

Advisory Table on Resilient Natural and Built Infrastructure

In support of the development
of a National Adaptation Strategy
Phase 1 (Fall 2021)



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1. Introduction

Canada is warming at twice the rate of the global average¹, with the north at three times the rate, and is increasingly experiencing extreme events such as heatwaves, wildfires, and floods, alongside gradual climate impacts such as rising sea levels, and thawing permafrost. These impacts already have clear implications for Canada's built infrastructure, as evidenced by disasters across Canada throughout 2021. Built infrastructure types impacted by climate change in Canada include (but are not limited to): roads, highways and railways, buildings, water supply infrastructure, wastewater and stormwater infrastructure, ports and waterways, and energy and information/communication technologies². Natural infrastructure is also impacted by climate change; however, for the purpose of this report, natural infrastructure is primarily considered in the context of natural or hybrid systems providing infrastructure services. Climate impacts on the natural environment are directly considered under the auspices of the *Thriving Natural Environment* Advisory Table.

Infrastructure has been identified by a Council of Canadian Academies' expert panel as **Canada's most consequential climate risk**, but also as the **top sector for climate resilience potential in Canada**, as measured by the proportion of damages that can be avoided through adaptation policy and programs.

A range of Canadian stakeholders and experts are signaling that the benefits of acting *now* are significant, including in the context of the post-pandemic socio-economic recovery and the infrastructure transformation required to develop a net-zero society in Canada, with key opportunities to scale ambition to advance short- and long-term infrastructure objectives. While the federal government is uniquely positioned to deploy a range of impactful policy and program levers to accelerate progress towards climate-ready infrastructure, making communities safer and more climate-resilient is a **whole-of-society effort**, including all levels of government, especially as provincial, territorial, Indigenous and local governments own and operate around 97 percent of publicly owned infrastructure in the country³. The acceleration of climate-ready infrastructure across Canada is also a shared responsibility of a wider range of key players, including the private sector, professionals, and civil society.

This includes opportunities for advancing the uptake of natural and hybrid infrastructure solutions. Natural infrastructure refers to the use of preserved, restored or enhanced ecosystem features and materials (e.g., water, native vegetation, sand and stone) to deliver infrastructure outcomes and targeted community services, while also providing co-benefits for the environment, the economy, community health, and well-being. Examples may include "salt marshes and maritime forests to address coastal flooding; wetlands and riparian buffers to address riverine flooding; permeable pavement and

¹ As found in Environment and Climate Change Canada's [Canada in a Changing Climate Report](#) (2019).

² Further information can be found in the report from the International Institute for Sustainable Development on [Advancing the Climate Resilience of Canadian Infrastructure](#) (2021).

³ According to Infrastructure Canada's [Engagement Paper on the National Infrastructure Assessment](#) (2021), in Canada, publicly-owned infrastructure is primarily owned by municipal governments (61.9%), followed by provincial and territorial governments (32.6%), with only a small portion owned by the federal government (2.8%) and Indigenous communities (2.7%).

retention ponds to improve urban and rural stormwater management; and green roofs and trees to increase resilience to extreme heat in cities”⁴.

There is currently a patchwork of leading initiatives and innovation across Canada to advance climate-resilient infrastructure⁵, including within First Nation, Métis Nation, Inuit, and urban Indigenous communities, and spearheaded by the private sector, advancing climate-resilient infrastructure, including through nature-based solutions⁶. Yet, due to the absence of collaboration, coordination, alignment, and knowledge-sharing between various partners and stakeholders, and inadequate intentional investment to address climate related risks, there are missed opportunities, siloed and piecemeal approaches, objectives that are sometimes in conflict, policies and processes that block progress on resilience, and an overall inability to monitor progress and amplify successes.

In December 2020, under the [Strengthened Climate Plan, A Healthy Environment and a Healthy Economy](#), the Government of Canada committed to developing the first-ever [National Adaptation Strategy](#) (NAS) for Canada, working with: provincial, territorial, and municipal governments; First Nation, Métis Nation, Inuit, and urban Indigenous Peoples; and other key partners and stakeholders. The NAS is intended to establish a shared vision for climate resilience in Canada, identify key priorities for increased coordination (coherency), and develop a framework for measuring progress at the national level. As such, the NAS is expected to provide a **national framework for action** that includes key milestones and targets to help ensure that all parties have clarity on roles and responsibilities to invest in and implement adaptation solutions that are coherent, cohesive, aligned, and strategic. Another expected outcome is the development of a **Federal Action Plan**, which will influence future federal programming, and direct future investment.

2. Overview of the NAS Advisory Table on Resilient Natural and Built Infrastructure

In August 2021, Environment and Climate Change Canada (ECCC) released [an update on the NAS](#), which announced the establishment of [five thematic advisory tables](#) to support the development of the Strategy:

- 1) Health and Wellbeing (Federal lead: Health Canada)
- 2) Resilient Natural and Built Infrastructure** (Federal lead: Infrastructure Canada)
- 3) Thriving Natural Environment (Federal lead: Environment and Climate Change Canada)
- 4) Strong and Resilient Economy (Federal lead: Natural Resources Canada)
- 5) Disaster Resilience and Security (Federal lead: Public Safety Canada)

The Advisory Tables are expected to advance work over two phases:

- As part of Phase 1 (Fall 2021), Advisory Tables were asked to advise on a proposed *transformational goal* for a resilient future for Canada, along with *medium-term objectives* for achieving that vision.

⁴ Also in IISD, 2021 (p. vi)

⁵ As evidenced by case studies presented in the [Map of Adaptation Actions](#) (under the “infrastructure” sector theme) and the Prairie Climate Centre’s [Climate Atlas](#).

⁶ In September 2021, the Canadian Council of Ministers of the Environment (CCME) released a [Natural Infrastructure Framework that provides insights on key concepts, definitions and terms](#).

- In the context of Phase 2 (Winter/Spring 2022), Advisory Tables will be invited to focus on establishing *short-term actions* for attaining those objectives, including discussion of performance indicators and reporting structures.

The Advisory Table on Resilient Natural and Built Infrastructure (hereafter, the Advisory Table) was designed to be **co-chaired** by a federal and an external leader. Tim Angus, Director General - Strategic and Sectoral Policy at Infrastructure Canada (INFC) is serving as the federal Co-Chair of the Advisory Table alongside Caroline Larrivée, Scientific Program Director at Ouranos. INFC's Infrastructure and Environment Division is providing Secretariat support for the Advisory Table.

In establishing the Advisory Table **membership** (cf. Annex A), a diverse representation of sectors, voices, perspectives, and experiences were sought, along with collective multidisciplinary expertise and the overall ability of selected members to speak to current gaps, needs, issues, challenges, and priorities in relation to resilient infrastructure across Canada. Membership spanned a range of sectors, from experts in various levels of government and Indigenous organizations to the policy and research community, the private sector, and professional organizations. Membership also included a robust expertise-based Indigenous representation (3 members out of 19 identify as First Nations, in addition to a subject matter expert recommended by the Métis National Council). Of note, while there have been active efforts to recruit expert members from Northern/remote areas (e.g., Northwest Territories, Yukon, Nunavut) and the Prairies, with some limited success (e.g., one member leads construction for all housing in Indigenous communities in Northern Quebec), this has so far remained an area where stronger representation is desired; co-chairs and the INFC Secretariat have continued seeking expertise-based recommendations.

Development of the Resilient Natural and Built Infrastructure pillar of the NAS provides a crucial opportunity to catalyze national collaboration on climate-safe infrastructure priorities and support high-impact leadership at all levels to address the complex multi-jurisdictional challenges in this space.

2.1. Overview of the Advisory Table's work under Phase 1

The Advisory Table's **key deliverable** for Fall 2021 was to develop a proposed Transformational Goal for Resilient Natural and Built Infrastructure in Canada by 2050, as well as 3-5 Medium-term Objectives to help achieve this goal. This advice is expected to inform the overall National Adaptation Strategy by contributing to the framework that will shape subsequent actions, funding, and accountabilities.

In the lead-up to this milestone, four virtual **working sessions** were held between November 3 and December 17, each two-weeks apart to sustain momentum, whilst allowing the INFC Secretariat to prepare the subsequent working session, continually building on discussions to foster meaningful iterations and in-depth outcomes. Discussions were active and thoughtful, and reflected the breadth of participants' backgrounds, expertise, and perspectives. Advisory Members were also engaged between meetings (e.g., through ongoing contributions to a collaborative Jamboard tool, surveys, and e-mail input). Facilitation support provided by Stratos, along with the use of Chatham House Rules, fostered open and inclusive conversations.

The historic extreme events in British Columbia, including extreme heat, wildfires, and flooding, as well as the climate-driven severe weather events in Atlantic Canada that took place this year that continue to

disrupt services and affect infrastructure, were yet another reminder, acknowledged by Co-Chairs and Table Members together, that there is a **stronger-than-ever impetus** for robust and timely action to advance climate change adaptation and resilience in the infrastructure sector. These events further highlighted the necessity of advancing resilience in ways that reduce social and economic impacts from climate-driven natural disasters, in particular those that directly affect the most vulnerable⁷.

3. Proposed Transformational Goal and Medium-Term Objectives for Resilient Infrastructure in Canada

Below is the Advisory Table's advice with respect to potential core components of a NAS framework as it pertains to resilient infrastructure, as a foundation for upcoming stakeholder engagement. Importantly, while the Advisory Table reached a shared level of comfort with this framework, it does not imply endorsement of each component by individual Advisory Members and Co-Chairs (nor their respective organizations).

3.1. At-a-glance: Proposed framework for Resilient Natural and Built Infrastructure in Canada

Members envisioned that the NAS can meaningfully contribute to achieving resilient infrastructure systems by:

- Identifying and coordinating the roles and responsibilities of key players across jurisdictions and levels of governance;
- Setting measurable actions and a national expectation that all decision-makers incorporate adaptation into policy and across the infrastructure lifecycle, including planning, permitting, design, implementation, operations, maintenance, renovation, and rehabilitation;
- Identifying the levers and areas of influence that actors can use, including but not limited to codes, asset management, regulations, funding and funding requirements, and procurement;
- Defining needs and potential institutional arrangements for aggregating and disseminating knowledge, data and guidance;
- Expanding engagement to include new perspectives on infrastructure and infrastructure services, in particular different socio-cultural perspectives; and
- Linking to other national priorities, such as reconciliation, achieving net-zero, pandemic recovery and biodiversity and conservation efforts.

To support the NAS outcomes for resilient infrastructure, members recommended that the goal and objectives **be scoped** by:

- Starting with established framing, including technical, policy and legal, financial, socio-economic, and institutional aspects:
 - Incorporating intergovernmental collaboration;

⁷ The Speech from the Throne on November 23rd, 2021 highlighted that the development of Canada's first-ever National Adaptation Strategy would be part of the Government's work to "strengthen action to prevent and prepare for floods, wildfires, droughts, coastline erosion, and other extreme weather worsened by climate change."

- o Ensuring that we are considering more than the technical;
- o Linking adaptation to cultural and societal norms and changes in how we relate to our environments (e.g. pandemic-driven changes in infrastructure needs and decision-making); and
- o Integrating Indigenous Knowledge Systems.
- Identifying the current barriers that limit adaptation actions, including but not limited to intergovernmental and cross-jurisdictional impediments, lack of accessible climate data and lack of training for professionals.
- Framing the goal and objectives through an outcomes-focused lens, and differentiating between the means and the ends—with the objectives describing ends and outcomes, and the means to be addressed in the identification of actions in the next phase of NAS development.

In further refining the goal and objectives, members highlighted the importance of noting the overarching expectations included in resilient infrastructure. Throughout the workshop sessions, members discussed the definitions of infrastructure, infrastructure systems, infrastructure services, sustainable, resilient, and equitable. Consequently, by way of definition, it is assumed throughout this report that:

- Infrastructure includes new and existing assets, as well as grey, hybrid, and natural infrastructure. In the context of the work of this Advisory Table, it did not encompass human or social infrastructure.
- The use of the term “Indigenous” acknowledges and recognizes the distinctions-based identification of First Nations, Métis Nation, Inuit, and urban and off-reserve communities, and the diversity of cultures, languages, needs, economies, and assets across communities.
- Climate change resilience is dynamic and includes evolving knowledge, influences and future-oriented data, with regular re-assessment.
- Sustainable includes secure and equitable, and evolves with changing context and conditions.
- The overarching approach is systems-based and recognizes the interdependencies, interconnectivity, and cascading impacts to infrastructure services.
- Solutions will address the root causes of climate change vulnerability and prioritize marginalized populations for shared benefits, opportunities, and resources.

A one-page overview of the proposed Transformational Goal and Medium-Term Objectives is provided on the next page. The goal and objectives were developed by the Advisory Table as potential foundations for a NAS framework for Resilient Natural and Built Infrastructure in Canada.

Proposed Transformational Goal for Resilient Natural and Built Infrastructure in Canada

By 2050, infrastructure systems in Canada are climate resilient and continue to intentionally be adapted to a changing climate to deliver reliable, equitable, and sustainable services to all of society, including First Nations, Métis Nation, Inuit, and urban and off-reserve Indigenous peoples.

Proposed Medium-Term Objectives supporting the achievement of this Goal



Technical. By 2030, technical standards have been raised for easier adoption and climate change resilience is skillfully embedded in all decisions to locate, plan, design, manage, adapt, operate, and maintain infrastructure systems across their lifecycle.



Financial. By 2030, a robust investment framework is in place to purposefully guide the allocation of sufficient public and private funds towards low-carbon climate-resilient infrastructure, maximizing the long-term benefits of infrastructure investments.



Policy & Legal. By 2030, all levels of government utilize a coherent and integrated, community-informed policy and regulatory framework to drive resilience in public and private infrastructure decision-making.



Socio-Economic. By 2030, climate-resilient infrastructure systems support the health and well-being in communities and secure economies, with a particular emphasis on prioritizing benefits and eliminating funding gaps for marginalized populations and those in high-risk areas.



Governance & Institutional. By 2030, there are clear and coordinated responsibilities within and between jurisdictions, including with Indigenous communities, to effectively and cooperatively implement climate adaptation best practices and solutions that account for the unique needs and context across the country.

As part of Phase 2 (Winter-Spring 2022), and to complement the range of stakeholder engagement, the Advisory Table will work to identify **short-term actions** and **associated performance indicators** that measure progress and success in achieving the goal and objectives. Phase 2 also includes **defining the key concepts**, details of which are noted throughout section 3.2 and 3.3.

3.2. Spotlight on the proposed Transformational Goal

The Transformational goal is expected to be inspirational, ambitious, and achievable. As such, it is intended to establish a shared vision, inclusive of many perspectives and views, and instill hope for an ideal long-term future while being grounded in a view of what is possible to attain, helping to answer the following questions:

- What does a resilient future for Canada look like with respect to natural and built infrastructure?
- Where do we need to go?
- What general outcomes should the National Adaptation Strategy advance by 2050 with regards to infrastructure resilience?

At the outset of its work, the Advisory Table identified the following **core desired outcomes** for a NAS as it pertains to infrastructure resiliency:

- Resilience is systemic with infrastructure supporting social, economic, and environmental systems with services that are reliable and create resiliency locally, regionally and nationally.
- Climate data and risk information for the present and future is easily understood and accessible, with codes and standards including climate resiliency requirements to support the rehabilitation of existing or design of new infrastructure systems.
- We no longer refer to “resilient” infrastructure as it is mainstream, with integrated decision-making at all levels of governance, across all stakeholders, and across levers (e.g., policies, legislative, regulatory, financial).
- Resilient infrastructure is diverse based on local geography, community, and economic needs, and places an emphasis on the needs of vulnerable populations, with equity as a central consideration.

Throughout the working sessions, the Table identified key elements that should underpin a transformational goal to help achieve these outcomes, while strongly advocating for the use of clear and plain-language statements that would resonate both with decision-makers and Canadians more generally. The Table acknowledged that further context would need to be provided in the NAS with regards to the underlying assumptions and definitions embedded as part of these statements.

Based on advice received through Phase 1, the **proposed Transformational Goal** for resilient infrastructure is:

By 2050, infrastructure systems in Canada are climate resilient and continue to intentionally be adapted to a changing climate to deliver reliable, equitable, and sustainable services to all of society, including First Nations, Métis Nation, Inuit, and urban and off-reserve Indigenous peoples.

In the context of this goal:

- **Infrastructure systems** are defined as sets of built and nature-based infrastructure assets that together deliver key services, and which share vulnerabilities and interdependencies within the built environment and with the natural systems that support it.
- Infrastructure systems may cut across multiple scales, from jurisdictions to ecosystems to watersheds, and beyond, including transboundary.

- A **changing climate** includes increases in both shocks such as extreme weather events, and stresses from slow-onset impacts.
- **Reliable** services refer to services that are not significantly disrupted in the face of climate-driven impacts, with all partners, stakeholders and the community being confident in the predictability and security of service delivery in the wake of increasingly volatile climate conditions.
- **Equitable** refers to an equity-based approach to decision-making and outcomes, with a particular emphasis on prioritizing benefits for marginalized populations and those in high-risk areas.
- **Sustainable** services preserve or enhance the social, economic and ecological processes required to maintain resilient social and natural systems in an evolving context, including in a manner that:
 - fairly and equitably meets the specific needs of all communities, including those whose infrastructure is most at-risk from climate-driven impacts (e.g., Northern, coastal, remote), and who have historically been marginalized (e.g., Indigenous, low-income); and
 - is aligned with transitioning to low-carbon infrastructure services as an opportunity for climate risk mitigation and innovation.
- **Infrastructure services** include provision and support for health care, utilities, water and wastewater, telecommunications, emergency services, trade and transportation routes, power (among others).

3.3. Spotlight on the proposed Medium-Term Objectives

Medium-term objectives are expected to outline concrete, measurable and specific milestones within a 5 to 10-year timeframe that are necessary to make progress towards the Transformational Goal and would form a basis for a set of shorter-term actions. They were intended to help to answer the following questions:

- How will we achieve the Transformational Goal with regards to infrastructure resilience?
- What elements or key focus areas must we consider?
- What stages or landmark achievements are necessary building blocks to reach the Transformational Goal?
- What progress should we see in 5-10 years?

During the first working session of the Advisory Table, it was agreed that increasing the climate resilience of infrastructure typically involves a combination of responses focusing on:

1. **Technical aspects** (e.g., use of future-looking data, standardized climate risk assessments, protocols, qualifications, nature-based solutions, research, and innovation).
2. **Financial aspects** (e.g., applying a climate lens to inform and prioritize investments, climate-related financial disclosure of risk to operations and maintenance, and adequate and sustainable investment including in low-carbon technology, research and development).
3. **Policy & legal aspects** (e.g., new construction standards and updated codes, updates to regulations to facilitate the uptake of low-carbon climate resilient infrastructure, mainstreaming climate-resilient decision-making).
4. **Socio-economic aspects** (e.g., equity-informed approach to considering differential and intersectional impacts of climate hazards on infrastructure; change in behavioural patterns).

associated with the use of infrastructure; empowering communities; learning from community input, particularly Indigenous Knowledge).

5. Governance & Institutional aspects (e.g., awareness raising and capacity building for the infrastructure sector with respect to climate adaptation).

These areas were used as thematic starting points in developing a set of medium-term objectives that would support the achievement of the overarching transformational goal.

3.3.1. Technical

The Advisory Table identified that a desired technical outcome for a NAS as it pertains to infrastructure resilience should be that: By 2030, skilled decision-makers and practitioners systematically leverage robust and relevant information and data about climate-related risks to infrastructure systems and the services they provide; decision-makers consider leading technical options (including new technologies) to increase resiliency to a changing climate at all key stages of the lifecycle of infrastructure systems, including through nature-based solutions; building back better should be a key consideration when recovering from climate-driven disasters.

As such, and based on advice received through Phase 1, the proposed plain language **Technical Medium-Term Objective** for resilient infrastructure is:

By 2030, technical standards have been raised for easier adoption and climate change resilience is skillfully embedded in all decisions to locate, plan, design, manage, adapt, operate, and maintain infrastructure systems across their lifecycle.

In the context of this goal:

- **Skillfully** means that robust information, training, technical options and data about changing climate-related risks to infrastructure systems are developed and leveraged purposefully and aptly (e.g., different approaches for interpreting and using the data, as needed in a changing context) to increase resilience at all key stages of the lifecycle of nature-based and built infrastructure systems.

Illustrative examples of potential short-term actions that have been identified by the Advisory Table in support of this objective, and in advance of Phase 2 work include:

- Developing and making available robust and accurate climate data.
- Updating key hazard-related maps, such as floodplain or wildland fire maps, and making them accessible publicly.
- Prioritizing the adaptation of infrastructure depending on available resources.
- Assessing infrastructure risks in ways that account for interdependencies, and consider performance under multiple emissions scenarios.
- Standardizing and regulating assessments of infrastructure for adaptation and climate change (similar to how Phase 1 Environmental Site Assessments (ESAs) have become standardized and regulated, fostering an industry of qualified practitioners).
- Making low-carbon technologies accessible in terms of price and regulation.

3.3.2. Financial

The Advisory Table identified that a desired financial outcome for a NAS as it pertains to infrastructure resilience should be that by 2030, a shared resilient infrastructure investment framework, supported by strong disclosure and transparency practices, is in place at all levels of governance, supporting a low-carbon economy and directing adequate and sustainable public and private investment towards developing, maintaining, and operating climate-ready infrastructure, as well as moving away from investments that detract from or do not build resilience, when necessary.

As such, and based on advice received through Phase 1, the proposed plain language for the **Financial Medium-Term Objective** for resilient infrastructure is:

By 2030, a robust investment framework is in place to purposefully guide the allocation of sufficient public and private funds towards low-carbon climate-resilient infrastructure, maximizing the long-term benefits of infrastructure investments.

In the context of this goal:

- **Robust** includes support by strong disclosure and transparency practices, as well as implementation at all levels of governance accompanied by the direction of adequate and sustainable public and private investment.
- **Purposefully** means strategically aligned with intended low-carbon climate-resiliency and associated outcomes (environmental, social/equity and economic co-benefits).
 - This also refers to investment decisions explicitly considering where reduced or discontinued investment may optimize resilience outcomes as it pertains to the balance between investing in high-risk areas and no longer investing in infrastructure systems where resiliency in a changing climate is not achievable (e.g., rebuilding in high-risk floodplains; or investing in port facilities where access roads are at high-risk of climate events).
- **Sufficient** means adequate and sustainable funding across all stages of the infrastructure lifecycle, from planning to operation and maintenance, etc.
- **Low-carbon resilience** refers to the “the strategic and systematic integration of plans and actions to reduce greenhouse gas emissions and manage climate risks in planning, design and operations”⁸.
- **Benefits** include non-monetary benefits, such as social, economic, health, environmental, and cultural benefits.

Illustrative examples of potential short-term actions that have been identified by the Advisory Table in support of this objective, and in advance of Phase 2 work include:

- Strategically prioritizing investments by targeting the most critical and essential services as well as the groups most at risk;
- Developing and implementing physical risk disclosure requirements for institutional investors and publicly traded companies;

⁸ From the [Climate Resilience Guidelines for BC Health Facility Planning & Design](#) (2020).

- Assessing the long-term costs⁹ of maintaining public infrastructure level of service and of adapting, and building these into long-term infrastructure budgets (similar to what Ontario FAO released in December 2021); and
- Developing criteria for all infrastructure receiving public funding so that it is not only resilient and low-carbon in itself but contributes to broader community/regional/national resilience (e.g., supply chain and logistics systems, technology systems, utilities, communications systems, etc.).

3.3.3. Policy & Legal

The Advisory Table identified that a desired policy & legal outcome for a NAS as it pertains to infrastructure resilience should be that by 2030, a coherent policy framework for infrastructure resilience is integrated across all levels of government in Canada that supports coherence and flexibility between policies and regulations, public and private investments and capacity-building across the infrastructure system lifecycle, mandating climate change-informed and inclusive decision-making, and regularly being assessed and updated to act on evolving knowledge, technology, innovation, science, and community informed approaches.

As such, and based on advice received through Phase 1, the proposed plain language **Policy & Legal Medium-Term Objective** for resilient infrastructure is:

By 2030, all levels of government utilize a coherent and integrated, community-informed policy and regulatory framework to drive resilience in public and private infrastructure decision-making.

In the context of this goal:

- **Coherent** refers to a harmonized set of principles, actions and timelines that together form a robust and integrated path to infrastructure resilience.
- **Policy and regulatory framework** includes the set of principles and policy instruments, including but not limited to regulations, codes and standards, that mandate and support specific directions for action.
- **Government** includes federal, provincial and territorial, Indigenous, and regional and local municipal jurisdictions.

Illustrative examples of potential short-term actions that have been identified by the Advisory Table in support of this objective, and in advance of Phase 2 work include:

- Updating codes and standards to fully reflect low-carbon climate resilience considerations and promote their uptake and adoption across jurisdictions.
- Completing a gap analysis of existing policy framework (or pieces thereof) in Canada.
- Creating and maintaining a directory of existing national standards and resources related to climate adaptation.

3.3.4. Socio-Economic

⁹ In this context, the lifecycle cost of infrastructure is understood as the cost to design, build, operate, maintain/renew and dispose of the infrastructure.

The Advisory Table identified that a desired socio-economic outcome for a NAS as it pertains to infrastructure resilience should be that by 2030, infrastructure systems and investments continue to support resilient social systems (e.g., increasing health and well-being in communities), with criteria that prioritize solutions for marginalized populations, including Indigenous communities, and communities most at-risk. Infrastructure would also be expected to protect businesses and economic sectors by securing supply chains and business continuity in the face of a more volatile climate and decarbonization efforts.

As such, and based on advice received through Phase 1, the proposed plain language for the **Socio-Economic Medium-Term Objective** for resilient infrastructure is:

By 2030, climate-resilient infrastructure systems support the health and well-being in communities and secure economies, with a particular emphasis on prioritizing benefits and eliminating funding gaps for marginalized populations and those in high-risk areas.

In the context of this goal (and in a preliminary manner – more robust definitions to be developed):

- **Health and well-being** includes physical and psychological health and well-being, while also encompassing broader social determinants of health and resiliency (such as education, neighbourhood, environment, income, etc.) (refer to the Health and Well-being Advisory Table report for further details).
- **Communities** is understood more broadly as social systems.
- **Strong and resilient economies** include securing supply chains and business continuity across all sectors in the face of an increasingly volatile climate (refer to the Strong and Resilient Economy Advisory Table report for further details).
- **Marginalized populations** refer to groups of the population which have historically been, or remain, structurally disadvantaged and/or more vulnerable to climate-related hazards within Canadian society, including First Nations, the Métis Nation, Inuit, and off reserve and urban Indigenous communities, racialized communities and low-income populations.
- **High-risk areas** refer to geographic areas and communities most at-risk of being adversely and disproportionately impacted by climate-driven impacts.

Illustrative examples of potential short-term actions that have been identified by the Advisory Table in support of this objective, and in advance of Phase 2 work include:

- Mapping of communities most at-risk and/or marginalized (from a resilient infrastructure standpoint);
- Establishing criteria to prioritize solutions for marginalized populations; and
- Mapping of high risk infrastructure critical to supply chains.

3.3.5. Governance & Institutional

The Advisory Table identified that a desired governance & institutional outcome for a NAS as it pertains to infrastructure resilience should be that by 2030, there is strong alignment within and between jurisdictions, including clear responsibilities, that fosters a strategic, systems-based and inclusive approach to infrastructure resilience. It would be expected that through adequate support, such a framework would enable and leverage key players' areas of influence, including local governments and Indigenous communities, to effectively implement climate adaptation solutions and best practices that account for unique needs and contexts across the country.

As such, and based on advice received through Phase 1, the proposed plain language **Governance & Institutional Medium-Term Objective** for resilient infrastructure is:

By 2030, there are clear and coordinated responsibilities within and between jurisdictions, including with Indigenous communities, to effectively and cooperatively implement climate adaptation best practices and solutions that account for the unique needs and context across the country.

In the context of this goal:

- **Responsibilities** include both formal authorities and contextual leadership and innovation.
- **Effectively** means fostering a strategic, systems-based and inclusive approach to infrastructure resilience.
- **Cooperatively** refers to positively enabling and leveraging each key players' areas of influence (including local governments and Indigenous communities) in ways that deliver the best resiliency outcomes, in a coordinated manner that accounts for vulnerabilities and interdependencies that cut across different jurisdictions, interests, and systems, and deliver co-benefits.
- **Jurisdictions and communities** include federal, provincial and territorial, regional and local governments, as well as First Nations, the Métis Nation, Inuit, and off reserve and urban Indigenous communities.

Illustrative examples of potential short-term actions that have been identified by the Advisory Table in support of this objective, and in advance of Phase 2 work include:

- Embedding coordination and collaboration across and between different orders of government as a factor in the allocation of public funding.
- Clarifying how infrastructure development impacts the environment, including defining interdependencies with nature-based infrastructure and natural processes, and putting forward actions that take them into account.

3.4. A note on potential cross-Tables linkages

Of note, there are overlapping interests and complementary work across the five Advisory Tables that will support and accelerate adaptation. It is the intent that the NAS will reflect coordination and alignment across these five pillars that together represent social, economic, environmental, and political systems in Canada.

Meaningful **cross-table integration** is planned in preparation for Phase 2 of the development of the NAS (Winter-Spring 2022). Specifically, the intent is that the Co-Chairs for all five NAS Advisory Tables, supported by their respective NAS Secretariat, will advance the identification of cross-table linkages as well as opportunities for further advancing integration across all NAS pillars. Some linkages are already expected with the following Advisory Tables / Pillars, such as possibly:

- *Thriving Natural Environment*: nature-based solutions, restored nature-based infrastructure systems;

- *Health and Well-Being*: supporting healthy communities, emphasis on marginalized populations and those most at-risk;
- *Strong and Resilient Economy*: resilience-building funding framework for public and private investment, supporting secure economies (including supply chain and business continuity); and
- *Disaster Resilience and Security*: Cross-jurisdictional alignment and leadership (e.g., flood mapping efforts), considerations of when forced to triage/prioritize essential infrastructure and services.

4. Next steps and Considerations

As part of Phase 2, and to complement a range of stakeholder engagements, the Advisory Table will work to identify potential **short-term actions** and **associated performance indicators** to best measure progress and success in achieving these objectives and its overarching goal.

Phase 2 will also include **defining key concepts** underlying the various objectives, details of which are noted throughout sections 3.2 and 3.3.

Annex A – Membership of the NAS Advisory Table on Resilient Natural and Built Infrastructure (as of December 20, 2021)

Co-Chairs

- **Tim Angus**, Director General, Strategic & Sectoral Policy - Infrastructure Canada
- **Caroline Larrivée**, Scientific Program Director - Ouranos

Provinces, Territories, Regional, Municipal Governments, National Indigenous Organizations

- **Andres Filella**, Manager, Climate Leadership - Metis Nation of Alberta
- **Anton Pojasok**, Vice-President, Environmental Management – Infrastructure Ontario
[Regular Alternate: Alice Dixon, Energy Specialist – Infrastructure Ontario]
- **Chris Arthurs**, General Manager, People, Innovation & Collaboration Services and City Resilience Officer – City of Calgary
[Regular Alternate: Dick Ebersohn, Manager of Climate Change and Environment - City of Calgary]
- **Irving Leblanc**, Director, Infrastructure - Assembly of First Nations
- **Sara Jane O’Neil**, Policy Advisor, Policy & Public Affairs - Federation of Canadian Municipalities
- **Elmer Lickers**, Senior Operations & Maintenance Advisor, Ontario First Nations Technical Services Corporation

Policy and Research Community

- **Dan Sandink**, Director, Research - Institute for Catastrophic Loss Reduction
- **Joanna Eyquem**, Managing Director, Climate-Resilient Infrastructure - Intact Centre on Climate Adaptation, University of Waterloo
- **Mike Puddister**, Director on the Board - Municipal Natural Assets Initiative
- **Paige Olmsted**, Senior Research Associate - Smart Prosperity Institute
- **Ryan Ness**, Director, Adaptation Research - Canadian Institute for Climate Choices
- **Serge Dupuis**, Assistant Professor, Civil Engineering - Université de Moncton

Private Sector

- **Chad Park**, Vice-President, Sustainability and Citizenship – The Co-operators Group
- [Regular Alternate: Tom Ewart, Manager, Sustainability and Citizenship – The Co-operators Group]
- **Elise Paré**, National Practice Lead, Climate Risk and Resilience - WSP in Canada
- **Jay Wilson**, Director, Generation and Stewardship - Canadian Electricity Association
- **Maxime Ladouceur**, General Manager, Kautaq Construction (Makivik)

Professional Groups

- **Daisy Foster**, Managing Director – Atlantic Infrastructure Management Network
- **Grant Fahlgren**, Chair, Reconciliation Advisory Committee – Canadian Society of Landscape Architects
- **Hiran Sandanayake**, Chair, Climate Change Committee - Canadian Water & Wastewater Association (and Senior Engineer, Water Resources at City of Ottawa)
[Regular Alternate: Amy Winchester, Vice-Chair, Climate Change Committee – CWWA (and Senior Chemical Engineer, CBCL Limited)]

Annex B – Summary of Working Sessions

Working Session 1 – November 3, 2021

- Meeting objectives were to create a shared understanding of the NAS and the scope and mandate of the Advisory Table; and to gather initial thoughts and take stock of desired outcomes to begin crafting the aspirational goal.
- While members agreed on the proposed mandate and scope, the following key points were conveyed:
 - Infrastructure, and moreover climate-resilient infrastructure should be defined, as part of the NAS work, in a way that expands beyond a traditional focus on the type of infrastructure that we already have (e.g., standalone buildings/assets, waste-water systems).
 - Thinking in terms of infrastructure systems or services rendered would moreover open the door to considering natural infrastructure (and ecosystem services) on the same level as grey infrastructure, as well as the cascading impacts and interdependencies.
 - There definitely is the potential for a NAS to help identify interactions between infrastructure systems and cross-jurisdictional action, to ensure coherence in actions that are implemented, leverage co-benefits, strengthen the linkages, share expertise and lessons learned, and align interests; subsequent meetings should help to unpack these expectations and translate them into actionable objectives and areas for action.

Working Session 2 – November 17, 2021

- Meeting objectives were to gain some consensus over a long-term, shared aspirational/transformational goal in achieving climate-resilient infrastructure systems and services by 2050, and to gather initial thoughts on potential medium-term objectives, over a 5-10 years horizon, in achieving this goal.
- To help kickstart the conversation, the INFC Secretariat for the NAS Advisory Table on Resilient Infrastructure had drafted the following preliminary transformational goal (along with medium-term objectives) based on the input received during the first working session:

By 2050, resilient infrastructure systems are systematically designed, developed and operated with long-term considerations of future [local and global] climate conditions, the interdependencies and potential cascading impacts, and in ways that preserve, enhance and/or rethink the equitable delivery of key infrastructure services to Canadian communities and economy in the face of a changing climate.
- While we had fruitful conversations, we heard that more work needs to be done on landing a robust transformational goal and medium-term objectives that would, for example, be shorter and more inspirational; clearly refer to both natural and built infrastructure; better convey the flexibility that will be needed in a largely uncertain/non-linear context; and point to clear, measurable outcomes.

Working Session 3 – December 3, 2021

- Meeting objectives were to review and refine the Transformational Goal, as well as the concrete and specific Medium Term Objectives necessary to make progress towards the Transformational Goal.
- The goal and objectives were updated to reflect feedback and language proposed by members in Meeting #2. To support the continued refinement of the goal and objectives, the Advisory Table completed a “Keep, Add, Delete, and Change” exercise for the goal and each objective, with members contributing expertise and recommendations to strengthen the content.
- There was general comfort with the updated goal and objectives. Overarching comments included:
 - Continue to refine and simplify statements.
 - Incorporate action-orientated language that is intentional.
 - Define the key vocabulary and set assumptions.
 - Expand on Indigenous to recognize the distinctions of First Nations, Metis Nation, Inuit, and urban and off-reserve communities to capture the diversity of needs, priorities, cultures, and assets.
- Following Meeting #3, the INFC Secretariat circulated a survey, which included further updated material to capture ideas from Meeting #3 and allowed members to provide input on their level of comfort as well as any additional comments on what they would like to see reflected. Survey results included some specific content for each theme with overarching advice to shorten and reduce jargon.

Working Session 4 – December 17, 2021

- Meeting objectives were to finalize the Transformational Goal and Medium-term Objectives, validate key elements of the draft Advisory Table Report, and explain next steps for engagement.
- Opening remarks were offered by Infrastructure Canada’s Assistant Deputy Minister (Policy & Results) at the outset of the meeting, outlining the importance and value of the work of the Advisory Table in providing actionable and forward-looking advice, which generated a short, substantive exchange on key needs and opportunities.
- Prior to the meeting, the Secretariat had further updated the goal and objectives based on survey results. Discussions sought to seek agreement on the goal, as well as the Technical and Financial objectives as they presented the most variance in agreement in the survey. While the focus of discussion was on the goal and objectives that required further discussion, plenary reviewed the other objectives too.
- Members provided comments to strengthen content, with key messages being to use plain language and shorten. The consensus confirmed that the core components were there but needed to be further refined to increase readability and reduce redundancies across the thematic areas and the other Advisory Tables.