

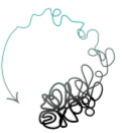


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## ECONOMIC DEVELOPMENT & CLIMATE CHANGE

Connecting the Dots within the Newfoundland and Labrador Context

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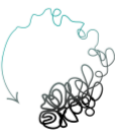
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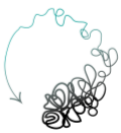


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## TABLE OF CONTENTS

INTRODUCTION	1
CLIMATE CHANGE PROJECTIONS FOR NL	1
CASCADING CLIMATE IMPACTS	2
RISK ASSESSMENT	3
OPPORTUNITIES	5
APPLYING TO THE NL CONTEXT	6
DECISION-MAKING PROCESS	9
SUPPORTING LITERATURE	10



## INTRODUCTION

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The economy of Newfoundland and Labrador (NL) and the lifestyle of its residents have always been deeply connected to the land and ocean, and the natural resources that abound from them. From agriculture and fisheries, mining and energy generation, to tourism, the arts, and the activities of everyday life, we have built systems and narratives that rely on a stable climate and healthy ecosystems to function optimally. The reality is that we have entered a period of climate instability and what has worked for us in the past is now experiencing vulnerability and strain. Climate change is actively shifting our baseline and we must reframe our decision-making accordingly. We must consider more factors, ask ourselves new questions, and look further ahead than we may have before. Incomplete analysis and short-sightedness at this point in history may not only lead to poor investment outcomes, but even risk to life.

This document aims to illustrate the connections between climate change and economic development in NL so that we can move forward in a way that minimizes risk and maximizes benefits for all.

## CLIMATE CHANGE PROJECTIONS FOR NL

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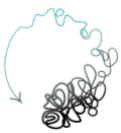
It is well established that the climate is changing, manifest in shifting patterns of temperature and precipitation that lead to extreme weather events and ecosystem changes. In NL, the general trend is **warmer, wetter, and stormier**, with specific changes in temperature and precipitation ranging from nominal to completely altered depending on the specific location in the province. For example, Northern Labrador has already experienced and is facing considerably greater temperature increases than the Avalon Peninsula of Newfoundland.

Detailed climate information related to any particular location can be found on [Climatedata.ca](https://climatedata.ca). Supported by the Canadian Centre for Climate Services of Environment and Climate Change Canada, this website is an accessible and trustworthy source of temperature and precipitation projections in Canada considering different GHG emission scenarios.

The changes in baseline temperature and precipitation are **increasing the frequency and intensity of extreme weather events** such as storms (precipitation and wind events), heat waves, and drought. Each of these have cascading impacts on communities, businesses, and ecosystems which will be explored herein.

Given the immense amount of infrastructure along the coasts of NL and the cultural and economic significance of the ocean, **sea level rise** is of particular concern. A significant amount of sea level rise is expected regardless of emission scenario – even if the world stopped emitting GHGs today, sea level will continue to rise for many hundreds of years because of the changes that have occurred to date.

ClimateData.ca features a tool for assessing sea level rise across Canada. An additional resource is [Climate Central's Coastal Risk Screening Tool](#) which provides further visualization at the local level.

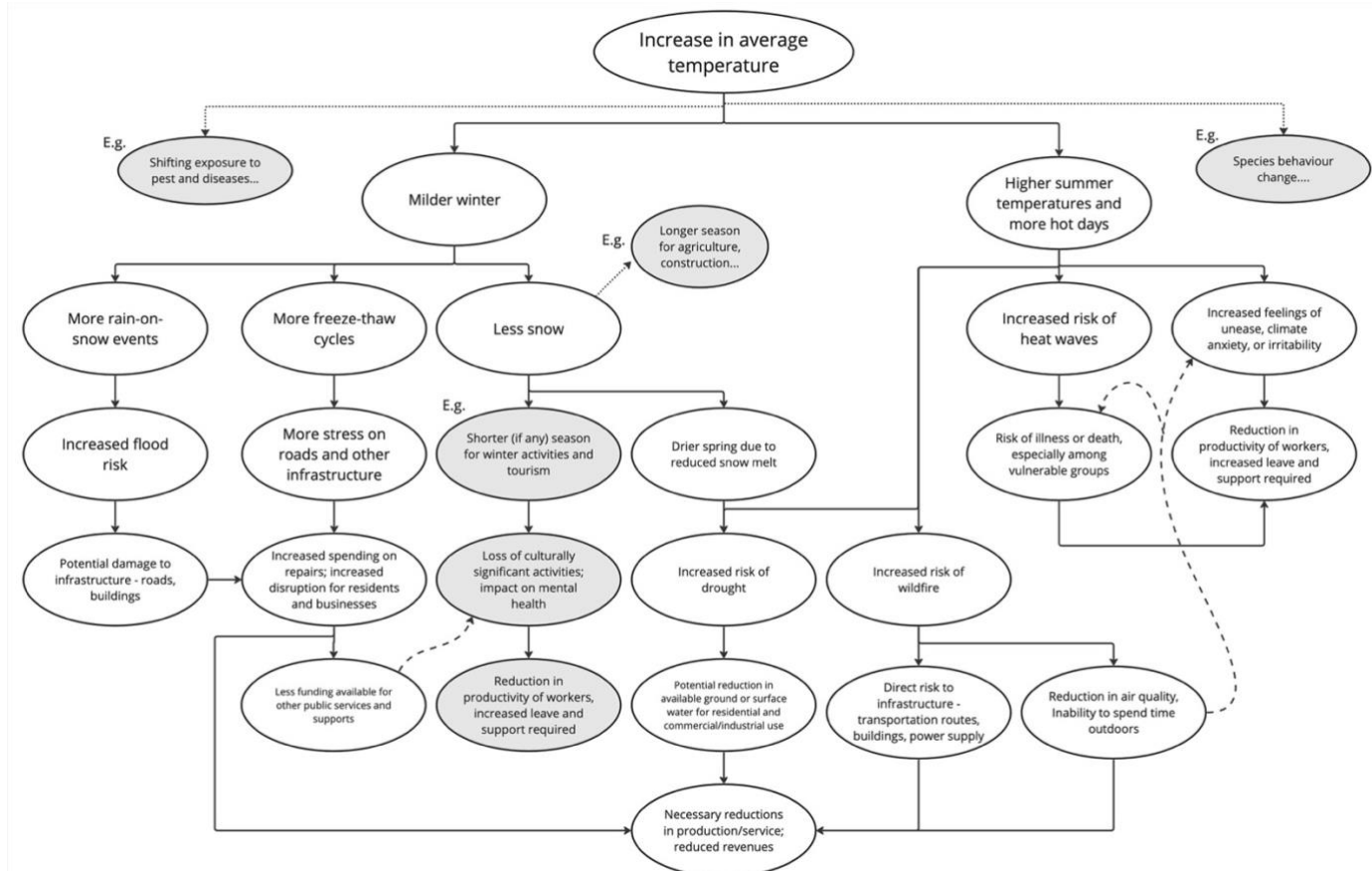


On top of sea level rise, there is evidence of an increase in the frequency and magnitude of **hurricanes** and they are shifting further north in the Atlantic Ocean. As demonstrated by Hurricane Fiona in September 2022, this pattern puts NL at greater risk of **storm surges** which can be devastating.

## CASCADING CLIMATE IMPACTS

Even seemingly small changes in climate can have cascading and compounding impacts. The following flow chart illustrates this using an increase in average temperature as an example. While some impacts are relatively universal across sectors, there are others that may be very sector-specific. The grey ovals show some example impacts that may be relevant to certain industries but not others. A particular climate impact may be beneficial to one industry but detrimental to another.

As shown, this type of impact mapping exercise can quickly become complex and can go in many directions – the example included here is by no means exhaustive. While it is not always necessary to create a physical map such as this, it is this type of systems-thinking that has value for integrating climate conscious decision metrics into decision-making today. We must interpret the available climate data considering the unique context of each industry, proposed project, etc. By going through this process, we identify important risks and opportunities that we may otherwise have missed.





# RISK ASSESSMENT

Risk assessment and risk management are not new concepts in business and economic development planning. Incorporating climate risks consistently into risk management is necessary for the public and private sectors in NL, given the greatest risks we now face.

In their [2024 Global Risks Report](#), the World Economic Forum identifies the top four global risks over the next 10 years as directly connected to climate change:

- 1<sup>st</sup> Extreme Weather Events
- 2<sup>nd</sup> Critical Change to Earth Systems
- 3<sup>rd</sup> Biodiversity Loss and Ecosystem Collapse
- 4<sup>th</sup> Natural Resource Shortages

Extreme weather events are what come to mind first for most when they think about climate risks. Risks related to collapsing earth systems and biodiversity loss are more difficult to conceptualize and could have impacts beyond what we can even imagine. Natural resource industries in particular face a significant amount of uncertainty given our current trajectory.

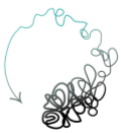
Some climate risks are more severe than others, and some have indirect rather than direct impacts on an operation. As shown in the flow chart above, a wildfire or flood can pose a direct physical threat to an industry’s infrastructure, but these events also have wide-reaching impacts on the community. If key roads become impassable, supply chains may be disrupted and staff or customers may not be able to reach facilities. If residences or public buildings are impacted, or air or water quality deteriorates, a community could find themselves in crisis which may completely disrupt business as usual. Destruction of an ecosystem could endanger the supply of critical feedstocks. Perhaps the immediate location of a company’s operations is not at risk, but a key supplier or customer is.

While it is impossible to determine the precise likelihood of any one event or impact occurring, a key component of responsible decision-making is determining an organization’s tolerance to these risks, especially where public or employee safety is involved.

To illustrate, let’s look at two examples:

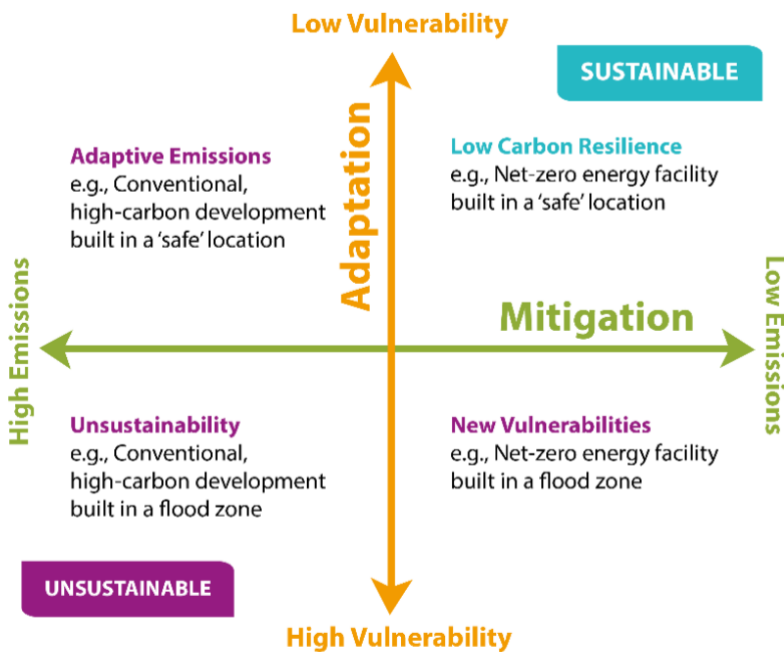
A coastal walking trail – in determining whether to proceed with such a project, a community may consider how frequently the trail may be used by residents, how much tourism it could bring to the area, how much it will cost to construct, if the path can avoid ecologically sensitive areas, etc. However,

VULNERABILITY ASSESSMENT					
CONSEQUENCE (How serious?)	CATASTROPHIC	UNLIKELY / RARELY	PROBABLE / OCCASIONALLY	LIKELY / REGULARLY	ALMOST CERTAIN / FREQUENTLY
	MAJOR	UNLIKELY / RARELY	PROBABLE / OCCASIONALLY	LIKELY / REGULARLY	ALMOST CERTAIN / FREQUENTLY
	MODERATE	UNLIKELY / RARELY	PROBABLE / OCCASIONALLY	LIKELY / REGULARLY	ALMOST CERTAIN / FREQUENTLY
	MINOR	UNLIKELY / RARELY	PROBABLE / OCCASIONALLY	LIKELY / REGULARLY	ALMOST CERTAIN / FREQUENTLY
		PROBABILITY (How likely?)			



if the elevation of this walking trail is within just a meter or two of sea level, it is nearly guaranteed to be inundated at some point in the not-too-distant future, either by a storm surge event or simply by the anticipated rise in baseline sea level over time. Coastal events could result in frequent, costly repairs or complete destruction of the trail. Facing this level of risk, the other potential benefits of the project may be deemed irrelevant.

Coastal flooding and erosion due to sea level rise and storm surges are risks that are very difficult and costly to mitigate effectively. As described by the trail example, the consequence of such impacts could be moderate or they could be catastrophic. This potential for severe consequences along with very high probability of occurrence is the reason why climate experts are advocating for managed retreat from coastlines. In the absence of strong coastal setback regulations by local governments, investors are often left to determine coastal risk on a project-basis. Lack of understanding or failure to accept the climate projections can result in putting new infrastructure in vulnerable places and ultimately wasting public or private funds.



New construction of a net-zero commercial building – a company may have the best “green” intentions by proposing a highly energy efficient facility with on-site renewable energy generation, but the proposed building site is as important as it’s carbon footprint. If located in a flood plain, for example, there is risk of the building being unable to obtain insurance, of significant and/or recurring damage during precipitation events, or emergency access risks due to flooding of surrounding roads. In this situation, robust on-site stormwater management may or may not be able to mitigate the risk sufficiently to justify the investment

– the specific circumstances must be investigated closely to determine levels of probability and consequence for difference scenarios and a decision must be made regarding the organization’s and/or funder’s tolerable level of risk.

The above diagram summarizes the direction we need to go in. In order to achieve true sustainability both environmentally and financially, we must prioritize both climate change mitigation (eliminating GHG emissions) and adaptation (preparing for climate change impacts). This is often called *Low Carbon Resilience*.



Both the “probability vs. consequence” and “low carbon resilience” frameworks can and should be applied to every public and private investment decision. While the focus of this document so far has been on addressing climate projections, those projections are directly related to our GHG emissions and therefore our decisions surrounding energy, materials, and land use, each of which are becoming subject to increasing levels of regulation. The more we reduce emissions, the more we reduce the risks to our assets and systems and the less we have to spend later in adaptation measures, repairs, retrofits, or even fines. By being proactive instead of reactive when it comes to climate change, we can future-proof and de-risk our investments.

## OPPORTUNITIES

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From the perspective of individual business owners and investors, there is significant value in exercising conscientiousness around climate factors:

**Operational Resilience & Risk Management:** As discussed, climate change poses significant risks to businesses, including extreme weather events, supply chain disruptions, resource scarcity, and regulatory changes. By taking steps to reduce their carbon footprint and transition to more sustainable practices, businesses can mitigate these risks and protect their operations and assets.

**Brand Reputation:** Consumers are increasingly concerned about sustainability and climate change, and are more likely to support companies that are taking action to address these issues. By demonstrating a commitment to climate mitigation and adaptation, businesses can enhance their brand reputation and attract environmentally conscious customers.

**Cost Savings:** Implementing energy efficiency measures, transitioning to renewable energy sources, reducing waste, and addressing climate vulnerabilities can all lead to cost savings for businesses in the long run. By investing in climate initiatives, businesses can reduce their operational expenses and improve their bottom line.

**Regulatory Compliance:** Governments around the world are implementing regulations and policies to reduce greenhouse gas emissions and adapt to climate change. By proactively addressing these requirements, businesses can avoid potential penalties and fines, as well as stay ahead of changing regulatory landscape.

**Access to New Markets and Opportunities:** As the global economy shifts towards sustainability and renewable energy, businesses that are leading the way in climate mitigation will have a competitive advantage. By embracing clean technologies and sustainable practices, businesses can position themselves for growth and access new markets and business opportunities.





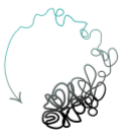
**Insurance and Financing:** Insurers and investors are increasingly considering climate risks when assessing the financial health and viability of businesses. Businesses that can demonstrate robust climate adaptation strategies are more likely to secure favorable insurance rates and financing terms. Projects that proceed in areas that are clearly vulnerable to climate impacts may be denied insurance altogether.

**Staff Morale and Productivity:** Employees are increasingly looking to work for companies that prioritize sustainability and social responsibility. Addressing climate change can improve employee morale, engagement, and productivity.

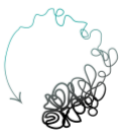
## APPLYING TO THE NL CONTEXT

The following table summarizes at a high-level the climate changes experienced to date/future projections, associated impacts, risks, and opportunities associated with key aspects of the NL economy.

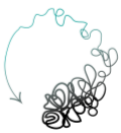
SECTOR / FACTOR	CLIMATE CHANGES/ PROJECTIONS	CASCADING IMPACTS	ECONOMIC RISKS	ECONOMIC OPPORTUNITIES
<b>Fishery, Marine</b>	<ul style="list-style-type: none"> <li>• Ocean warming</li> <li>• Sea level rise</li> <li>• Increased frequency and intensity of storms</li> </ul>	<ul style="list-style-type: none"> <li>• Ocean acidification</li> <li>• Biodiversity loss, ecosystem collapse</li> <li>• Change in species behaviour</li> <li>• Shifting exposure to pests and diseases</li> <li>• Storm surges</li> <li>• Heatwaves</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced or eliminated access to target species</li> <li>• Increased risk to coastal infrastructure (wharves, processing facilities)</li> <li>• Increased disruption to harvest season/schedules</li> <li>• Higher occurrence of unsafe outdoor conditions for workers</li> </ul>	<ul style="list-style-type: none"> <li>• Potential access to new species</li> <li>• Demand for ocean innovation initiatives to safeguard ecosystems, clean pollution, capture carbon, etc.</li> </ul>
<b>Forestry</b>	<ul style="list-style-type: none"> <li>• Higher temperatures</li> <li>• Inconsistent precipitation</li> </ul>	<ul style="list-style-type: none"> <li>• Heatwaves</li> <li>• Wildfire</li> <li>• Drought</li> <li>• Flooding</li> <li>• Shifting exposure to pests and diseases</li> <li>• Biodiversity loss, ecosystem collapse</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced or eliminated access to stock</li> <li>• Higher occurrence of unsafe outdoor conditions for workers</li> <li>• Global supply chain instability leading to increased costs/market changes</li> </ul>	<ul style="list-style-type: none"> <li>• Emerging focus on wood construction to achieve lower embodied carbon than steel, concrete</li> <li>• Longer construction season</li> <li>• Increasing focus on proper forest</li> </ul>



				management and tree planting for carbon sequestration
<b>Agriculture, Food Systems</b>	<ul style="list-style-type: none"> <li>Higher temperatures</li> <li>Inconsistent precipitation</li> <li>Increased frequency and intensity of storms</li> </ul>	<ul style="list-style-type: none"> <li>Heatwaves</li> <li>Wildfire</li> <li>Drought</li> <li>Flooding</li> <li>Shifting exposure to pests and diseases</li> <li>Longer growing season</li> <li>Soil erosion and poor soil health</li> </ul>	<ul style="list-style-type: none"> <li>Reduced yields or complete crop failure/collapse</li> <li>Increased disruption to food supply chains due to climate impacts elsewhere and ocean storm activity (ferry transportation)</li> <li>Higher occurrence of unsafe outdoor conditions for workers</li> </ul>	<ul style="list-style-type: none"> <li>Potential to grow new crops in warmer climate</li> <li>Potential for higher yields</li> <li>Demand for local, fresh, and affordable food</li> </ul>
<b>Mining, Energy</b>	<ul style="list-style-type: none"> <li>Higher temperatures</li> <li>Inconsistent precipitation</li> <li>Increased frequency and intensity of storms</li> <li>Sea level rise (coastal or offshore infrastructure)</li> </ul>	<ul style="list-style-type: none"> <li>Heatwaves</li> <li>Wildfire</li> <li>Drought</li> <li>Flooding</li> <li>Storm surges</li> </ul>	<ul style="list-style-type: none"> <li>Disruption to access roads, power supply, water supply</li> <li>Direct threat to infrastructure</li> <li>Global supply chain instability leading to increased costs or reduced access to feedstocks</li> <li>Higher occurrence of unsafe outdoor conditions for workers</li> </ul>	<ul style="list-style-type: none"> <li>Increasing demand for renewable energy, low-carbon materials, and critical minerals</li> </ul>
<b>Tourism</b>	<ul style="list-style-type: none"> <li>Higher temperatures</li> <li>Inconsistent precipitation</li> <li>Increased frequency and intensity of storms</li> <li>Sea level rise</li> </ul>	<ul style="list-style-type: none"> <li>Heatwaves</li> <li>Wildfire</li> <li>Drought</li> <li>Flooding</li> <li>Storm surges</li> <li>Biodiversity loss, ecosystem collapse</li> <li>Shifting exposure to pests and diseases</li> <li>Reductions in air quality</li> </ul>	<ul style="list-style-type: none"> <li>Loss of core market value from changes to local climate, (e.g. less snow, extended heat, loss of infrastructure due to sea level rise, loss of wildlife, etc.)</li> <li>Increasing prevalence of climate-related travel anxiety</li> <li>Increasing costs for travel, lodging and activities</li> </ul>	<ul style="list-style-type: none"> <li>Growing awareness of and demand for “eco-tourism” offerings</li> <li>Less extreme climate changes expected than many other destinations</li> </ul>
<b>Public Infrastructure &amp; Safety</b>	<ul style="list-style-type: none"> <li>Higher temperatures</li> <li>Inconsistent precipitation</li> </ul>	<ul style="list-style-type: none"> <li>Heatwaves</li> <li>Wildfire</li> <li>Drought</li> <li>Flooding</li> <li>Storm surges</li> </ul>	<ul style="list-style-type: none"> <li>Increased demand on emergency and healthcare services</li> </ul>	<ul style="list-style-type: none"> <li>Opportunity to reduce current and future risks to public infrastructure and</li> </ul>



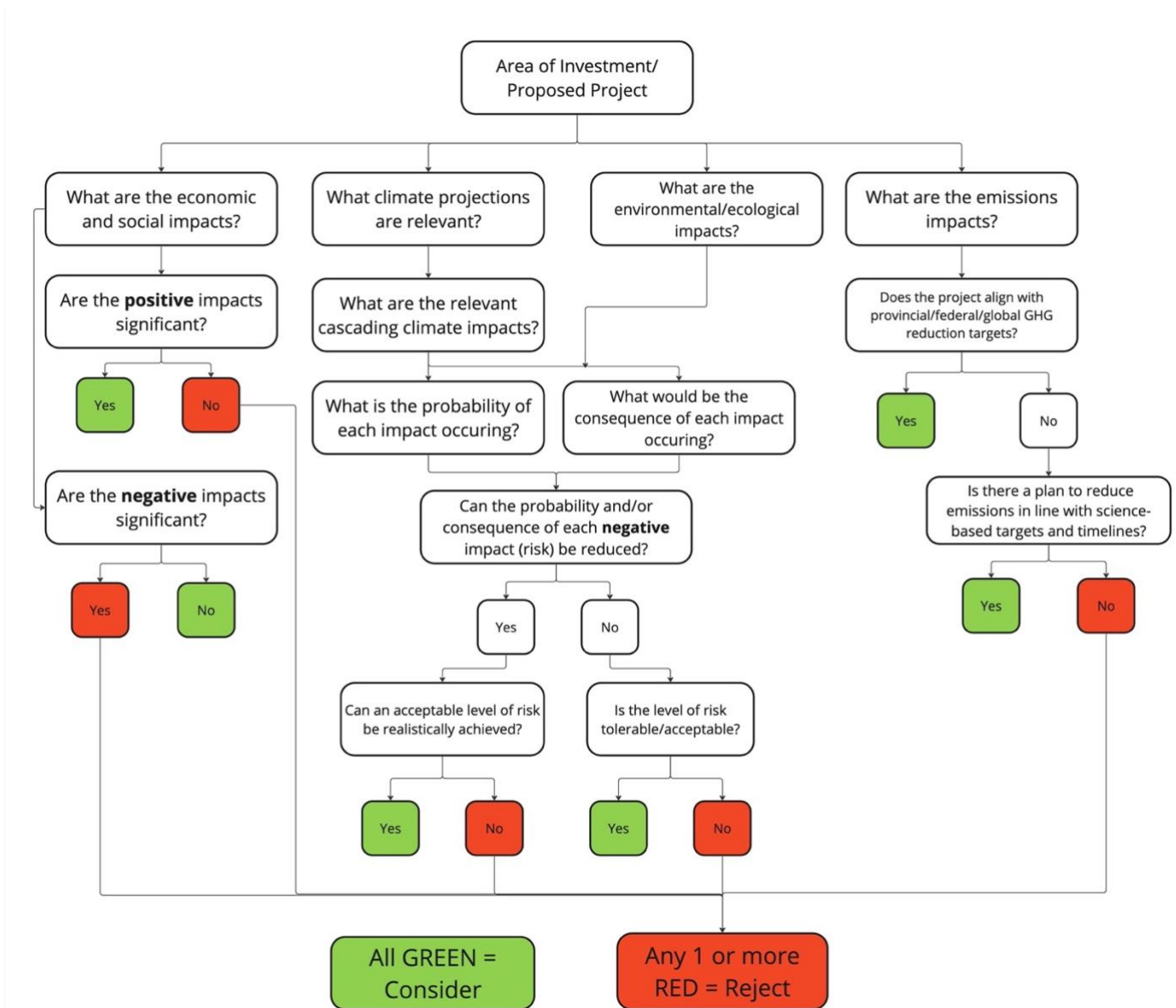
	<ul style="list-style-type: none"> <li>• Increased frequency and intensity of storms</li> <li>• Sea level rise</li> </ul>	<ul style="list-style-type: none"> <li>• Shifting exposure to pests and diseases</li> <li>• Reductions in air quality</li> </ul>	<ul style="list-style-type: none"> <li>• Increased vulnerability to unplanned power outages</li> <li>• Risk to all low-elevation coastal infrastructure</li> <li>• Increased insecurity in day-to-day life and business-as-usual operations</li> </ul>	<p>health/safety by proactively addressing vulnerabilities (e.g. coastal retreat) and ceasing to build in vulnerable areas</p> <ul style="list-style-type: none"> <li>• Longer construction season</li> </ul>
<b>Human Capital</b>	<ul style="list-style-type: none"> <li>• Higher temperatures</li> <li>• Inconsistent precipitation</li> <li>• Increased frequency and intensity of storms</li> <li>• Sea level rise</li> </ul>	<ul style="list-style-type: none"> <li>• Heatwaves</li> <li>• Wildfire</li> <li>• Drought</li> <li>• Flooding</li> <li>• Storm surges</li> <li>• Shifting exposure to pests and diseases</li> <li>• Reductions in air quality</li> <li>• Increased climate anxiety and political unrest</li> <li>• Trauma and grief from extreme weather events and ecological loss</li> </ul>	<ul style="list-style-type: none"> <li>• Labour productivity losses, increased leave and support required (in any sector) due to mental and/or physical health impacts of climate changes</li> <li>• Unwillingness to work in industries which contribute to the climate crisis or do not take sufficient climate action</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing demand for "green" jobs</li> <li>• Less extreme climate changes expected than many other locations (may attract new residents/workers from elsewhere)</li> </ul>

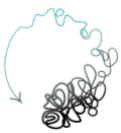


## DECISION-MAKING PROCESS

Applying the concepts introduced above, a decision-making process for a particular investment opportunity or proposed project may look something like the flow chart below. This is, of course, simplified - there will always be nuances to consider for any given situation – but in general, to achieve climate resilience and responsible economic development, a project should not proceed if *any* of the following is true:

- Project does not significantly benefit the economy and/or people of a community
- Project has significant negative impacts people or the economy
- Project has one or more intolerable climate-related or environmental risks
- Project does not currently align with and there is no plan to meet science-based emission targets





## SUPPORTING LITERATURE

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The impact of climate change on the economy has been well studied by many others. The Canadian Climate Institute released a report in September 2022 titled [Damage Control: Reducing the Costs of Climate Impacts in Canada](#). The key findings include the following statements:

- Climate change is a macroeconomic risk that threatens to significantly undermine future prosperity.
- **The Canadian economy is highly climate-sensitive, posing a major risk to businesses and investors.**
- Climate change is a fiscal risk that threatens to upend government spending.
- Emissions reductions and proactive adaptation measures, taken together, are the most effective means of reducing cost.

The report highlights that:

“The impacts of climate change are not confined to particular regions or sectors of the economy. **Businesses and investors across the country and in virtually every sector are at risk.**”

and

“The failure to understand the economic threat posed by climate change has led Canadian governments to drastically underestimate both the economic benefits of climate policies and the **costs of the status quo.**”

The report’s recommendations include:

- Governments should build climate impacts and adaptation policies into their own economic decision making.
- **Governments should encourage—and where appropriate, mandate— accounting for climate change risks in private-sector decision making.**
- Governments should scale-up adaptation measures to match the magnitude of the risk Canada faces.

Similarly, the [Canada in a Changing Climate Synthesis Report 2023](#) released by Natural Resources Canada listed ten Key Conclusions, all of which have relevance to economic development broadly, but two of which were:

- **The business case for climate adaptation is strong.**  
Climate change impacts already cost Canadians billions of dollars each year, and costs will continue to rise. There is a strong business case for adaptation, with the benefits (including



avoided costs) gained through adaptation measures generally exceeding the costs of implementation.

- **Now is the time for the private sector to step up on adaptation.**

Businesses face a range of direct and indirect risks from climate change. It is vital to engage and empower the business community and other private sector stakeholders if we are to progress at the scale needed to reduce current and future climate change risks and take advantage of potential opportunities.

It has been demonstrated through research at the national level that the rising severity of extreme weather events and climate related disasters drive significant costs for reparations; costs which are potentially avoidable. The [Insurance Bureau of Canada](#) (IBC) highlights that in 2023, severe weather caused over \$3 billion in insured damage in Canada for the second year in a row. **Of the top 10 years with the highest insured losses due to severe weather, 9 of them have been since 2011** and 8 of them have topped \$2 billion. To put these figures in perspective, from 1983 to 2009, the average annual insurable payouts for severe weather was \$400 Million – \$2 billion is 5 times that, \$6 billion is 15 times that.

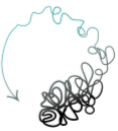
These figures do not include losses that were not insured or were uninsurable, and do not include government disaster response spending. A 2020 report released by the IBC and the Federation of Canadian Municipalities, [Investing in Canada's Future: The Cost of Climate Adaptation at the Local Level](#) highlights that:

**“An accepted standard for capital losses is for every dollar of losses borne by insurers in Canada, \$3-4 are borne by government, households and businesses.”**

So the events of 2023 likely actually cost us \$9-12 billion collectively – and these losses are only expected to increase as climate change progresses. The aforementioned Damage Control report estimates that Canada will experience \$25 billion in annual losses across the economy relative to a stable-climate scenario by 2025. Depending on whether or not the globe significantly reduces emissions, we could be looking at \$78-\$101 billion annually by 2050 and \$391-\$865 billion by 2100.

These are just a few examples of studies and reports on this topic. Some additional references include:

- [The Intact Centre on Climate Adaptation](#) – reports and resources webpage
- [The Health Costs of Climate Change: How Canada can adapt, prepare, and save lives](#) and [Tip Of the Iceberg: Navigating the known and unknown costs of climate change for Canada](#) by the Canadian Institute for Climate Choices (now the Canadian Climate Institute)
- [Spending What it Takes: Transformational climate investments for long-term prosperity in Canada](#) by the Canadian Centre for Policy Alternatives and the Climate Action Network
- [Adapt Now: A global call for leadership on climate resilience](#) by the Global Commission on Adaptation



- [Too Little, Too Slow: Climate adaptation failure puts the world at risk](#) by the United Nations Environment programme
- [Unlocking the Inclusive Growth Story of the 21<sup>st</sup> Century: Accelerating Climate Action in Urgent Times](#) by The New Climate Economy (World Resources Institute)
- [Estimating the benefits of Climate Resilient Buildings and Core Public Infrastructure](#) by the Institute for Catastrophic Loss Reduction
- [Economics of Adaptation](#) by the Intergovernmental Panel on Climate Change
- [A Climate Reckoning: the economic costs of BC's extreme weather in 2021](#) by the Canadian Centre for Policy Alternatives
- [Guide for Integrating Climate Change Considerations into Municipal Asset Management](#) by the Federation of Canadian Municipalities



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