assets on a straight-line basis over 40 years to apply a longer depreciation period for assets built to a higher standard of resilience.



## Recommendations: Climate-resilient communities – planning

Municipal land-use planning is a powerful tool that can be used to advance community resilience. The vision for Ontario’s land use planning system is set out in *Provincial Policy Statement 2020*:

**“The long-term prosperity and social well-being of Ontario depends on planning for strong, sustainable and resilient communities for people of all ages, a clean healthy environment, and a strong and competitive economy.”**

Effective land use policy, as it relates to climate change and resilience, requires clear provincial policies combined with municipal land-use decisions consistent with the policies. The Ministry of Municipal Affairs is responsible for the overall policy framework. Partner ministries work with the Ministry to develop provincial policies through their participation in the One Window protocol that municipalities incorporate into their official plans and other planning documents. Municipalities are responsible for implementing these policies through their municipal planning decisions.

### Members of the Advisory Panel recommend for immediate implementation:

That the Ministry of the Environment, Conservation and Parks work with the Ministry of Northern Development, Mines, Natural Resources and Forestry, and the Ministry of Municipal Affairs and Housing to evaluate the degree to which current provincial land-use policies contribute to the resilience of communities to climate hazards and the degree to which existing Ministry guidance documents support local implementation. The Province should develop a policy guidance document for its policy as it relates to climate resilience and advise other ministries in the development of their own guidance documents as they relate to climate change.

That the Ministry of Northern Development, Mines, Natural Resources and Forestry set the provincial policy framework for flood mapping and to provide guidance to municipalities and Conservation Authorities that ensures the consistency of land-use decisions with those policies. The Ministry should track and disclose to the public the status, methods and details of up-to-date flood mapping.

### Members of the Advisory Panel recommend for near-term implementation:

That the Ministry of the Environment, Conservation and Parks and the Ministry of Northern Development, Mines, Natural Resources and Forestry jointly work to enhance the support, expertise and resources available to municipalities to update official plans with regard to natural infrastructure as a central component of community resilience to climate change (focused particularly on Provincial Policy Statements 2.1, 2.2 and 3.1 of the *Provincial Policy Statement 2020*).

That the Ministry of the Environment, Conservation and Parks urge the Ministry of Agriculture, Food and Rural Affairs to review its programs and policies to reflect the vulnerability of agricultural communities to climate change and promote innovative and mitigative farm practices that enhance climate resilience.

## **Recommendations: Climate-resilient communities – natural infrastructure/soils**

For southern Ontario and regions of northern Ontario that have experienced significant landscape changes, the ongoing conservation, management and restoration of natural cover must remain central to the provincial commitment to green infrastructure. Natural ecosystems such as waterways, wetlands, woodlands, grasslands and wildlands contribute critically to climate resiliency by providing ecological goods and services such as water and carbon retention, quantity and quality, mitigating heat events, maintain water and air quality, at the same time as conserving biological diversity and wildlife habitat and providing respite for people.

Communities that protect and invest in natural infrastructure benefit from environmental, climatic and economic outcomes. Stronger alignment with federal programing (current opportunities and into the future) is needed to support immediate action in southern Ontario where so much natural cover has been lost. Moreover, healthy soils contribute to climate resiliency and support food security and Ontario's rural economy. Cover crop strategies are one element of this strategy, which can enhance the organic (carbon) content of soils. Rural and Great Lakes water quality is another key element of this strategy.

### **Members of the Advisory Panel recommend for immediate implementation:**

That the Province develop planning and policy guidance to ensure that as communities grow, existing natural infrastructure is protected and connectivity is restored to achieve the best climate and biodiversity outcomes.

That the Province allocate infrastructure funding to the strategic securement and restoration/delivery of natural infrastructure that enhances resiliency to climate change and its effects, and that results in co-benefits such as flood and drought mitigation, conservation of biological diversity, human health, quality of life, and local visitation and spending.

### **Members of the Advisory Panel recommend for near-term implementation:**

That the Province recognize natural infrastructure as an asset to be inventoried and managed to maintain the associated climate, economic and biodiversity benefits, and invest in improved technology to support the identification and mapping of wetlands and other natural assets.

That the Province advance programs to support increased planting of native trees, shrubs and vegetation as appropriate on public and private lands in southern and central Ontario, with a renewed focus on lowland and wetland sites, and along roadsides in southern Ontario to increase CO<sub>2</sub> uptake, hold water longer and better, and provide habitat and windbreaks. The government should lever funding available through the federal "2 Billion Trees Program."

That the Province should work collaboratively with agricultural producers, agribusiness, public agencies and agricultural associations to promote soil health initiatives identified in Ontario's Soil Strategy, including investment in soil health technology.

## **Recommendations: Climate-resilient communities – flood**

The Ontario Flooding Strategy is being implemented to 1) update flood, erosion hazard and shoreline policies and technical guidance; 2) develop and implement a multi-year strategy for the update of floodplain mapping; and 3) continue and enhance financial investments in the delivery of hazard and erosion management programs, among other goals.

### **Members of the Advisory Panel recommend for immediate implementation:**

That the Province advance the delivery of Ontario's Flooding Strategy in collaboration with Conservation Authorities, municipalities, indigenous communities, conservation organizations and others, and ensure it has climate resiliency as a central goal. Wetland and shoreline stewardship and enhancement should be a focus of such a strategy, as should the timely update of technical guidance documents that promote better integration of natural hazard, natural heritage and water resource systems.

That the Province invest in and provide policy guidance to integrated watershed management as it relates to climate resiliency, including such measures as the monitoring of water quality and quantity and associated ecological effects, in order to document long-term trends and support adaptive and mitigative measures.

That the Province work with municipalities and others to ensure that they have the tools needed to update flood hazard mapping to effectively prioritize flood damage reduction investments where they are most urgently needed.

### **Members of the Advisory Panel recommend for near-term implementation:**

That the Province work with the federal government to designate areas at highest risk of flooding as federal flood hazard areas to prioritize infrastructure and relocation investments for homes at high risk of flooding.

That the Province continue to take part in conversations with the federal government and other provinces on the viability of a national high-risk flood pool.

That the Province further rationalize oversight and responsibility for flood resilience.

## **Next steps for the Advisory Panel on Climate Change**

Members of the Advisory Panel on Climate Change were appointed by the Minister in November 2019 to serve for a period of two years. This Report provides a summary of our findings and recommendations.

Members of the Advisory Panel welcome the opportunity to continue to advise the Minister, if requested, and support action by the Ministry and the Government to build climate resilience in Ontario. We remain available to provide practical and cost-effective advice about implementation of climate action to support greater resilience for homes, communities and public infrastructure.

We thank the Minister for the opportunity to share our views.

# Appendix one

## Mandate of the Advisory Panel on Climate Change

In November 2018, the Government of Ontario released *A Made in Ontario Environmental Plan*. The wide-ranging report concluded with four commitments:

- Continue to consult with the public and engage with Indigenous communities.
- Establish an advisory panel on climate change.
- Begin implementing priority initiatives.
- Measure and report on progress.

In November 2019, the Advisory Panel on Climate Change was appointed for an initial term of two years to advise the Minister of the Environment, Conservation and Parks:

- on the development and implementation of the climate change resilience commitments outlined in *A Made in Ontario Environment Plan*;
- on key areas related to addressing climate change resilience, in particular:
  - raising awareness and facilitating access to climate data/information on the impacts of a changing climate in Ontario;
  - increasing resilience of Ontarians to the impacts of a changing climate, including impacts to infrastructure, communities, the economy, people and the environment.

The Minister directed the Advisory Panel to focus specifically on:

- Community resilience.
- Infrastructure resilience.
- Climate resilient homes.

Given this important mandate, the Panel posed a simple question to guide its discussions, its engagement with stakeholders and its approach to our interim and final reports: What specific actions and policies will reduce the likelihood of negative impacts caused by climate change to the lives and livelihoods of Ontario residents by making their households, their communities and the infrastructure that supports them more resilient?

# Appendix two

## Biographies of committee members

### Paul Kovacs (Chair)

Paul Kovacs is founder and Executive Director of the Institute for Catastrophic Loss Reduction at Western University. For more than 20 years he was a lead author for the Intergovernmental Panel on Climate Change (IPCC), the world's leading forum for the study of climate issues. Paul was part of the IPCC team that won the Nobel Peace Prize "for their efforts to build up and disseminate greater knowledge about man-made climate change." He is Canada's leading authority on insurance and climate change and a contributing author to numerous international and Canadian reports on reducing the risk of loss from earthquakes, flood and severe wind. Paul is Chair of the Global Alliance of Disaster Research Institutes. For more than thirty-five years Paul has been a popular commentator on insurance, disaster safety and economic policy. He has written more than 200 publications and articles and he is a champion for insurance, disaster resilience and adaptation to climate extremes.

### Lynette Mader (Vice-Chair)

Lynette Crawford Mader is the Ontario Manager of Provincial Operations for Ducks Unlimited Canada (DUC) where she oversees wetland conservation and restoration programs. Prior to that role, Lynette established DUC Ontario's first Conservations Solutions (fee for service) program and also led DUC Ontario's landowner stewardship programs earlier in her career. Before joining DUC, Lynette held public relations and marketing roles at various agricultural businesses including Cold Springs Farms and Turkey Farmers of Canada, as well as a successful family run farm market and winery business. Lynette has served on Natural Spaces, Stewardship Network

Ontario, the Ontario Biodiversity Council, the Species at Risk Program Advisory Council, the Protected Areas Working group, was Co-Chair of the Ontario Wetland Advisory Panel and more recently a member of a Wetlands Technical Advisory Group.

### Katherine Balpataky

Katherine Balpataky is the Senior Director of Corporate Partnerships with ALUS, where she works with business leaders to achieve environmental, social and governance goals and address climate risk with nature-based solutions delivered by farmers and ranchers. Prior to ALUS, Katherine held leadership roles to help mobilize corporate actions to address water challenges with Canadian Water Summit, Canadian Water Network, and the National Roundtable on the Environment and Economy. She is an advisory committee member of the UNESCO Chair in Food, Biodiversity and Sustainability and participates as part of the Agriculture Working Group of the Alliance for Water Stewardship for North America. A former journalist, she has interviewed leading authorities on climate, infrastructure, policy and land management solutions and authored hundreds of articles to draw attention to approaches of relevance to Canadians.

### Keith Currie

Keith Currie, a Collingwood Ontario-area farmer, serves as the Zone 13 director to the board of the Ontario Federation of Agriculture (OFA). He served as the organization's 31<sup>st</sup> President, first being elected in 2016, and serving for 4 years as OFA's chair. Keith has more than 25 years of experience with OFA and agricultural advocacy, which began with an appointment to the Simcoe County Federation of

Agriculture, where he held numerous positions including President from 2004-2006. Keith has served on and chaired many local and provincial agriculture organizations as well as many conservation initiatives during his career including: President Ontario Federation of Agriculture 2016-2020; AgScape (Provincial organization that delivers Agriculture in the Classroom, K-12); Presidents Council (Council of all chairs in primary agriculture, agriculture academia, food processors and educators); Eco-Ag (Collaboration of major agriculture commodity organizations on environmental issues); Peer Review Committee Nottawasaga Valley Conservation Authority; Ontario Ministry of Environment, Conservation and Parks Advisory Panel on Climate Change; Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Minister's Advisory Panel; and 4-Plan Review Panel (Ministry of Municipal Affairs and Housing): a review of significant land use plans in Ontario (Greenbelt Plan, Oak Ridges Moraine Conservation Plan, Niagara Escarpment Plan and the Ontario Growth Plan). In February of 2019, Keith was elected as the First Vice President of the Canadian Federation of Agriculture (CFA) at the CFA annual meeting in Ottawa. With a diploma in Agriculture Production Management from Ridgetown College, he returned home to the Collingwood Ontario family operation, to manage an eighth-generation dairy and cash crop farm in Simcoe County with his wife Janice and four children. The dairy herd was dispersed in 2003 and the operation now focuses on production of grains and oilseed, forages for dry hay, as well as a market gardening operation focussing on sweet corn and gladiolus flower production.

### **Blair Feltmate**

Dr. Blair Feltmate is the Head of the Intact Centre on Climate Adaptation, University of Waterloo. Previous positions he has held include Vice President, Sustainable Development, Jones Heward Investment Counsel/Bank of Montreal; Director, Sustainable Development, Ontario Power Generation; Partner, Sustainable Investment Group/YMG Capital

Management. He is on the Advisory Board, National Adaptation Strategy, Canada. He is Sustainable Finance Council member, Global Risk Institute, and he is a member of Climate Proof Canada (Insurance Bureau of Canada). Blair is Expert Member, International ISO Strategic Advisory Group, ESG. He is Chair, Adaptation Council, Canadian Institute for Climate Choices (Environment and Climate Change Canada). He was Chair, Federal Government of Canada Expert Panel on Climate Adaptation. Blair was an NSERC Postdoctoral Fellow, University of Waterloo. He holds a Ph.D in Theoretical and Applied Ecology (University of Toronto), Master's in Arts (Wilfrid Laurier University), Master's in Zoology (University of Toronto), and Hon. Bachelor's Biology (University of Toronto). Blair has written textbooks on Sustainable Banking and Aquatic Insects. He is generally interviewed by the media 100 times per year on climate change/ESG related issues.

### **Alex Gill**

Alex Gill is a social entrepreneur who serves as the Executive Director of the Ontario Environment Industry Association (ONEIA). He has led ONEIA's efforts to create better policy and business conditions for the province's growing environment and cleantech sector since 2005. In addition to his work as an environmental business leader, Alex leads Mendicant Group, a consultancy that supports social-purpose organizations across Canada and in 16 countries (so far) around the world. He currently serves as moderator of the G20 Young Entrepreneurs' Alliance and teaches in the Department of Politics and Public Administration at Toronto's Ryerson University. He founded and still leads Ryerson's Social Ventures Zone, which has grown into Canada's leading social enterprise incubator since its start in 2014. Alex is a graduate of Stanford University, University of Toronto and the University of Windsor. You can follow Alex's Twitter feed (@alexgill) for updates on his work in the areas of environment, entrepreneurship and social change.

## **Todd Jerry**

Todd Jerry is the Director of Government Relations for the Insurance Bureau of Canada Ontario Region. He has worked in the federal government and government relations for more than ten years. He served in senior policy and legislative roles for the federal Treasury Board and regulated industries. In his spare time, Todd enjoys skiing, baseball, hockey and spending time with his wife, Ravina.

## **Patricia Koval**

Patricia Koval is a corporate director and lawyer based in Toronto, Canada. She is a retired corporate law partner of Torys LLP, a major Canadian law firm. As well, Pat was an Adjunct Professor at University of Toronto Law School, where she lectured, among other things, on carbon finance. Patricia is the Vice-Chair of the Board of the Ontario Independent Electricity System Operator and a member of its Markets Committee, a member of the Board of Directors and several Board committees of Trans Mountain Corporation, and a Board member of Deltera Inc., Delmanor REIT and several other operating companies in the Tridel Group. Pat is also the Chair of the Board of The Canada-India Business Council and of the Canadian Performance Reporting Board of CPA Canada, and a member of the GTA Executive of the Institute of Corporate Directors. Patricia has a long history of volunteering in the conservation sector where, in addition to serving as Vice-Chair of Nature Conservancy of Canada's Ontario Region Board, she is a Past Chair of the Board of World Wildlife Fund Canada and the current Chair of The Toronto and Region Conservation Foundation and U.S.-based Turtle Survival Alliance Foundation. Pat is also a Board member of U.S.-based Rainforest Trust and of Lewa Wildlife Conservancy Canada, and a member of the global Advisory Council of Wildlife Conservation Society. She is the author of "Carbon Finance" in the widely-used legal textbook, "The Law of Climate Change in Canada" and a co-author in "Canada in a Changing Climate: National Issues Report", published by the Government of Canada in 2021. Patricia has also authored a number of articles on, and lectured on, liability and disclosure related to

climate change, and is currently a lecturer in Osgoode Hall Law School's "ESG, Climate and Law Certificate Program". Patricia graduated from the joint MBA/J.D. program at Schulich School of Business and Osgoode Hall Law School in Toronto, Canada.

## **Georjann Morriseau**

Georjann Morriseau has over 10 years experience in the public and corporate sector, and served as the Director of Indigenous Affairs and Public Relations at Resolute Forest Products. Ms. Morriseau was Chief and Councillor for the Fort William First Nation and has served on numerous boards. She is currently a member of the Thunder Bay Police Services Board and was federally appointed as Commissioner, First Nation Tax Commission. She was also a founding board member for the Governance Development Network, which promotes and builds upon self sustainability within First Nation communities.

## **John Riley**

John Riley has had careers as botanist, geologist, ecologist and conservation professional with the Royal Ontario Museum, Ontario Geological Survey and Ministry of Natural Resources, Ontario Nature and the Nature Conservancy of Canada (NCC). He is NCC's Emeritus Science Advisor. He serves on his local Committee of Adjustment (chair), and Planning, Environment and Natural Heritage Advisory Committee. He is a co-founder of the Partnership for Public Lands, Oak Ridges Moraine Foundation, and Greenbelt Foundation. He has written books on Ontario's peatlands, its Hudson Bay Lowland, its Niagara Escarpment and Georgian Bay World Biosphere Reserves, as well as on Ontario woodlands and alvars. John founded NCC's science and stewardship programs, and authored conservation blueprints for the Great Lakes and Prairies-Parkland ecoregions, as well as conservation atlases for Labrador and northern Alberta. He has authored more than 100 papers and 20 books, his latest The Once and Future Great Lakes Country. He lives and farms in Mono.

**On behalf of the Panel, this report was compiled and  
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