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Climate adaptation and Indigenous food safety in Canada: Current approaches and the role of environmental public health

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Key Messages

- Climate change can compromise food safety in Canada, yet consideration of the impacts remains largely absent from Canadian climate adaptation policies and plans.
- Indigenous food systems are disproportionately affected by climate change, due to multiple structural and environmental factors, increasing the risks to traditional food safety, food access, and food sovereignty.
- Climate-related impacts on food safety are outpacing policy interventions, where food systems are not explicitly addressed, increasing exposure to unsafe food conditions in Indigenous and remote communities.
- There is a critical need to integrate Indigenous knowledge and leadership into food safety and climate adaptation planning and to include longer planning horizons.
- Strengthening climate adaptation policies, strategies, and approaches through explicit inclusion of food safety in climate adaptation planning, coupled with adequate resources and Indigenous-led solutions, is essential to protect public health.
- Environmental Public Health Professionals must adapt to emerging, climate-driven hazards and shift toward collaborative, culturally safe approaches to food safety.

Introduction

Climate change is increasingly recognized as a significant driver of environmental public health risks in Canada, including risks that affect food safety. Climate variables such as temperature and precipitation influence pathogen survival, food contamination risks, and the environmental conditions that shape food production, processing, and distribution.[1] As environmental conditions continue to shift, food safety must increasingly be considered within the broader context of climate adaptation and environmental public health (EPH) practice.[2]

Environmental Public Health Professionals (EPHPs), including Public Health Inspectors (PHIs), play a central role in protecting community health through food safety oversight, water quality monitoring, environmental hazard control, and emergency response. Their work is increasingly shaped by climate change, which is altering key environmental determinants of health. Across Canadian jurisdictions, adaptation planning identifies a range of climate-driven risks that are expected to increase demands on EPH programs and require greater anticipation of evolving hazards.[2]

Within this broader context, food systems represent a key area where climate-related risks are becoming more evident. Climate change can affect food safety through multiple pathways, including changes in pathogen growth conditions, shifts in animal and wildlife reservoirs, disruptions to production and distribution systems, and increased contamination risks following extreme weather events.[1,3] Evidence from Canada further indicates that rising temperatures are associated with increased incidence of foodborne pathogens such as *Salmonella*, *Campylobacter*, and *Escherichia coli*, underscoring the sensitivity of foodborne disease patterns to a changing climate.[4]

Climate-related changes also have distinct implications for land-based and traditional food systems. Shifts in wildlife distribution, ice and water conditions, and broader ecosystem changes can affect harvesting practices, species availability, and access to country foods, with implications for both food safety and food security.[5] Traditional foods remain central to diet, culture, and well-being in many Indigenous communities, and environmental change will influence how these foods are harvested, stored, and shared.[5,6]

Climate strategies and adaptation plans can support policy developed by governments and organizations to anticipate, prepare for, and respond to the impacts of climate change across sectors. These plans commonly address infrastructure, water, health, and ecosystems, with some recognition of food systems as climate sensitive. While many adaptation plans discuss food system resilience and food security, explicit attention to food safety, and Indigenous food safety as a distinct operational priority, is less consistent, highlighting an important area for further examination. The work presented below examines these issues through a scan of major Canadian federal, provincial, and territorial climate strategies.

This report is intended for EPHPs and related public health practitioners involved in food safety, environmental health, and climate adaptation. Its purpose is to translate analysis of climate strategies and plans into practical context for EPHPs by highlighting how these documents intersect with environmental public health responsibilities and identifying where additional guidance or policy development may be needed.

Methodology

The primary research questions addressed in this study are:

1. What are the existing strategies and frameworks in Canada addressing the impact of climate change on Indigenous food safety?
2. How can these approaches be strengthened to support the preservation of Indigenous food practices and improve resilience to climate-related risks?

A jurisdictional scan and policy analysis, rapid literature review, and examination of case examples were used to address these questions in the form of a narrative discussion from an environmental public health perspective.

Jurisdictional scan and policy analysis

Climate adaptation plans in Canada were analyzed through a comparative analysis of strengths, weaknesses, opportunities and threats (SWOT) to assess if and how food safety and Indigenous food safety considerations were addressed. The analysis sought to identify ways to better integrate environmental public health practice into adaptation planning. A jurisdictional scan of 20 (three federal/nationwide and 17 provincial/territorial) publicly available climate plans was conducted in mid-2025.

Climate change strategies or plans were identified through the jurisdictional scan and reviewed using a structured content analysis approach to determine the explicit presence or absence of key elements. The key elements were informed by a systems-based understanding of food safety recognizing that food safety and Indigenous food safety are interconnected with factors such as food security, food sovereignty, and broader food system and water-related considerations. The key elements reviewed were:

- Food safety (explicit consideration of food safety in the context of climate change)
- Food security/food sovereignty (as they relate to food safety)
- Indigenous food systems (inclusion of Indigenous food systems and traditional food practices)
- Water for food (as it pertains to food safety, such as water used in food production or protection of water sources that provide food, like fish-bearing rivers)
- Foodborne illness

When scanning for the "Indigenous food systems" element, the following lenses were applied:

- Security and sovereignty, recognition of Indigenous governance, knowledge systems, and self-determination
- Suggested creation of a mandate to ensure resources are allocated in the plan to support First Nations, Inuit, and Métis in managing climate-driven food safety risks.

A gap analysis was conducted to assess the extent to which existing Canadian climate change plans, strategies, and frameworks address the "food safety" element within diverse food systems. Seven plans were further examined using a SWOT analysis to assess feasibility of implementation, inclusivity of reviewed key elements, and opportunities for improvement. The plans were selected to span a range of practice (from those containing no key elements to those containing all key elements) and geographical diversity (two national level, one east coast (PEI), one west coast (BC), one territory (NWT), and two Prairies (SK)). Findings were synthesized to identify common themes, strengths, and gaps.

The seven plans analyzed were:

1. Health of Canadians in a Changing Climate[7]
2. Assembly of First Nations 2023 National Climate Strategy[8]
3. BC Climate Preparedness and Adaptation Strategy[9]
4. Saskatchewan Climate Change Strategy – Prairie Resilience[10]
5. Saskatchewan Adaptation / Resilience Framework[11]
6. Prince Edward Island Climate Adaptation Plan[12]
7. Northwest Territories 2030 Climate Change Strategic Framework[13]

Based on this synthesis, key deficiencies in the current climate change planning landscape are highlighted with recommendations for improvements.

Literature review and case examples

A review of recent (last 10 years) peer-reviewed and grey literature was conducted with key terms (Appendix A) related to climate change and food system safety, Indigenous food sovereignty and food safety, and public health system adaptations in Canada and comparable settings. Sources were identified through targeted database and organizational searches (Google Scholar, PubMed, and Saskatchewan Health Authority Library), as well as citation chaining from other resources, with priority given to recent and policy-relevant publications. Findings were synthesized to incorporate emerging evidence and practice-informed insights.

Illustrative case examples were developed to provide applied context and demonstrate implementation of food safety and Indigenous foods safety in practice. These were identified through the literature review and professional networks and selected based on relevance to EPHP

scope of work, climate change, Indigenous food systems and food safety, and environmental public health policy or program responses in Canada. Information was drawn from publicly available sources and supplemented by contextual knowledge. These cases are not intended as comprehensive evaluations, but as examples that highlight key themes, promising practices, and implementation considerations. A synthesis of the above was used to inform the development of practical, evidence-informed guidance and recommendations.

Results and discussion

Jurisdictional scan and analysis of climate plans

Jurisdictional scan

Twenty jurisdictional climate plans were reviewed (full list in Appendix B), with Table 1 providing a summary of the presence or absence of the key elements defined earlier. The **water for food** element is explicitly mentioned most frequently (14/20) and **food safety** is explicitly mentioned the least frequently (3/20). Of the remaining key elements, **food security/sovereignty** was mentioned in 11/20, **Indigenous food systems** in 11/20, and **foodborne illness** in 8/20.

Only *Health of Canadians in a Changing Climate*[7] and *Government of the Northwest Territories 2030 NWT Climate Change Strategic Framework*[13] mention all five key elements. The *Pan-Canadian Framework on Clean Growth and Climate Change*[14] addresses only food security/food sovereignty and Indigenous food systems. The Assembly of First Nations (AFN) *National Climate Strategy*[8] emphasizes food security, Indigenous food systems, water for food, and foodborne illness (4/5 elements) but does not explicitly mention food safety.

Across all provincial and territorial (PT) plans, coverage of the key elements varies widely, ranging from zero to five (see Table 1). Notably, the Northwest Territories shows the most comprehensive inclusion of the elements, covering all five, including explicitly mentioning food safety.[13] At the other end of the range, Saskatchewan plans did not explicitly cover any of the five elements, and Manitoba only covered one (water for food).[10,11,15] Several provinces explicitly cover three of the five elements as illustrated with British Columbia and Alberta both mentioning food security, Indigenous food systems, and water for food, but do not include food safety or foodborne illness; Quebec explicitly mentions food security, water for food, and foodborne illness; and Nunavut addresses Indigenous food systems, water for food, and foodborne illness.[9,12,16-19]

Overall, the data reveal a systemic gap, with climate and food adaptation planning prioritizing food security and resilience, but largely neglecting food safety, Indigenous food safety, and foodborne illness, underscoring the need for integrated, Indigenous-informed food safety frameworks in climate change plans.

Table 1. Summary of jurisdictional scan of climate change strategy plans

Jurisdiction	Food safety	Food security/ Food sovereignty	Indigenous food systems	Water for food	Foodborne illness
Canada (Climate)[14]		✓	✓		
Canada (Health Canada)[7]	✓	✓	✓	✓	✓
Canada (AFN)[8]		✓	✓	✓	✓
British Columbia[9]		✓	✓	✓	
Alberta[16]		✓	✓	✓	
Saskatchewan[11]					
Saskatchewan[10]					
Manitoba[15]				✓	
Ontario[20]					
Ontario[21]		✓	✓		
Quebec[17,18]		✓		✓	✓
New Brunswick[22]		✓		✓	
Nova Scotia[23]		✓			✓
Prince Edward Island[12]	✓	✓		✓	✓
Newfoundland and Labrador[24]				✓	
Newfoundland and Labrador[25]			✓	✓	
Yukon[26]			✓	✓	
Northwest Territories[13]	✓	✓	✓	✓	✓
Northwest Territories[27]			✓	✓	✓
Nunavut[19]			✓	✓	✓

Climate change planning gap analysis

The scan of 20 existing Canadian climate change plans and frameworks (list in Appendix B) revealed that despite growing recognition of climate-related risks to food systems, current strategies largely do not address food safety explicitly. Across federal, provincial, and territorial plans, references to food safety are limited or absent, and few documents recognize the distinct challenges faced by Indigenous food systems in maintaining food safety, including for traditional and country foods.

Most climate plans and strategies do not explicitly address food safety, nor do they identify resources or culturally relevant tools to support Indigenous sovereignty to manage climate-related food safety risks. This gap undermines efforts in environmental public health, food sovereignty, and climate change resilience, and highlights critical areas where strengthened policy action or strategic direction is needed.

SWOT analyses were completed on the seven plans identified in the Methodology and reviewed for patterns, gaps, and strategic implications. The detailed analyses of the plans can be found in Appendix C. Figure 1 presents an integrated summary of the SWOT analyses across the selected plans, focused specifically on food safety, Indigenous food safety, and Indigenous food systems. The most significant opportunity identified was the potential for alignment across jurisdictions. This could be achieved by using the evidence from federal health assessments, the governance vision of the AFN strategy, and the operational capacity of provincial/territorial (PT) plans to build Indigenous-led and climate-resilient food safety systems.

The *Pan-Canadian Framework on Clean Growth and Climate Change* was excluded from the SWOT analyses because it lacked mention of most of the key elements assessed, specifically food safety, Indigenous food safety (though Indigenous food systems are mentioned), water as it relates to food safety, and foodborne illness. There is an opportunity to fortify these concepts and actions in this document for national alignment, though it should be noted Saskatchewan has not adopted the Pan-Canadian Framework at this time, and many existing PT plans do not integrate the information from the Framework within their respective plans.

Figure 1. Summary of SWOT analyses

Key findings from the SWOT analysis of seven climate plans	
Strengths: What the plans do well collectively • Show growing recognition of food system vulnerability • Acknowledge that climate change threatens food systems • Bring attention to ecosystem health as foundational to food systems • Demonstrate momentum toward Indigenous engagement • Most provincial/territorial plans (BC, PEI, NWT) refer to inclusion of Indigenous engagement and traditional knowledge in application of plans	**Weaknesses:** Systemic gaps across plans • Rarely address food safety explicitly, though may be implicit to considerations of infrastructure, ecosystem resilience, or agriculture • Rarely address outcomes related to food safety • Indigenous food safety and food systems are largely invisible in provincial strategies • A Western regulatory lens dominates plans, where food is framed through regulatory, agriculture, or market food systems • Contain implementation and authority gaps, demonstrate limited transfer of authority to Indigenous communities, lack co-governance mechanisms
Opportunities: Where alignment and progress are possible • Co-develop Indigenous-led, climate-adapted food safety systems • Recognize traditional indicators of food safety alongside monitoring • Align regulations to reflect Western and traditional knowledge • Support community-based monitoring of food safety indicators • Use climate adaptation to advance food sovereignty, knowledge transmission, infrastructure, response, protection, and preparedness • Integrate food safety into adaptation planning through explicitly naming food safety as a climate risk • Embed food system indicators into resilience frameworks, and link ecosystem adaptation directly to food safety outcomes	**Threats:** Risks across all plans • Climate change impacts are outpacing policy adaptations • Impacts on traditional food species, harvest, storage, and transport are creating food safety risks • Short planning horizons (e.g., 3–5 years) are misaligned with long-term food system needs • Many actions depend on short-term funding or pilot projects • Risk of regulatory harm through restriction of traditional food practices • Indigenous and remote communities face higher exposure to unsafe food conditions with fewer adaptation resources • If food systems are not explicitly addressed, adaptation may benefit commercial and urban systems first

In summary, the SWOT analysis of these selected plans found:

- **Strengths**: Some plans provide general climate adaptation guidance or refer to public health risk management, which could serve as a foundation for integrating food safety considerations.
- **Weaknesses**: Explicit inclusion of food safety, Indigenous food systems, and culturally relevant food safety strategies are largely absent. Implementation mechanisms are unclear, and allocation of resources to Indigenous Peoples is minimal.
- **Opportunities**: Planning approaches could be strengthened by incorporating Indigenous knowledge into jurisdictional plans, clarifying governance roles, and providing tools and resources for climate-resilient food safety management.
- **Threats**: Without targeted policy action, climate-driven risks to both conventional and Indigenous food systems may undermine food safety, public health, and community resilience.

Overall, the analysis demonstrates a significant gap in Canadian climate strategy planning. Food safety, particularly for Indigenous food systems, is not sufficiently addressed. Existing plans provide limited actionable guidance, lack mechanisms for Indigenous participation and authority, and do not consistently integrate culturally relevant tools or resources. Addressing these gaps is critical to safeguarding public health, supporting Indigenous self-determination, and enhancing resilience to climate-related food safety risks.

Environmental public health perspective and case examples

The literature consistently demonstrates that climate change is fundamentally reshaping Indigenous food systems across Canada, with direct implications for traditional Indigenous food safety, sovereignty, and environmental public health practice. EPHPs play a critical role in protecting public health through food safety, water quality oversight, environmental hazard control, climate impact mitigation measures, and emergency response. As climate change accelerates, many of the environmental conditions and environmental determinants of health that EPHPs manage are becoming increasingly unstable, complex, and difficult to regulate within existing frameworks. In Canada, climate adaptation plans increasingly recognize climate-driven risks to food, water, and Indigenous food systems. However, analyses of these plans show that operational guidance, particularly around food safety and traditional Indigenous food safety, remains nearly absent. This section aims to bridge the gap between climate adaptation planning and practical implications for EPHPs, highlighting the evolving role of frontline practitioners in supporting safe Indigenous food systems under changing environmental conditions.

Linking climate impacts on Indigenous food systems to food safety risks

Traditional Indigenous foods, also called *country foods* or *land-based foods,* include a wide range of culturally significant wildlife, plants, and locally processed foods central to the health, identity, and

food sovereignty of First Nations, Inuit, and Métis communities. These foods can include wild game, birds, fish and shellfish, foraged plants and mushrooms, fruits and berries, roots, and seaweed. Traditional food processing methods are often applied and may include wind drying, smoking, and fermenting. Storage may be in personal or community freezers or ice cellars. Many foods and preparation practices carry deep social, cultural, and spiritual meaning. The foods are often nutritionally superior to many market alternatives (particularly in remote areas) and are essential for community health and well-being.[28,29]

Climate-driven environmental change is disrupting the ecological foundations of traditional Indigenous food systems and affecting nearly all environmental determinants of health, including water quality, wildlife health, and pathogen dynamics. In Inuit communities such as Igloolik and Ulukhaktok, warming temperatures, sea ice loss, and shifting seasonal patterns are reducing safe access to harvesting areas and altering the distribution and health of key species.[30,31] Permafrost thaw and unpredictable freeze–thaw cycles are compromising traditional food storage systems such as ice cellars, increasing the risk of spoilage and contamination.[31] These changes introduce new and uncertain food safety risks, including increased exposure to contaminants, zoonotic diseases, and spoilage due to unpredictable storage conditions. Similarly, research on beluga whale harvesting in Nunavik highlights how changing marine ecosystems are affecting both the safety and cultural significance of country foods.[32] Warming temperatures and changing hydrological systems can increase risks such as exposure to harmful algal blooms, water contamination, and foodborne illness.[33]

Many communities also hold concerns about harvested food safety due to increases in zoonotic illnesses.[34,35] Food safety in Indigenous contexts cannot be separated from environmental conditions, requiring EPHPs to adopt a broader ecological lens in their work and assess emerging hazards that introduce new food safety risks associated with climate change, environmental impacts, and ecosystem disruption.

The absence of explicit consideration of food safety in climate adaptation plans risks overlooking emerging hazards and allocating resources to address them. It also provides an opportunity for EHPHs to advocate for inclusion of these key elements and to advise on strategies that integrate a broader range of knowledge. Indigenous knowledge systems play a critical role in identifying and responding to environmental change. Indigenous food harvesting practices function as forms of social–ecological monitoring, providing detailed, place-based observations of changes in species behaviour, ecosystem health, and environmental conditions.[36,37] Studies from coastal British Columbia and the Northwest Territories demonstrate how Indigenous knowledge has documented declines in key species, shifts in migration patterns, and changes in plant availability long before these trends are captured by current monitoring systems.[38,39]

The integration of Indigenous knowledge with Western science is widely identified as essential for effective climate adaptation and improved food safety. Mixed-methods research, such as the beluga whale study in Nunavik, shows how combining Indigenous observations with laboratory

analysis improves understanding of contaminant risks and ecosystem change.[32] Similarly, fisheries management and water governance case studies demonstrate that incorporating Indigenous knowledge into decision-making leads to more adaptive and context-specific management strategies.[40,41] For EPHPs, this underscores the importance of engaging with Indigenous knowledge holders and communities as equal partners in monitoring, risk assessment, and communication on climate food safety impacts.

Successful knowledge integration requires changes to how Indigenous knowledge is integrated into the decision-making structures and processes that guide and shape climate adaptation planning. Current systems often treat Indigenous knowledge as supplementary rather than foundational, limiting its influence on decision-making.[42] Climate change disproportionately affects Indigenous populations, not only through environmental exposure but also through systemic inequities rooted in colonial policies and socio-economic marginalization.[43,44] These inequities are evident in both remote and urban contexts, where food insecurity and safety risks are shaped by limited access to traditional foods, reliance on expensive and less nutritious market foods, and inadequate supporting infrastructure.[45,46]

In contrast, community-led initiatives, such as Indigenous-led fisheries, wild rice revitalization projects, and local food system development in northern communities, demonstrate the effectiveness of Indigenous governance models in enhancing food system and safety resilience.[47-49] Strengthening food safety and resilience requires emphasizing food sovereignty, local control, and ecological stewardship, aligning closely with holistic understandings of health and environment.

EPHPs are uniquely positioned to support these approaches and often act as partners to Indigenous communities by providing microbiological testing, assisting in wildlife contamination assessments, and collaborating with local knowledge holders to ensure safety without undermining cultural protocols or food sovereignty.[50] Rather than relying solely on standardized regulatory frameworks, EPHPs increasingly engage in relationship-based, adaptive, and culturally informed work. Unlike their regulatory role in market food systems, environmental public health work that involves traditional Indigenous foods is collaborative rather than prescriptive, aligning with principles of cultural safety and self-determination. This includes supporting community food spaces, assessing water quality used during food preparation, providing technical food safety advice on food preparation methods, translating scientific findings into locally relevant guidance, responding to community concerns about harvested food, and offering environmental public health support during outbreaks or contamination events.

There is a need to explicitly incorporate traditional Indigenous food safety into climate adaptation planning, including clear roles for EPHPs and resources to support implementation. Climate adaptation strategies can be strengthened by prioritizing community-based monitoring and Indigenous-led governance of local food systems, recognizing the value of local knowledge and leadership. A greater emphasis may be needed on preventive and adaptive public health approaches, enabling EPHPs to anticipate and respond to emerging risks rather than reacting to

crises. Strategic cross-sector collaboration between health, environment, and Indigenous governance systems is essential to address the interconnected nature of climate change and food systems. Realizing this potential requires resources and support for community-based monitoring and a shift toward collaborative, culturally safe approaches that recognize Indigenous knowledge as foundational rather than supplementary.

Case examples

Provincial and federal adaptation plans, including the *Pan-Canadian Framework on Clean Growth and Climate Change* and the *National Climate Strategy*,[14] recognize vulnerabilities in water systems, fisheries, and northern infrastructure. However, they consistently lack explicit attention to microbial risks, traditional food safety, and foodborne illness within Indigenous food systems.[7,9,14] EPHPs thus operate at the interface of climate impacts, food safety, and public health, filling gaps not yet addressed in policy while supporting culturally grounded food sovereignty and resilience in Indigenous communities.

The five case examples presented below highlight the roles EPHPs can play in these spaces and the impacts of the gaps in climate adaptation plans. Across Canada, climate change is altering water and temperature conditions in ways that compromise the safety of traditional Indigenous foods, including marine species in British Columbia, freshwater fish in Saskatchewan, Ontario and Quebec, ice-cellar-stored meats in northern Inuit communities, and coastal shellfish in the Maritimes.

Common challenges include increased microbial contamination from warming waters and thaw driven by changing temperature patterns, and increased runoff, drought, and flooding, driven by changing melt and precipitation patterns. These changes elevate the risks of spoilage and foodborne illness. EPHPs have a critical role in monitoring water and food quality, implementing culturally appropriate handling and processing guidance, advising on safe consumption, and collaborating with Indigenous harvesters to preserve both food safety and food sovereignty.[5,51,52]

Case #1 – British Columbia: Herring eggs (spawn-on-kelp) and marine food safety

Rising sea temperatures and altered nearshore runoff patterns increase risks of microbial contamination in herring eggs, a culturally significant food for coastal First Nations. Environmental change can also disrupt marine species abundance and harvest timing.[51]

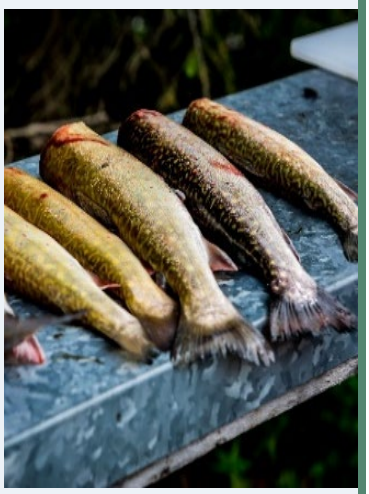
- **Food safety implications:** Increasing microbial risks in coastal waters underscore the importance of tailored monitoring for traditional marine foods.[51]
- **EPHP involvement:**
  - Monitor water quality at harvest sites
  - Test herring eggs for microbial contamination
  - Co-develop culturally relevant handling guidance with Indigenous harvesters
- **Climate adaptation plan gap:** BC's *Climate Preparedness and Adaptation Strategy* emphasizes coastal resilience but lacks explicit coverage of microbial contamination impacts on Indigenous traditional food safety.[9,14]

Pacific Herring roe on kelp

Case #2 – Saskatchewan: Drought lowering lake levels and freshwater fish safety

Prolonged drought concentrates bacteria and cyanotoxins in lakes, increasing chemical and pathogen exposure risk in fish traditionally harvested and processed, especially during cleaning and preparation.[53,54]

- **Food safety implications:** Water scarcity and quality directly influence microbial and cyanotoxin risks in freshwater traditional foods, affecting both food safety and food sovereignty.[53,54]
- **EPHP involvement:**
  - Co-develop culturally informed risk and advisory communications
  - Implement boil-water and safer fish cleaning protocols
  - Test water and fish quality
- **Climate adaptation plan gap**: Saskatchewan's climate strategy addresses water scarcity broadly but does not explicitly tackle contamination risks in traditional food systems, representing a gap in linking water-related climate impacts to Indigenous food safety.[10]

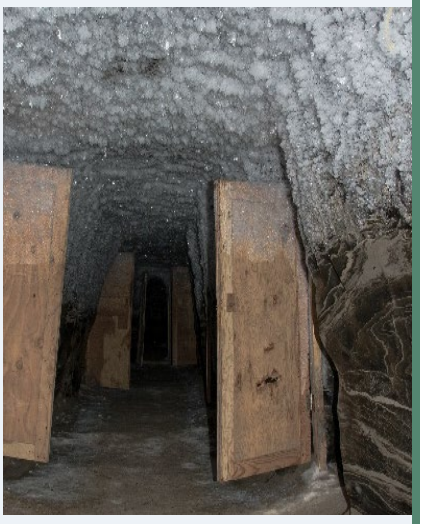


Trout on gutting/filet table

Case #3 – Far north (Inuit Nunangat): Permafrost thaw and traditional food storage

Thawing permafrost increases water infiltration into ice cellars, which increases microbial growth and spoilage risks for stored caribou, seal, and fish. Broad climatic instability also affects travel and timing of harvests.[31,32]

- **Food safety implications:** Thaw induced moisture elevates food spoilage risk and challenges longstanding preservation practices central to Inuit food sovereignty.[31,32]
- **EPHP involvement:**
  - Document thaw trends
  - Test stored foods for pathogens
  - Explore alternative storage solutions co-developed with the community
- **Climate adaptation plan gap:** Federal adaptation frameworks (e.g., *Pan-Canadian Framework*, *National Climate Strategy*) recognize northern climate impacts broadly but do not explicitly integrate traditional food safety or foodborne illness outcomes.



Underground freezers in Tuktoyaktuk

Case #4 – Maritimes and other coastal communities: Shellfish contamination and traditional harvests

Warming ocean temperatures, increased precipitation, and coastal runoff contribute to elevated microbial loads and biotoxin risks for shellfish — a key traditional food source for Mi'kmaq and other coastal Nations.[55]

- **Food safety implications**: Climate alterations in coastal waters directly affect microbial contamination patterns, challenging food safety and Indigenous food sovereignty.[55]
- **EPHP involvement:**
  - Collect samples and conduct or facilitate microbial and toxin testing in shellfish
  - Interpret test results
  - Provide guidance on safe harvesting and processing
  - Work with Indigenous harvesters to maintain access to traditional marine foods
- **Climate adaptation plan status**: Atlantic climate adaptation strategies mention coastal ecosystem resilience but do not explicitly integrate Indigenous food safety concerns related to microbial contamination, showing a need for improved policy alignment.

Malpaque oysters, PEI

Case #5 – Central Canada (Ontario/Quebec): Changing water patterns, wildlife movement, and food safety

Changing precipitation patterns, altered hydrology, and increased frequency of flooding and drought in central Canada are reshaping terrestrial and freshwater ecosystems. These changes influence the distribution, health, and behavior of wild game species such as moose and other land-based food sources relied upon by Indigenous communities. Shifts in water availability and quality affect forage conditions, habitat stability, and migration routes, contributing to observed declines and changes in harvested species.[31,36]

- **Food safety implications:** Climate-driven changes in water systems can increase exposure to pathogens and contaminants in wildlife through altered diets, degraded habitats, and increased stress on animal populations. These changes affect both the safety and reliability of traditional foods, with documented impacts on Indigenous food sovereignty, well-being, and cultural practices.[31,36]

Young moose in a field in central Canada

- **EPHP involvement:**
  - Assess risks related to wildlife health and environmental contamination
  - Provide guidance on safe harvesting and consumption
  - Collaborate with Indigenous knowledge holders to interpret observed changes in animal behavior and condition
- **Climate adaptation plan gap:** Provincial adaptation strategies in Ontario and Quebec recognize climate impacts on water systems and ecosystems but generally lack explicit integration of these changes with traditional food safety or wildlife-based food systems.[17,18,20,21]

Future directions

The jurisdictional scan of Canadian climate plans, SWOT analysis, literature review, and case examples provide important insights into current gaps in addressing the climate impacts on food safety and Indigenous food safety. This section includes high-level policy considerations that can be used to strengthen climate adaptation policy and planning activities, followed by detailed recommendations for environmental public health to help address identified gaps and support future improvements.

Policy and plan considerations

The review of existing climate plans identified gaps in addressing food safety. There are several opportunities to better integrate food safety, particularly within Indigenous food systems, into climate adaptation frameworks. The following policy considerations emphasize opportunities to strengthen governance approaches, monitoring of key food safety indicators, and improving practice to address emerging climate-related risks while supporting Indigenous knowledge systems and community-led approaches.

1. **Recognize conventional and Indigenous food safety systems in climate planning:**
   Governments can formally recognize conventional and Indigenous food safety knowledge, practices, and indicators in climate adaptation plans and strategies as valid and essential components of food safety governance. This includes acknowledging community-defined protocols for harvesting, preparation, storage, and sharing of traditional foods.

2. **Co-develop climate-adapted food safety monitoring:**
   Establish and provide resources for food safety monitoring programs that integrate traditional knowledge with Western scientific methods. Monitoring could include wildlife health, water quality, environmental contaminants, and ecological changes that may affect food safety for specific communities. Community-led monitoring in Indigenous communities can support identification of priority risks. For jurisdictions with existing monitoring systems, review suitability against current and predicted needs, and improve access and ability to optimize use of available data. Plans should include consideration for integrating multiple data sources including those from local initiatives, citizen science, and other disparate sources.

3. **Embed food safety into climate adaptation planning:**
   Climate adaptation plans and strategies at all levels should explicitly address food safety, including traditional Indigenous foods. Plans should include Indigenous food system indicators, cross-sector coordination (health, environment, emergency management), environmental public health, and, if applicable, sustainable funding considerations.

4. **Support climate-resilient food infrastructure:**
   Support evaluation of infrastructure needs to support food safety in Indigenous food systems, such as cold storage, safe water access, harvesting access, processing facilities, and emergency food preparedness based on community priorities. Develop policy and programs to support the identified needs and allocate resources to enable improvements.

Incorporating the considerations above into new climate adaptation policies, strategies, and plan updates can ensure that food safety risks due to climate change are more consistently identified and addressed through appropriate resourcing. Distinguishing food safety considerations within Indigenous food systems can support the identification of community-specific or food-specific hazards that may not be apparent in broader food system approaches. This is needed to help inform the prioritization of risk-reducing measures. These efforts can be supported through Indigenous-led or co-developed food safety governance or advisory mechanisms. Support through funding for community-based, community-led, climate-adapted food safety monitoring and knowledge transmission approaches would further strengthen these efforts and increase the beneficial impact on food safety. Additionally, food safety regulatory frameworks may benefit from further review to ensure alignment with Indigenous food sovereignty principles and changing climate conditions.

Environmental public health (EPH) recommendations

The following recommendations emphasize opportunities to strengthen climate considerations in the EPH profession, programs, and practices to ensure that emerging climate-related risks to food safety are addressed, particularly those that disproportionately affect Indigenous food systems.

1. **Integrate a climate lens into all EPH practice:**
   Embedding climate change considerations into routine inspections, risk assessments, and food safety evaluations, can allow for anticipation of emerging hazards such as temperature-related spoilage, shifting pathogens, and extreme weather impacts on infrastructure.

2. **Strengthen community-based monitoring systems for climate-sensitive food safety risks:**
   Expanding monitoring systems can ensure that emerging food safety risks linked to climate change such as zoonotic diseases, contaminants in wildlife, and harmful algal blooms can be identified. Supporting and co-developing local monitoring programs with Indigenous and local communities can help track environmental changes, wildlife health, water quality, and food safety indicators, using both Western scientific and Indigenous knowledge approaches.

3. **Advance braided knowledge approaches in practice:**
   Treating Indigenous knowledge systems as equal to Western science can ensure they are incorporated into surveillance, risk assessment, and decision-making processes, particularly for traditional food safety systems.

4. **Enhance cultural safety and competency among EPHPs:**
   Providing training and professional development can ensure EPHPs can work with Indigenous communities in a culturally safe manner, recognizing the cultural, spiritual, and social importance of traditional foods.

5. **Shift from regulatory to collaborative practice models:**
   Moving beyond compliance-focused approaches toward relationship-based, advisory roles can support Indigenous food sovereignty and self-determination in food safety decision-making.

6. **Develop guidance for traditional food safety under climate change:**
   Creating practical, context-specific tools and protocols can improve assessment and management of risks associated with traditional food harvesting, preparation, and storage in changing environmental conditions.

7. **Support adaptive infrastructure and food storage solutions:**
   Working with communities can help to identify safe alternatives to traditional storage methods and ensure that water used for food preparation and processing remains safe under variable climate conditions.

8. **Strengthen intersectoral collaboration and policy integration:**
   Setting out clear roles for EPHPs in climate adaptation frameworks and plans can ensure collaboration across health, environment, wildlife, and Indigenous governance responsibilities to address interconnected risks.

9. **Promote Indigenous-led food sovereignty and resilience initiatives:**
   Supporting and providing resources for community-driven programs such as local food production, land-based education, and Indigenous-led fisheries and harvesting initiatives can enhance food safety and climate resilience.

Summary

This paper explored the inclusion of food safety, particularly Indigenous food safety considerations, in climate adaptation planning across Canada and examined the role of EPHPs in supporting Indigenous food safety systems in a changing climate.

Rapid environmental changes, such as shifts in water patterns, permafrost thaw, wildlife movement, and emerging pathogens, are impacting the safety, availability, and reliability of traditional foods. Climate change can compromise food safety through impacts on species, harvest, storage, and transport.

Despite these growing risks, the jurisdictional scan revealed that food safety is rarely addressed in climate adaptation planning, and the SWOT analysis provided further considerations of areas for improvement. Consideration of Indigenous food safety and sovereignty and the unique challenges faced by traditional food systems is particularly lacking. This lack of integration may exacerbate existing inequities in food systems, and the lack of resources and culturally relevant tools to support Indigenous-led approaches also compromises the capacity to manage climate-related food safety risks.

EPHPs are well positioned to support holistic, systems-based, culturally informed, and culturally led approaches to climate adaptation and food safety. Indigenous knowledge offers essential insights that complement Western science, yet policies and adaptation plans rarely provide guidance for environmental public health programs, operationalized by EPHPs, on integrating this knowledge into practice to support culturally safe food safety practices. Community-based monitoring and risk assessment for climate-related food safety risks is also largely absent.

EPHPs, federal, provincial, and territorial agencies involved in climate adaptation policy, strategy, and plan developments, communities, and health authorities will benefit from applying a climate impact lens across public health work and implementing adaptation and mitigation measures that are essential for public health protection. Through interdisciplinary collaboration, public health can support integration of Indigenous knowledge, strengthen operational guidance, and support community-led initiatives that promote safe, resilient, and culturally grounded food systems for future generations.

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Appendix A: Literature review search information and approach

Component	Description
Databases/ sources	Google Scholar, PubMed, and SHA Library (Saskatchewan Health Authority Library)
Geographic focus	Canada (priority), with selected comparator countries where relevant
Search approach	Iterative keyword searching using combinations of keywords: climate change, Indigenous food systems, food safety, policy, and adaptation/resilience terms
Concept areas	Climate change and food safety; Indigenous food sovereignty and food safety; policy and governance frameworks; adaptation and resilience

Appendix B: List of climate plans reviewed in jurisdictional scan

Jurisdiction	Plan Name	Link	Year
Canada	Pan-Canadian framework on clean growth and climate change	https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework/climate-change-plan.html	2018
Canada	Health of Canadians in a changing climate	https://changingclimate.ca/health-in-a-changing-climate/	2022
Canada	Assembly of First Nations: National climate strategy	https://afn.bynder.com/m/77556e1d9da51db7/original/2023-Climate-Strategy-Report.pdf	2023
British Columbia	Climate preparedness and adaptation strategy: Actions for 2022–2025	https://cleanbc.gov.bc.ca/ https://www2.gov.bc.ca/assets/gov/environment/climate-change/adaptation/cpas.pdf	2021
Alberta	Emissions reduction and energy development plan	https://www.alberta.ca/emissions-reduction-and-energy-development-plan	2024
Saskatchewan (1)	Saskatchewan Climate resilience measurement framework	https://publications.saskatchewan.ca/api/v1/products/92479/formats/109479/download	2019
Saskatchewan (2)	Prairie Resilience: A made-in-Saskatchewan climate change strategy	https://www.saskatchewan.ca/business/environmental-protection-and-sustainability/a-made-in-saskatchewan-climate-change-strategy/saskatchewans-climate-change-strategy	2017
Manitoba	Made-in-Manitoba climate and green plan	https://www.gov.mb.ca/asset_library/en/climatechange/climategreenplandiscussionpaper.pdf	2017
Ontario (1)	A Made-in-Ontario environment plan	https://www.ontario.ca/page/made-in-ontario-environment-plan	2022
Ontario (2)	Ontario's climate change strategy (2014)	https://docs.ontario.ca/documents/4928/climate-change-strategy-en.pdf	2014
Quebec	2030 Plan for a green economy 2013–2020 climate change action plan (en français)	https://www.quebec.ca/en/government/policies-orientations/plan-green-economy/ https://www.environnement.gouv.qc.ca/changementsclimatiques/plan-action-en.asp	2020
New Brunswick	New Brunswick's climate change action plan 2022–2027	https://www2.gnb.ca/content/dam/gnb/Corporate/Promo/climate/climate-change-action-plan.pdf	2021
Nova Scotia	Our climate, our future Nova Scotia's climate change plan for clean growth	https://climatechange.novascotia.ca/sites/default/files/uploads/ns-climate-change-plan.pdf	2022
Prince Edward Island	Building resilience: Climate adaptation plan	https://www.princeedwardisland.ca/sites/default/files/publications/building_resilience_climate_adaptation_plan_oct_2022.pdf	2022
Newfoundland and Labrador (1)	Climate change mitigation action plan 2025–2030	https://www.gov.nl.ca/eccc/occ/action-plans/	2025
Newfoundland and Labrador (2)	Climate change adaptation action plan 2025–2030	https://www.gov.nl.ca/eccc/occ/action-plans/	2025
Yukon	Our clean future: A Yukon strategy for climate change	https://our-clean-future.yukon.ca/	2019
NWT (1)	2030 NWT Climate change strategic framework	https://www.gov.nt.ca/ecc/en/2030-nwt-climate-change-strategic-framework-cadre-strategique-sur-le-changement-climatique-des-tno	2018
NWT (2)	2030 NWT Climate change strategic action plan 2019–2023	https://www.gov.nt.ca/ecc/en/2030-nwt-climate-change-strategic-framework-cadre-strategique-sur-le-changement-climatique-des-tno	2018
Nunavut	Climate change impacts and adaptation in Nunavut	https://climatechangenunavut.ca/sites/default/files/3154-315_climate_english_reduced_size_1_0.pdf	

Appendix C: Individual SWOT analysis of seven select plans

Jurisdiction	Strengths	Weaknesses	Opportunities	Threats
Canada[7]	Explicit linkage between climate change and food safety Recognition of Indigenous food systems, including traditional food methods Connects food safety to other human health indicators and determinants, and to community Information is evidence-based, using surveillance data	Provides detailed assessment but not actions or implementation pathways Western food safety lens dominant framing of food safety through colonial regulator standards Little guidance or tools for communities to adapt harvesting, storage, or monitoring of traditional foods under changing conditions	Can support updating or developing climate-adapted food safety surveillance approaches Opportunity to move toward co-developed community-defined safety indicators grounded in Indigenous knowledge Can be used to inform federal and provincial food safety, health, and climate adaptation policies affecting Indigenous food safety	Rapid increase in climate impacts may outpace health system capacity to monitor shifts affecting food Rigidity in food safety regulations means traditional foods risks being over-restricted or criminalized rather than supported Loss of safe access to traditional foods increases food safety risk (through unsafe access or having to shift to higher risk practices storage, nutrition, etc.
Canada[8] **(AFN)**	Positions food sovereignty at the core of the information holistically Provides Indigenous-defined food safety, such as knowledge around seasonal and spiritual aspects Climate justice lens links unsafe food systems to colonial disruption, infrastructure gaps, and environmental degradation Identifies community-led solutions, knowledge transfer	Limited technical details on monitoring or formal food safety systems may confuse alignment Implementation strategies rely heavily on external funding and government cooperation Focus on place-based food systems make national-level standardization difficult	Supports a policy shift from risk-avoidance to food system resilience and sovereignty Opportunity to establish First Nations–led food safety authorities or monitoring programs Supports knowledge revitalization through climate adaptation strategies around traditional food knowledge and practice	Governments may resist transferring authority over food systems and safety regulation Risk of underfunding or lack of sustained investments leaving communities without support Species decline, habitat loss, and water contamination threaten the foundation of Indigenous food systems

British Columbia[9]	Strong focus on ecosystems that underpin Indigenous and local food systems Risk awareness of climate hazards that directly affect food safety Commitment to Indigenous engagement Includes actions that can indirectly support food safety (e.g., floodplain management, wildfire mitigation)	Food safety appears mainly through infrastructure and ecosystem protection rather than as a distinct focus Engagement does not always translate into Indigenous decision-making authority over food systems Near-term focus may not match long-term cultural and ecological food system needs	Positioned to integrate Indigenous food systems explicitly as an adaptation priority Opportunities for shared stewardship of fisheries, wildlife, and lands that are critical to food systems Local capacity building through support of community-level infrastructure (cold storage, smokehouses, safe water access)	Extreme unpredictable weather events can rapidly contaminate food sources and disrupt harvesting seasons Adaptation measures may be applied unevenly and prioritize urban or commercial food systems Provincial food safety regulations may unintentionally restrict traditional food practices under climate stress
Saskatchewan[11]	Tracks progress on natural systems, general community preparedness, and well-being, which can indirectly support food systems	Lack of food safety focus Lack of Indigenous food safety or food system; no sovereignty or collaboration focus with Indigenous communities Potential food system resilience gets subsumed under broader measures rather than targeted actions	The resilience measurement framework could add specific indicators for food safety and Indigenous food systems safety Potential for collaboration with Indigenous communities for locally designed climate and food safety indicators Potential for cross-sector integration incorporating agriculture, health, communities, and food safety	Without explicit planning for food safety, climate adaptation actions may overlook important cultural and safety needs of Indigenous communities Lack of specific intentional monitoring for food safety risks (e.g., pathogens, toxins) can mask emerging threats
Saskatchewan[10]	Seeks to build resilience across sectors including agriculture, land use, and ecosystems, which are foundations of food systems	There is no clear focus on food safety issues or foodborne illnesses Indigenous food systems and safety are not clearly defined as priorities	Could integrate food safety standards adapted to climate risks into future updates or resilience reporting frameworks Opportunity to co-develop monitoring of	Increasing temperatures and extreme events risk contaminating water and shifting wildlife patterns, undermining both western and traditional food safety

	Emphasis on natural systems' resilience could benefit ecosystems that underpin wildlife and plant species central to Indigenous food practices, although this link is not made explicitly Consultation commitment with Indigenous communities and stakeholders	Without targeted measures, general resilience planning may not protect traditional food safety specific to Indigenous food systems	climate impacts on traditional plants and animals critical to food sovereignty Programs for drought resilience, soil health, and water access could indirectly strengthen food safety and security	Provincial policies focus on economic resilience over culturally defined food safety needs, deepening inequities for Indigenous communities
Prince Edward Island[12]	Plan acknowledges Indigenous communities' relationship with the land and commits to advance reconciliation and integrate local knowledge Explicitly mentions food and water access and actions that are directly related to food safety Partners with food industry to respond to climate risks and are well positioned to support food safety implementation	Limited detail on Indigenous food system and safety in those systems The actions tend to be broad (infrastructure, coastal resilience) rather than tailored to food safety risks like contamination or ecosystem shifts impacting traditional harvests	Linkage to other climate plans such as seafood sector climate adaptation strategy with incorporation of Indigenous perspectives Region-specific climate model outputs could inform monitoring programs to pre-empt safety risks Building on existing commitments to reconciliation, the plan could include Indigenous-led food system resilience measures	Rising seas and storms may disrupt monitoring and disproportionately impact communities relying on subsistence or small-scale fisheries Lack of targeted food safety infrastructure (cold storage, emergency supplies) could exacerbate system vulnerabilities during climate events
Northwest Territories[13]	Framework supports building resilience to climate change impacts to food issues and production Emphasizes involvement of communities and use of local/traditional knowledge in planning	Food safety not clearly central and lacks detailed actions on food safety (e.g., pathogen monitoring, safe harvest guidelines) for traditional foods Implementation dependency on funding to support	Longer seasons could enhance local food availability and food safety opportunities Traditional and scientific knowledge integration could support co-designed food system monitoring that includes cultural food safety indicators	Climate shifts in the North can lead to unpredictable effects on food availability and safety Logistics and high costs of food storage and transport can compound during climate caused emergency events, disproportionately

	Food production strategy offering groundwork for climate adaptation of food systems and food safety incorporation	Indigenous communities and remote food systems	Co-creating food safety approaches with youth and elders strengthens future resilience	affecting Indigenous and remote food safety

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