

Climate Change Adaptation Strategy for Nova Scotia's Cattle and Sheep Sectors



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EXECUTIVE SUMMARY

The cattle and sheep sectors play a central role in Nova Scotia's agricultural system. The sectors produce nutritious products, provide economic value to farm families and rural communities, and contribute to food security and economic development of the province. Nova Scotia has a natural ability to produce high quality forages but where land is unsuitable for crop growth, cattle and sheep livestock are able to graze pastures.

Climate change presents Nova Scotia's cattle and sheep sectors with both bio-physical and socio-economic challenges and opportunities. To support the sectors' ability to adapt and thrive in a changing climate, a Scan Team made up of representatives from across the sectors developed this climate change adaptation strategy to provide a collective vision for the sector and to identify priorities for action. The strategy is centred on ambitious climate adaptation outcomes, which, together, are intended to position the sector for improving its preparedness for immediate and long-term impacts of climate change.

Nova Scotia's climate is changing and will likely bring with it increased temperatures, altered precipitation patterns, and increased storm frequency and intensity. Livestock and cropping systems are vulnerable to the direct and indirect effects of these changes. Together, increased temperatures and changing precipitation patterns, can cause periods of drought or flooding that, in turn, can create conditions leading to increased populations of new and existing pests and diseases. Periods of intense heat will likely affect human, animal, and crop health, especially when paired with periods of drought, which has implications for worker health and safety; storms, like Hurricane Fiona, caused significant damage to infrastructure such as barns and fences with consequences for overall crop quality and quantity.

Most value chain components within the cattle and sheep sectors –land, water, soil, and feed upon which livestock production depends; labour, infrastructure, transportation, consumer demand and markets; and businesses, farm families and communities – will need to adapt as Nova Scotia's climate changes. Although impacts of climate change are difficult to predict making challenges associated with them complex to address, Nova Scotia's cattle and sheep sectors have already begun the process of preparing themselves. This strategy builds on these efforts while addressing critical gaps and provides a pathway for these sectors to achieve the adaptation outcomes they have identified.

At its core, climate change adaptation is a social process requiring ongoing commitment and engagement from stakeholders throughout an entire system. This adaptation strategy offers Nova Scotia's cattle and sheep sectors an opportunity to build its capacity to weather change and adapt all segments of the value chain. To be effective and successful, strong collaboration and collective coordinated action is essential. A coordinated sectoral approach to address wide-ranging impacts across the value chain can help engage key partners, align sectors towards shared outcomes, monitor progress, and adjust adaptive actions over time. Many outcomes within this strategy aim to improve coordinated action across the individual sectors and where appropriate between the sectors.

This strategy, developed by a team of stakeholders from across both sectors, presents a set of agreed-upon outcomes and first steps designed to increase the sectors preparedness for climate change. Immediate priority should be given to: developing governance and partnership agreements between the cattle and sheep sectors, provincial and federal governments, and other key groups associated with the sector; support for climate adaptation research and application of knowledge; accessible services and programs; awareness of and support for sustainably produced cattle and sheep sector products; and updating and using agreed-upon management practices for water protections and access, soil management and animal health management.

Immediate next steps towards the implementation of this strategy includes communicating the strategy to cross-sector stakeholders in order to foster understanding and collective ownership of the strategy. Effective coordinated action relies on the cattle and sheep sectors' commitment to actively support the implementation of the strategy. Once commitment has been made, the next tasks are to create and support a sectorally representative governance group, which will coordinate, monitor, and help support strategy actions, as well as knowledgeable and representative implementation teams. Implementation teams will be tasked with developing the implementation plans and developing and implementing workplans and activities designed to achieve the adaptation outcomes outlined out in this strategy.

INTRODUCTION

Climate change is happening (Eyzaguirre et al., 2022), and Nova Scotia's cattle and sheep sectors are on the front lines experiencing its impacts. These climate change impacts, some of which were experienced in the aftermath of Hurricane Fiona, are wide ranging affecting all aspects of the Nova Scotian cattle and sheep sectors value chain from input quality and availability to consumer demand. Due to the cascading impacts of climate change, a coordinated sector-wide approach, which involves the participation of partners from across the value chain, is an effective way to align the sectors towards achieving their shared outcomes. A coordinated approach is also helpful in implementing priority activities including communicating with and engaging key partners, monitoring progress, and adjusting adaptive action over time.

In April of 2021, Nova Scotia's cattle and sheep sectors began working with the Nova Scotia Department of Environment and Climate Change (ECC), through the Climate Adaptation¹ Leadership Program (CALP). Through this partnership, the cattle and sheep sectors collectively developed a plan to guide partners from across the value chain to anticipate and strategically respond to changing operating conditions brought about by climate change. This sector-wide climate adaptation strategy is the result of that work (see Appendix 1 for details on CALP's scope and approach).

Although Nova Scotia's cattle and sheep sectors are distinct², they share many commonalities regarding required inputs, operations, and management as well as the overall structure of their value chains. These similarities are significant and the reason for the combination of these sectors. This strategy, in which both sectors collectively developed, is designed to support both sectors collectively and individually to achieve their adaptation outcomes in the face of climate change.

Over the past 1.5 years, two dedicated team contributed to the development of this climate adaptation strategy: a Scan Team and a Governance Team. The Scan Team, made up of representatives from across the cattle and sheep sectors, participated in a series of workshops and activities that included the development and analysis of a sector-wide climate change survey. The survey was implemented between October 28 and December 3, 2021. The survey asked questions about climate vulnerabilities and impacts, ways that climate change has been taken into consideration at that time, and factors that increase the sectors' effectiveness in addressing change³. The survey results, along with expertise supplied by the Scan Team, contributed to the development of this strategy. A governance team, made up of sector representatives and senior leaders from the Nova Scotia government, provided guidance throughout the process and will be instrumental in ensuring the effective implementation of the strategy.

This strategy is designed to help guide the sectors to effectively adapt and thrive in the face of climate change by setting ambitious yet realistic outcomes, which, when achieved, will mean the sectors are proactively preparing for and adapting to the changing climate. This strategy also highlights key partners that are needed to play a central role in its implementation as well as potential activities that could be considered steppingstones for enhancing the sectors' ability to adapt.

Strategy highlights

This strategy was developed using an outcome-oriented approach. An outcome-oriented approach is particularly well suited to climate change adaptation planning because it offers strong strategic direction by clearly describing the future end-state that the sector is trying to achieve while providing flexibility in the steps or activities taken to achieve those outcomes. This flexibility is critical because while the desired future end-state will likely remain constant, there are many uncertainties about how climate change will play out and impact the sectors: Which climate risks will be encountered along the way? How will different

¹ In human systems, adaptation is the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects (IPCC WGII Sixth Assessment Report Annex).

² See Appendix 2: Cattle and Sheep Sector System Model which captures similarities and distinctions between the sectors

³ For details on the structured CALP process and key findings from the sector-specific climate adaptation survey please see Appendices 2 and 3, respectively.

groups or players respond? What will the cascading or cumulative impacts be (including those resulting from the actions of others)? When it comes to addressing impacts and responses that have a high degree of uncertainty, there are likely many possible solutions, as well as uncertainty about which solution will work well; and for how long. This adaptation strategy contains outcomes for Nova Scotia's cattle and sheep sectors that are ambitious yet plausible and measurable, and it will allow for flexibility in the path and activities used in its implementation.

Importance of climate change adaptation for the cattle and sheep sectors

The production of quality beef and lamb products relies on numerous value chain components including land, quality water, healthy soil, and quality feed, all of which are highly vulnerable to climate change and identified to be of the top concern throughout the sectors. Due to their interconnected nature and the cascading effects of climate change, it is critical that these value chain components be maintained and improved for successful adaptation in the face of climate change. An approach involving partners from across the entire value chain is needed to ensure that management practices and processes across the sectors are adaptive to climate change impacts and to ensure that the highest quality products reach consumers.

The process of rearing healthy beef and sheep is similar when it comes to management practices and input needs. Nova Scotia's beef and sheep producers, whether using an intensive or extensive production system, require a healthy breeding stock, a successful breeding and calving/lambing season, high quality feed whether grown on-farm or imported from off-farm, safe and abundant water supplies, safe animal transportation, committed skilled labour, and reliable infrastructure. These components, which are critical for the production of high-quality products within both sectors, are highly vulnerable to climate change, particularly fluctuating temperatures and precipitation, pest and disease presence, and increased storm frequency and intensity. Consumer demand⁴ and market conditions⁵, additional components vital to the success of both the cattle and sheep sectors, may also shift as global consumers and markets adjust to climate change. These components also contribute to strong and sustainable farming and agriculture businesses, and farming families and communities throughout Nova Scotia, all of which are also vulnerable to climate change and its cascading effects.

There are distinct differences between the cattle and sheep sectors where climate change may impact the two sectors differently. Beef cattle typically require a longer growing period compared to lambs and therefore require larger quantities of feed. Beef cattle are also commonly transported to feedlots, many of which are located outside of the province, to finish growing before they are transported to abattoirs. Disruptions to transportation systems may be more common due to the effects of climate change, and may negatively impact cattle health, and availability of meat products for consumers. In contrast, most Nova Scotian lamb is destined for local consumption after being raised on-farm and transported to local abattoirs. Additionally, sheep breeding stocks require at least annual, sometimes more, hoof trimming and wool shearing, both of which are unnecessary for beef. As the number of very hot days increase, policies and requirements may shift to protect animals from heat stress (e.g., lowering stocking densities during transportation and more frequent shearing of sheep).

Climate change impacts these vulnerable components in other ways. Extreme rainfall poses threats to feed crops and grazing lands. Temperature variability and extremes, as well as warmer average temperatures, are expected to bring more pests and diseases that threaten animal and crop health. Periods of heat stress and weather extremes have implications for worker health and safety. Indirect impacts may include enhanced pressures on the sectors to manage changes to water quality, availability, and flood risks. Farm and sector profitability may shift due to shifting cost structures and consumer demand for Nova Scotian beef and sheep products given how the sectors are challenged on their performance as a major green-house gas producer.

As societies around the world address challenges of reducing greenhouse gas emissions, the cattle and sheep sectors, especially larger scale production facilities in Western Canada, have faced criticism. Industry is concerned about consumer backlash resulting in lower sales as well as potential federal regulations that

⁴ How much of which products are in demand from which markets

⁵ Accessibility, cost, and price structure

may affect industry viability. This adaptation strategy does not focus on greenhouse gas emissions but instead offers Nova Scotia's cattle and sheep sectors an opportunity to build its capacity to weather change and adapt all segments of the value chain. The strategy emphasizes partnership, communications, and shared outcomes to ensure that the success of the strategy and the sectors themselves are the shared responsibility across many partners and not only that of producers.

Survey results suggest that in the past year the cattle and sheep sectors have demonstrated leadership within the agricultural industry by taking climate change into consideration in situations requiring risk management and long-term planning, information sharing, data collection and analysis, funding, and operational decision making. Areas where climate change has not been taken into consideration include hiring and promoting staff and consultants, and in engaging with equity seeking groups such as Mi'kmaq and BI-POC groups. More focus on these areas may help to reduce the sectors' vulnerability and make outreach efforts more effective.

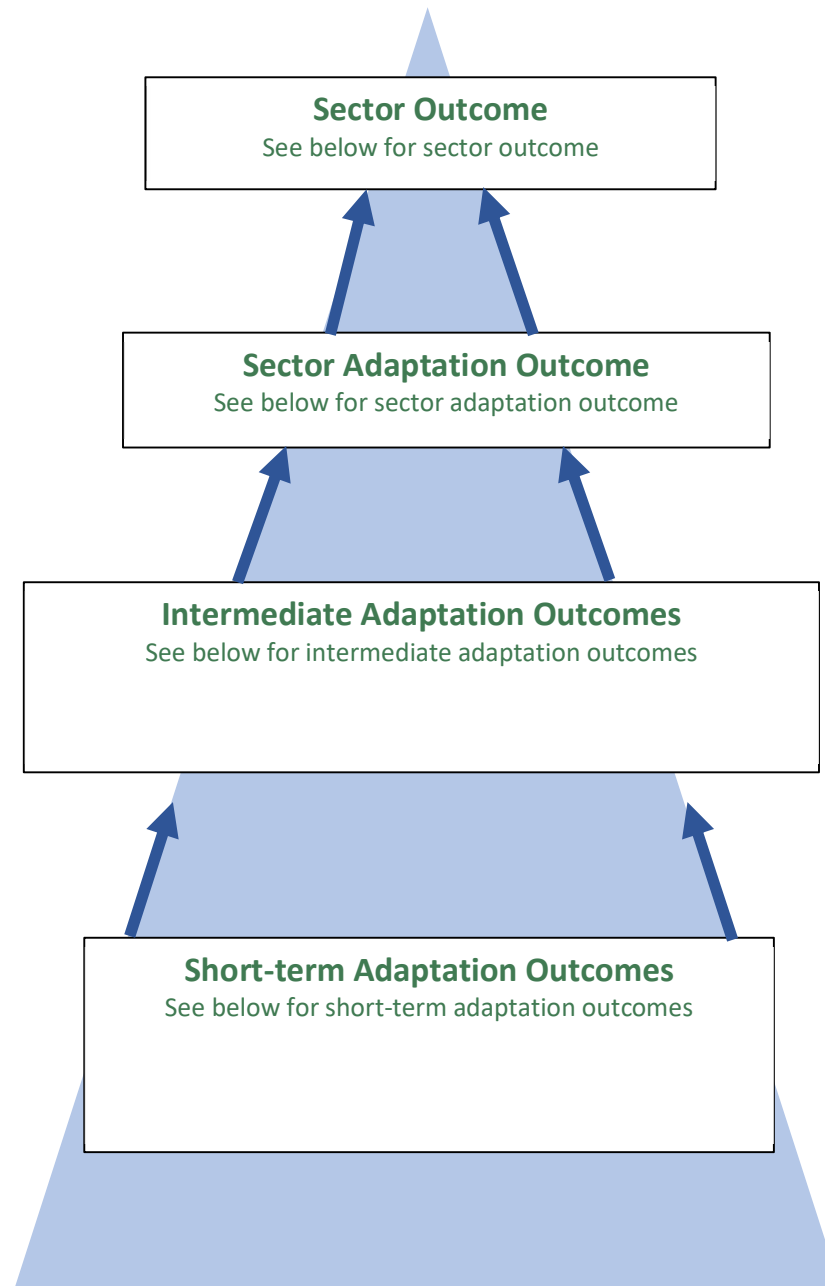
Climate change adaptation requires more than risk-management planning at the farm level; a coordinated collective approach, involving stakeholders from across the entire sectoral value chain, will be required to successfully take climate change adaptation action. Dedicated sector research to fill in the gaps of knowledge, to produce relevant climate information, and to provide insight on the most up-to-date best management practices, is also critical for successful climate change adaptation. New government and industry partnerships will be essential in facilitating programs that minimize negative economic consequences for producers and by extension farm families and communities, and to coordinate research and information sharing to support effective adaptation.

Climate change adaptation in Nova Scotia agricultural industry

Nova Scotia's agricultural industry, which plays an integral role in supporting the health and well-being of all Nova Scotians, is experiencing significant challenges and opportunities due to direct and cascading impacts of climate change. To better prepare for climate change, three agricultural sectors - cattle and sheep, horticulture, and Christmas tree and greenery - participated simultaneously in the CALP Program to conduct a climate change scan and produce sector-specific climate change adaptation strategies. Climate change presents different risks to each sector and each strategy reflects the sectors' unique climate adaptation priorities by outlining sector-specific adaptation outcomes. However, high-level themes that emerged were similar across all, presenting an opportunity for cooperation across sectors in the implementation of their strategies. Coordinating adaptive actions could help optimize resources, reduce redundancies, and support a synergistic approach to implementation in areas such as knowledge mobilization, research, and building stronger partnerships across value chains.

ADAPTATION OUTCOMES

Figure 1: The framework used to organize outcomes within this strategy. The sector outcome at the top represents what the cattle and sheep sectors aim to achieve overall - not just in the face of climate change but in the face of all potential challenges and opportunities that the sectors may encounter over time. Outcomes presented below the sector outcome are climate-change specific and reflect an increasing level of detail from top to bottom. These outcomes help to focus and organize the strategy and they are designed to guide action that the cattle and sheep sectors can take to prepare for climate change. Arrows show that accomplishments at each level are intended to contribute to the achievement of the outcome(s) at the level above.



The **Sector Outcome** describes what the cattle and sheep sectors are ultimately trying to achieve. It makes clear what a healthy, productive, and thriving sector looks like in.

The **Sector Adaptation Outcome** describes the state of the cattle and sheep sectors when essential things and processes the sectors need to function effectively are adaptive to climate change.

The **Intermediate Adaptation Outcomes** describe what the sectors will be like in the short-term horizon (i.e., by 2030), when the adaptation strategy is operationalized. They describe a change in the state of essential things, processes, and capacities.

The **Short-Term Adaptation Outcomes** contribute to each intermediate outcome. Bundled together, they describe all the changes that will lead to the achievement of their corresponding intermediate adaptation outcome

The outcomes in this strategy are arranged in a hierarchical structure (see Figure 1). The sectoral outcome describes the optimal state of the cattle and sheep sectors and provides sectoral context for the adaptation outcomes. The overarching sectoral adaptation outcome describes the ideal state of the sectors when it is adapting to climate change. The sectoral adaptation outcome is comprised of four unique theme areas, each with a singular intermediate adaptation outcome. The intermediate adaptation outcomes are broken down further into manageable short-term adaptation outcomes. These short-term adaptation outcomes together, contribute to achieving the theme area intermediate adaptation outcome. Similarly, the intermediate adaptation outcomes, together, contribute to achieving the sectoral adaptation outcome.

The Scan Team worked collaboratively to develop the strategy outcomes. All adaptation outcomes were informed by results of the cattle and sheep climate adaptation survey including: priority vulnerabilities (essential things and processes⁶ that were identified through the survey as being both important and vulnerable to climate change), climate change impacts, effectiveness factors (factors⁷ associated with an experience dealing with change that increase the effectiveness in addressing that change), and what the sectors are currently doing to address climate change⁸. A summary of key survey results can be found in Appendix 3.

Sector Outcome

The overarching outcome that the cattle and sheep sectors aim to achieve is:

“Nova Scotia’s cattle and sheep sectors are applying best available, sustainable⁹ practices to produce healthy animals and high-quality products that are trusted and in high demand. Sector operations are flexible and viable in the face of changing circumstances”.

Sector Adaptation Outcome

The adaptation outcome defining the desired state of the cattle and sheep sectors when they are adapted to climate change is:

“Nova Scotia’s cattle and sheep sectors, including their priority things¹⁰ and processes¹¹, are sustainably adaptive in the face of climate change. The sectors are applying reliable knowledge of climate risks and opportunities to act effectively and proactively, and thrive under the changing and uncertain conditions of climate change”.

Intermediate and Short-Term Adaptation Outcomes

Intermediate outcomes with their corresponding short-term outcomes are found in Table 1 below. Each of the 4 theme areas focuses on addressing areas of concern related to climate change while also incorporating ways to increase the effectiveness and adaptability of the sectors.

⁶ The system map showing things (i.e., inputs and enabling environments) and processes important for the sectors to achieve their desired outcomes can be found in Appendix 2

⁷ Factors associated with experience included context (e.g., who and how many people were involved, whether people agreed on various aspects like who to involve, what should be done, or outcomes to be achieved), the nature of the challenge (i.e., its complexity), the processes associated with the experience (e.g., whether people knew what to do, if communication was adequate, whether the process was well designed and implemented), and people and relationships associated with the experience (e.g., engagement level, ease of collaboration, resources available)

⁸ How frequently over the past year they had taken climate change into consideration across 22 situations

⁹ Sustainable refers to environmental, economic, and social sustainability. IPCC WGII Sixth Assessment Report Annex, 2022 definition of sustainability is: Involves ensuring the persistence of natural and human systems, implying the continuous functioning of ecosystems, the conservation of high biodiversity, the recycling of natural resources and, in the human sector, successful application of justice and equity

¹⁰ In particular: farm families & communities, land, healthy soil, water, quality feed and infrastructure.

¹¹ In particular: feed management, extensive and intensive production management, cropping, calving/lambing, and managing animal and soil health.

Table 1: Intermediate and short-term adaptation outcomes

Theme	Theme focus and outcome statements
1. Sector Leadership and Partnership	<p>Nova Scotia's cattle and sheep sectors are complex systems. Effective collaboration and coordination among stakeholders across the sectors is essential to effectively adapt to climate change. Having in place collaborative processes and effective partnerships can increase the likelihood of successful sector-wide adaptation.</p> <p>Intermediate adaptation outcome 1: By 2030, Nova Scotia's cattle and sheep sectors are continuing to effectively promote, lead, coordinate, and partner on implementing the sector climate change adaptation strategy.</p> <p>Short-term adaptation outcomes:</p> <ul style="list-style-type: none">1.1 By 2023, Nova Scotia's cattle and sheep sectors are using trusted and effective partnerships, institutional structures, and associated processes to lead, coordinate and guide the implementation of the sectors' climate change adaptation strategy.1.2 By 2024, Nova Scotia's cattle and sheep sectors have robust partnership arrangements with provincial and federal governments, as well as key groups associated with the sector. These arrangements are facilitating effective sector-wide coordinated collaboration to implement the climate change adaptation strategy.
2. Enhancement and Application of Knowledge to support Effective and Sustainable Climate Change Adaptation.	<p>Availability, accessibility, and usability of relevant knowledge, information and tools for climate change action will facilitate the development and implementation of effective responses to emerging priorities and changing production, processing, and marketing practices across the sectors.</p> <p>Intermediate adaptation outcome 2: By 2030, Nova Scotia's cattle and sheep producers and sector stakeholders are aware of, using, and sharing up-to-date and reliable knowledge, information, and tools to effectively update and revise their management practices in the face of climate change.</p> <p>Short-term adaptation outcome:</p> <ul style="list-style-type: none">2.1 By 2024, Nova Scotia's cattle and sheep sectors are collaboratively partnering with research providers to generate innovative, long-term industry research that is contributing to knowledge, information, and tools for supporting proactive climate change adaptation; research is sustainably supported and funded by industry stakeholders and partners.

- 2.2 By 2024, the Nova Scotian cattle and sheep sectors are using¹² relevant industry knowledge, information, and tools to develop climate plans, programs, and management practices to support sector adaptation.
- 2.3 By 2025, reliable sector-relevant climate change knowledge, information, and tools are being produced, translated, and updated through collaborative processes and partnerships.
- 2.4 By 2026, sector stakeholders are aware of and using reliable, relevant, and up-to-date climate change knowledge, information, and tools to support planning, risk management and decision making.

3. Adaptive and Innovative Services and Programs

Services and programs delivered by associations, government, and research institutions help industries access expert advice, resources, technology, and supports. Access to reliable, up-to-date, and affordable adaptive and innovative services and programs can help enable effective adaptation efforts made by the cattle and sheep sectors. access the necessary resources and supports from effective adaptation and growth efforts.

Intermediate adaptation outcome 3:

By 2030, Nova Scotia's cattle and sheep sector policies, services, programs, and research are climate change adapted, reviewed regularly, and accessible to producers and stakeholders for supporting sector climate change adaptation efforts.

Short-term adaptation outcome:

- 3.1 By 2025, the Nova Scotian cattle and sheep sectors are actively identifying relevant environmental and trade policies, and programs for addressing the changing and emerging needs of the sectors and for ensuring the continuous and prosperous growth and adaptation of the Nova Scotian cattle and sheep sectors in the face of climate change.
 - 3.2 By 2025, provincial and federal governments and sector associations, have strong collaboration and partnership agreements in place for climate change adaptation and are reliably, effectively, and affordably providing necessary and current services and programs for sector adaptation that are easily accessible to sector producers and stakeholders in a timely, affordable, and easily usable way.
 - 3.3 By 2028, the Nova Scotian cattle and sheep sector partners from throughout the value chain are accessing available climate adaptation programs and services and are using them for planning, implementing, and monitoring adaptation actions designed to minimize climate risks to sectors, and leverage emerging opportunities climate change may bring.
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¹² Successful in producing a desired or intended result

4. Sustainable and Productive Sectors

For the cattle and sheep sectors to remain sustainable and viable in the face of climate change they need to continue to use and/or adopt new practices. This means taking an innovative and proactive sector-wide approach to adapt vulnerable components associated with growing, storing, marketing, and transporting.

Intermediate adaptation outcome 4:

By 2030, the Nova Scotian cattle and sheep sectors have adopted and are consistently using sustainable, effective, economically feasible, and profitable management practices that are facilitating sector-wide enhanced productivity, sustainability, and climate change adaptation.

Short-term adaptation outcomes:

- 4.1 By 2024, representatives of Nova Scotia's cattle and sheep sectors, including provincial and federal governments and associations, are collaborating, communicating, and negotiating the needs of the sectors in the face of climate related stresses, are sourcing inputs and supply chains to minimize disruptions, and are actively resourcing programs and supports to sustain the sectors through supply chain and input fluctuations.
 - 4.2 By 2025, Nova Scotia's cattle and sheep producers are actively updating and using evidence-based management practices to address priority vulnerabilities including water protection and access (particularly during times of drought), soil health and management, high feed quality production, and animal health management.
 - 4.3 By 2026, Nova Scotia's cattle and sheep sectors, including consumers, are aware of sustainably produced cattle and sheep sector products, the benefits of buying local products, and are actively supporting sector growth and responsiveness to climate change.
 - 4.4 By 2027, Nova Scotia's cattle and sheep sectors are collaboratively working with retailers/traders to identify areas of common adaptation interests, maintain product quality, improve fairness in pricing/costing, and rationalize grading standards and are effectively sharing climate information that supports a thriving retail and marketing system.
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PRIORITY OUTCOMES

This strategy acts as a starting point to help orient the cattle and sheep sectors to become more climate-change ready. The strategy framework provides a progressively more detailed breakdown of outcomes that the sectors aim to achieve. All short-term outcomes are important, but it can be helpful to show which should be achieved first in order to prepare the groundwork for subsequent work. The Scan Team worked together to identify priority short-term outcomes that should be considered during the initial phase of implementing the strategy. Priorities are presented in Table 2 below, along with possible activities they identified that could contribute to achieving the outcomes (See appendix 4 for a more fulsome list of potential activities). Activities are the result of initial suggestions by the Scan Team and ECC to kickstart implementation action of the strategy. Activities may be amended and updated as needed by the teams implementing the strategy. A more detailed and comprehensive list of implementation activities will be needed for each short-term adaptation outcome and supporting implementation plans and/or workplans. These workplans will be developed and updated by the sector's implementation teams (see Next Steps section of this report for more details).

Table 2: Priority short-term outcomes, rationale, and possible activities

Priority Short-term Outcome	Rationale	Possible Activities
1.1 By 2023, Nova Scotia's cattle and sheep sectors are using trusted and effective partnerships, institutional structures, and associated processes to lead, coordinate and guide the implementation of the sectors' climate change adaptation strategy.	Strategy implementation will be more effective and efficient when strong collaborations between sectors, sectors associations, and government agencies are in place.	<ul style="list-style-type: none"> • Establish or repurpose a sectorally representative governance system that will transparently and equitably coordinate achievement of the industry's climate change adaptation strategy. • Develop decision making processes for the governance system that transparently defines representation, powers and responsibility and decision-making responsibilities. • Ensure agreement by the governance group on achievement of the strategy and commitment to achieve strategy outcomes. • Contact and engage with groups that are not regularly a part of engagement efforts or decision making within the cattle and sheep sectors.
1.2 By 2024, Nova Scotia's cattle and sheep sectors have robust partnership arrangements with provincial and federal governments, as well as key groups associated with the sector.	Strong and effective collaboration between both sectors and their stakeholders, including government and associations, will allow for easier and swifter implementation of the sectors' adaption	<ul style="list-style-type: none"> • Develop and implement a simple monitoring system to enable governance system to track its performance on achieving the strategy outcomes.

These arrangements are facilitating effective sector-wide coordinated collaboration to implement the climate change adaptation strategy.	strategy and therefore support short-term outcome 1.1.	<ul style="list-style-type: none"> • Develop and agree to partnership agreements between partners to the strategy.
2.3 By 2025, reliable sector-relevant climate change knowledge, information, and tools are being produced, translated, and updated through collaborative processes and partnerships.	Up-to-date climate change information is essential in supporting climate-change adaptation across the cattle and sheep sectors. It is important that gaps in knowledge are identified and remedied so decisions can be made based on best available knowledge and support for adaptation can be built sector-wide. Having reliable information and resources that are specific to the sectors will help advancing the industry's ability to adapt to climate change.	<ul style="list-style-type: none"> • Review and translate information coming out of the Living Labs and On-Farm Climate Change Action Fund (OFCAF) into relevant information that is shared sector-wide. • Explore partnership and information sharing options with CLIMAtlantic. • Identify efficient and reliable mechanisms to learn from sector-wide adaptation efforts (both successful and unsuccessful) of. • Grant funding opportunities and programs for applying adaptation best management practices on farm
2.1 By 2024, Nova Scotia's cattle and sheep sectors are collaboratively partnering with research providers to generate innovative, long-term industry research that is contributing to knowledge, information, and tools for supporting proactive climate change adaptation; research is sustainably supported and funded by industry stakeholders and partners.	It is important that industry stakeholders define and support areas of relevant sectoral research. By defining and supporting research initiatives, the sectors will be engaged and invested in research projects and more receptive to research results; this may lead to better understanding of and more rapid uptake and use of research results.	<ul style="list-style-type: none"> • Have focused and engaging conversations with and between producers and value chain representative about their challenges in relation to climate change. • Develop an information and education campaign to create more consumer awareness about climate change and NS cattle and sheep sectors. • Work with value chain stakeholders to identify critical research and capacity gaps to improve knowledge about implementing and monitoring the sectors' adaptation efforts.
3.2 By 2025, provincial and federal governments and sector associations, have strong collaboration and partnership agreements in place for climate change adaptation and are reliably, effectively, and affordably providing necessary and current services and programs	This short-term outcome is closely linked to short-term outcome 3.1: Affordable, accessible, and timely producer supports, which are informed and updated by up-to-date knowledge, provided by government agencies are critical in	<ul style="list-style-type: none"> • Create strong partnership agreements and ensure that there are effective connections between the Nova Scotia Departments of Environment and Climate Change and Agriculture by identifying who needs to do what, when, and where.

for sector adaptation that are easily accessible to sector producers and stakeholders in a timely, affordable, and easily usable way.	aiding the cattle and sheep sectors to adapt to climate change actively and quickly.	<ul style="list-style-type: none"> • Develop an extension service that evaluates existing infrastructure for viability during extreme wind events. • Develop programming and funding to supply stakeholders with necessary emergency infrastructure (e.g., generators, fuel storage, water storage, electric power sources, etc.) • Develop and maintain emergency contact list with names and numbers of available services by area during times of emergency.
4.3 By 2026, Nova Scotia's cattle and sheep sectors, including consumers, are aware of sustainably produced cattle and sheep sector products, the benefits of buying local products, and are actively supporting sector growth and responsiveness to climate change.	Consumer preferences influence all aspects of the cattle and sheep sectors including management practices. Educated consumers who actively support the cattle and sheep sectors to update their best management practices as these practices become more affordable to maintain. The adoption and maintenance of these best management practices will move the sectors toward being better climate change adapted.	<ul style="list-style-type: none"> • Identify barriers to consumer awareness • Conduct research into a consumer communication strategy that focusses on sector-wide system including benefits of forage.
4.2 By 2027, Nova Scotia's cattle and sheep sectors are collaboratively working with retailers/traders to identify areas of common adaptation interests, maintain product quality, improve fairness in pricing/costing, and rationalize grading standards and are effectively sharing climate information that supports a thriving retail and marketing system.	This short-term outcome is closely linked to short-term outcome 4.3: Producers need to be informed on the most up-to-date best management practices so that they may adopt these practices and become more climate change adapted. A publicly available, accessible, and up-to-date list of these collectively agreed upon best management practices, is essential for the cattle and sheep sectors. Adoption of these best management practices becomes easier when consumers are educated and actively supporting the sectors.	<ul style="list-style-type: none"> • Complete a literature review of best management practices for climate change adaption within the cattle and sheep sectors and work with Federation, Perennia, and NSDA to effectively share this knowledge with producers • Work with sector and value chain associations to identify and implement a sector appropriate mechanism to identify and evaluate best available knowledge of best management practices • Develop, test, and refine a sustainable knowledge transfer mechanism for making this knowledge available to sector-wide stakeholder.

KEY PARTNERS

The cattle and sheep sectors function as distinct but similar systems that both rely on farms, processors, traders, transporters, and consumers. The sectors are interconnected sharing people, processes and other components of the individual systems and they both contribute to the sector-wide adaptation outcomes outlined in this report.

Survey results suggest that successful implementation of the sectors' adaptation strategy may be more likely to occur when people are engaged and believe that they can make a difference. Therefore, successful implementation of the strategy likely depends on engagement, buy-in, participation, motivation, and commitment from all parts of the cattle and sheep systems. The following key partners are suggested as a starting point for successful strategy implementation as they were named numerous times by the Scan Team. This is not an exhaustive list and further details on specific partners associated with each short-term adaptation outcome can be found in Appendix 5.

- ❖ Federal and provincial government agencies who provide resources, funding, and programs to stakeholders within each sector. They also update, develop, and administer relevant agricultural policies and regulations. These agencies include Agriculture and Agri-Food Canada (AAFC), the Nova Scotia Department of Environment and Climate Change (NSECC), the Nova Scotia Department of Agriculture (NSDA), and the Nova Scotia Federation of Agriculture (NSFA).
- ❖ Nova Scotia cattle and sheep individual sector stakeholders including producers, traders, transporters, processors, consumers, the Maritime Beef Testing Station, NSDA extension services and Perennia specialists and industry consultants (e.g., veterinarians).
- ❖ Nova Scotia cattle and sheep individual sector associations such as Nova Scotia's Cattle Producers and the Sheep Producers Association both of whom promote and advocate the interests of their sectors. These associations are key partners that develop and facilitate industry stakeholder partnerships and strongly support and drive strategy implementation.
- ❖ Research partners with on-going research relevant to the sectors including Dalhousie University (specifically the agricultural campus), Agriculture and Agri-Food Canada and the Living Labs program.

NEXT STEPS

Having well-defined processes for implementing the strategy and monitoring progress will set the cattle and sheep sectors up for success when it comes to achieving the outcomes in this strategy. The table below outlines the recommended immediate next steps, in sequential order, for beginning the process of strategy implementation.

Priority Next Step	Rationale	Approximate timeline
Endorsement of strategy by cattle and sheep sectors' Governance Team and confirmation of resources for implementation	Seek buy-in and endorsement of the Strategy by NS Cattle Producers, Sheep Producers Association of Nova Scotia, NS Departments of Agriculture and Environment and Climate Change, Perennia, and Nova Scotia Federation of Agriculture. Explore availability of human and financial resources (ideal and likely) for initial and long-term sustained implementation	Winter 2023
Introductory engagement sessions with priority sector stakeholders.	Communicate strategy to key stakeholders. This will help initiate ownership of the strategy and commitment to action, increase awareness and understanding of adaptation outcomes, and identify next steps involved in implementation	Winter 2023
Formation of implementation team(s) tasked with achieving specific outcomes of the strategy	Implementation teams will support organized implementation of the strategy including engagement with key partners and development of workplans containing key activities designed to achieve strategic outcomes.	Spring 2023
Training of implementation team(s)	Relevant training on strategy implementation and monitoring will enhance teams' skills and knowledge for effectively implementing the strategy and will increase likelihood of successfully achieving short-term, intermediate, and overarching outcomes.	Summer 2023
Development of workplans by implementation teams	Implementation teams will be tasked with the development of detailed intermediate-outcome and short-term outcome specific workplans, including tangible activities, timelines, and budgets. Workplans will be used to measure progress made towards achieving outcomes.	Summer 2023
Approval and confirmation of resourcing for implementation plan/s by Governance Team	Seek buy-in and approval of implementation plan/s by Governance Team	Summer 2023

CONCLUSION

The cattle and sheep sectors play a central role in Nova Scotia's agricultural system. The sectors contribute to food security and economic development throughout the province while supporting farm families and rural communities. Climate change is bringing increased temperature, shifting precipitation patterns, and increased storm frequency and intensity that, together, present the sectors with biophysical and socio-economic challenges. Periods of intense heat pose risks for humans, animals health, damage to critical infrastructure, and overall crop quantity and quality.

Recognizing the need to act proactively and quickly to address vulnerabilities to climate change, the cattle and sheep sectors partnered with ECC to develop this climate adaptation strategy. The strategy uses an outcome-oriented approach, which is particularly well suited for climate adaptation planning because it offers strong strategic direction while providing flexibility in the steps or activities taken to allow for course-adjustment as uncertainties relating to climate change play out. The Scan Team - a group of stakeholders from across the sectors - developed the outcomes using results of the survey and their expertise to inform the work. Outcomes are designed to help sector stakeholders visualize a common climate adapted future they are working towards together, and implementation plans will follow with more detail.

Outcomes are organized into four theme areas focussing on sector leadership and partnership, enhancing knowledge to support climate adaptation, adaptive and innovative services and programs, and sustainability and productivity. Within theme areas outcomes, are broken down into several manageable short-term outcomes. The Scan Team prioritized short-term outcomes that should be achieved during the initial phase of implementation to prepare the groundwork for subsequent work. Immediate priority should be given to establishing partnerships, structures, and arrangements to lead, coordinate, and guide strategy implementation and collaboration; production, translation, and updating of reliable sector-relevant climate change knowledge, information, and tools; partnerships to contribute to long-term industry research; collaborations and partnerships agreements for providing services and programs for sector adaptation; sector and consumer awareness of and support for buying local; and updated evidence-based management practices to address priority vulnerabilities to climate change.

Climate change is experienced across the cattle and sheep sectors and therefore adaptation requires a sector-wide response. Achieving the adaptation outcomes will require the collective effort of all stakeholders working together, monitoring progress, and sustaining action. To successfully deal with climate change, sector stakeholders from producers, industry associations, and distributors to government departments and researchers, need to be committed to the outcomes and engaged in well-designed processes for strategy implementation.

As a next step, a well-defined process for implementation and monitoring needs to be developed. Sector stakeholders should be engaged to enhance their understanding of what will be required to achieve the adaptation outcomes and collective ownership of the strategy. A coordinator should be hired and embedded in an organization to manage and monitor strategy implementation. Under the guidance of the coordinator, ECC, and strategy governance, and in collaboration with the implementation teams, workplans should be developed detailing activities, timelines, and budgets for achieving strategy adaptation.

The cattle and sheep sectors produce nutritious products, provide economic value to farm families and rural communities, and contribute to food security and economic development of the province. Climate change presents Nova Scotia's cattle and sheep sectors with both bio-physical and socio-economic challenges and opportunities. The development of this strategy builds on existing capacities that the sectors already have for dealing with changing circumstances, and positions them for improving their preparedness for immediate and long-term impacts of climate change.

GLOSSARY

The Glossary provides the International Panel on Climate Change (IPCC WGII Sixth Assessment Report Annex, 2022) definition of some climate change-related terms used within this strategy.

Adaptation

In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects

Climate change

A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer

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IPCC WG11 Sixth Assessment Report Annex 11, 2022. Climate Change 2022, Impacts, Adaptation and Vulnerability. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Annex-II.pdf

APPENDICES

Appendix 1: Climate Adaptation Leadership Program (CALP) scope, methods, and approach

➤ The CALP Program

The Climate Adaptation Leadership Program (CALP) is a skills-development and capacity-building program intended to help enhance provincial departments and stakeholder's climate resiliency. Led by the Climate Change Division (CCD) within Nova Scotia's Department of Environment and Climate Change (ECC), the CALP program is partially funded by Natural Resources Canada (NRCan) through the Building Regional Adaptation Capacity and Expertise (BRACE) program, and partially by the Nova Scotia Government.

The CALP program is modelled around a typical adaptive management cycle which includes a 5-step process:

- Step 1. Becoming fully aware of climate risks and opportunities, as well as what factors make the sector effective in the face of change
- Step 2. Developing a sector adaptation strategy with strategic adaptation priorities
- Step 3. Pragmatically operationalizing the strategy
- Step 4. Monitoring and adjusting the strategy
- Step 5. Sustaining the strategy over the long term

➤ Program Goal

The CALP program uses a learn-by-doing approach to develop and implement a sector specific climate change adaptation strategy. Through the development and implementation of the sector adaptation strategy, the CALP process aims to enhance and build sector capacity while also increasing sector preparation and anticipation of climate related risks and opportunities in the present and in the future.

➤ Why is this Important?

The work of Nova Scotia's cattle and sheep sectors are essential to the health and well-being of the province. Climate change and its cascading impacts threaten the sectors' key things and processes, placing extra pressures on the sectors. The climate change adaptation strategy developed through the CALP process helps to guide the cattle and sheep sectors in achieving sector adaptability and resiliency in the face of climate change, mitigate climate risks, and take advantage of any opportunities that arise.

➤ CALP's Five-Step Learn-by-Doing Process

Steps	What's involved
Step 1	Three workshop series:
Study systems functions, priorities, capacities, and climate risks	Workshop Series 1 – System Mapping
	Workshop Series 2 – Survey Design
	Workshop Series 3 – Data Analysis

(Being Fully Aware)	
Step 2 Adaptation strategy development (Being Strategically Oriented)	<p>One workshop series:</p> <p>Workshop Series 4 – Strategy Development</p> <p>Approval of the strategy by scan and governance teams.</p> <p>The cattle and sheep CALP scan is currently transitioning from Step 2 to Step 3 as of August, 2022.</p>
Step 3 Strategy implementation (Being Tactically Pragmatic)	<p>An implementation team will be selected to help with strategy implementation.</p> <p>Strategy implementation will follow a similar workshop format as Step 1 with 4 possible workshops:</p> <p>Workshop Series A: Program Re-Orientation</p> <p>Workshop Series B: Implementation Planning</p> <p>Workshop Series C: Monitoring and Evaluation</p> <p>Workshop Series D: Building the Champion Network</p>
Step 4 Build a monitoring & evaluation system (Being Feedback Responsive)	<p>Questions will be addressed to ensure that strategy implementation is going as planned and results are occurring as expected.</p> <p>Examples of questions to be addressed:</p> <p>Are we achieving what we set out to do?</p> <p>What needs to change?</p> <p>What we did vs. what we were supposed to do?</p> <p>Are we seeing the desired results?</p>
Step 5 Make a plan to sustain action (Being Sustainably Networked)	<p>A plan will be developed to move forward while continuing to build sector capacity with sector stakeholders.</p>

➤ **Workshop Process Leading to the Adaptation Strategy**

Throughout steps 1 and 2, the Scan Team completed numerous workshops together. The workshops, which culminated in the adaptation strategy, are summarised below.

→ ***Workshop 1 Series: System Mapping***

The first part of Workshop Series 1 was used as an orientation. Scan Team members were introduced to the CALP process and their roles within the process. During the remaining portion of Workshop Series 1, Scan Team members worked collaboratively in reviewing and validating a system model of the cattle sector, prepared by the scan ECC facilitators and sector leads. This system model is a diagram that represents the intertwined components that work together for the successful operation of Nova Scotia's cattle sector from production to marketing and consuming. Once the system model was agreed upon and validated by the Scan Team, Scan Team members were also asked to validate sector outcomes, developed by ECC facilitators, and to develop a preliminary list of climate change impacts affecting the cattle sector. These workshop outputs laid the foundation for the remaining workshop series to come.

In an additional workshop/onboarding session, the sheep sector was incorporated into the cattle sector CALP scan. This included combining both sectors' systems maps, sectors' outcomes and adding sheep sector specific climate change impacts to the preliminary list of impacts. These items were re-validated at the beginning of workshop series 2 by the entire Scan Team.

→ ***Workshop 2 Series: Survey Design***

The second workshop series saw the cattle and sheep Scan Team agree-upon and validate a sectors-wide Climate Change Survey. Sector ECC facilitators prepared a survey draft prior to beginning Workshop Series 2 based on the information gathered from Workshop Series 1 and the sheep sector onboarding session, mainly the system model. Throughout the workshop series, Scan Team members collaboratively reviewed, edited, and validated the survey draft to create the final draft. Scan Team members also brainstormed the best ways to distribute the survey across their sector as well as ways to increase survey completion. After validation and endorsement from the scan Governance team, the survey was distributed via the processes outlined by the Scan Team, to the Nova Scotian cattle and sheep sectors as well as producers in New Brunswick and Prince Edward Island.

The survey covered topics such as:

- Demographic questions
- Providing an example of experiencing change
- Identify priority things and processes likely to be affected by climate change
- Identify most concerning climate change impacts that effect the cattle and sheep sectors
- Identify where climate change is being considered throughout the sectors

→ ***Workshop 3 Series: Data Analysis***

Workshop series 3 had Scan Team members analyzing data collected from their sector survey. Sector ECC facilitators led Scan Team members through various data analysis procedures, using the BNApp (a specifically designed online software), to give Scan Team members a sense of where their data comes from and what it is saying. Scan Team members were then provided ample time

to review key data emerging from the survey results and to discuss the meaning of the data findings. A full data analysis report was developed by sector ECC facilitators and validated and endorsed by both the Scan Team and scan governance team.

Data analysis covered throughout this workshop series included analysis on:

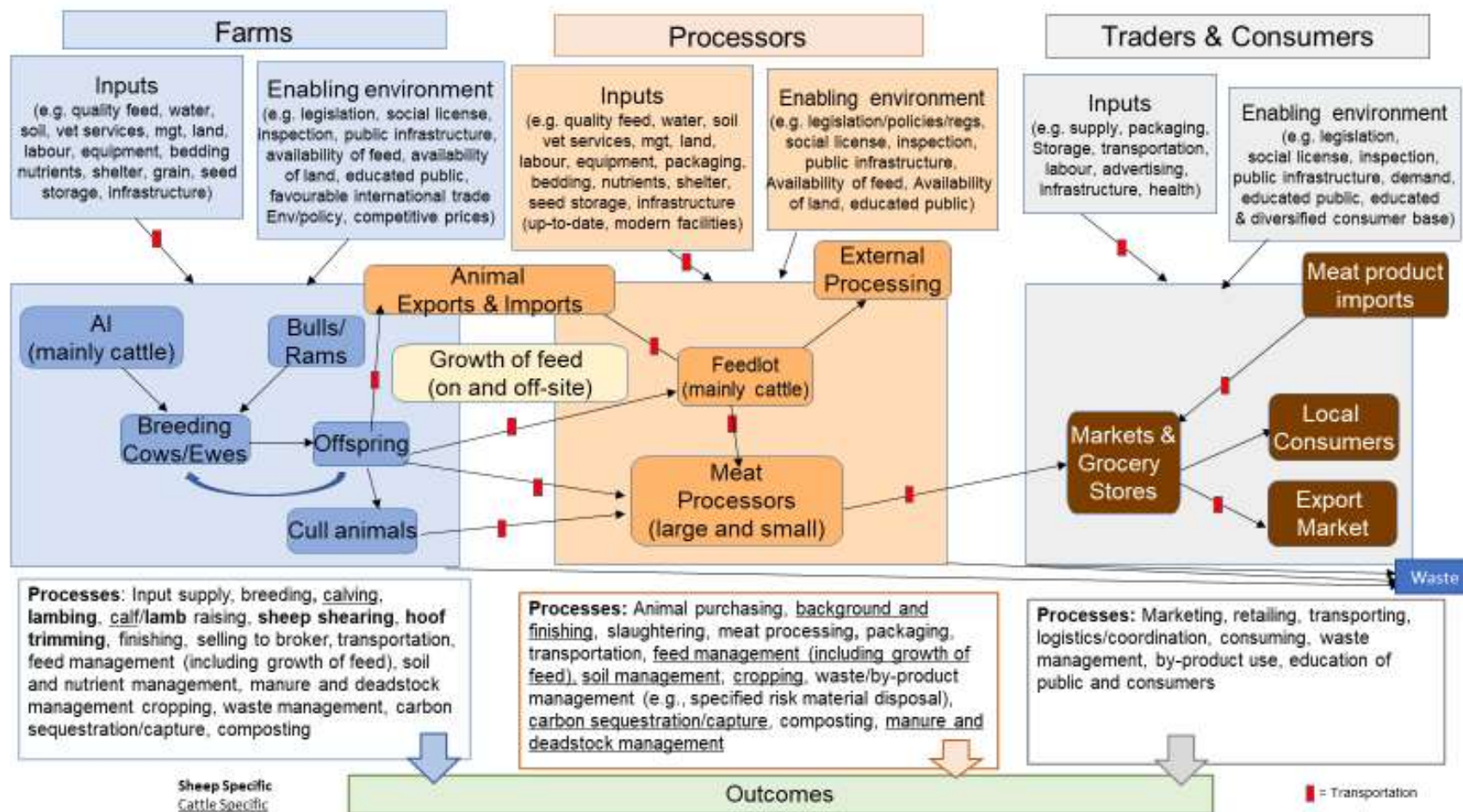
- Priority vulnerable things and processes to climate change
- Climate change impacts and opportunities
- Factors effective in addressing change
- Consideration of climate change on an individual level
- Consideration of where action will be required within 22 scenarios

→ ***Workshop 4 Series: Adaptation Strategy***

The final set of workshops saw the Scan Team develop the sectors' climate change adaptation strategy. Using the data collected from the survey, sector ECC facilitators developed a series of overarching, intermediate and short-term adaptation outcome statements which Scan Team members reviewed and validated until satisfied that all outcome statements represented the priorities of the cattle and sheep sectors. Scan Team members also developed a list of next steps as well as key and influential partners essential for strategy implementation.

ECC facilitators will seek endorsement from sector governance and Scan Teams before dispersing the strategy to the public.

Appendix 2: Cattle and Sheep Sector Model



Appendix 3: Key findings from the sector- specific climate adaptation survey

The cattle and sheep sectors' adaptation strategy was developed using the data gathered from the sector-wide climate change survey in the fall of 2021. This Appendix provides a summary of the key findings and messages that emerged from the survey data analysis.

Survey distribution and engagement

Who responded to the cattle and sheep sectors climate change survey?

The cattle and sheep sectors climate change survey received 36 respondents. To understand the audience that completed the survey, survey respondents were asked to indicate what part of the cattle and sheep sector(s) they were involved with. Respondents were able to select more than 1 answer. The majority of respondents identified as a beef producer with a large proportion indicating that they were both a beef and sheep producer. Another demographic question showed that 83% of respondents had at least 10 years experience within the cattle and/or sheep sectors.



Key finding 1

What cattle and sheep sectors things and processes did survey respondents consider most vulnerable to climate change?

Survey respondents selected land, healthy soil, water, quality feed and infrastructure as the most vulnerable cattle and sheep sectors things to climate change. Survey respondents also indicated that feed management, managing animal health, extensive production management, managing soil health, cropping, intensive production management and calving/lambing as the most vulnerable processes to climate change within the cattle and sheep sectors.

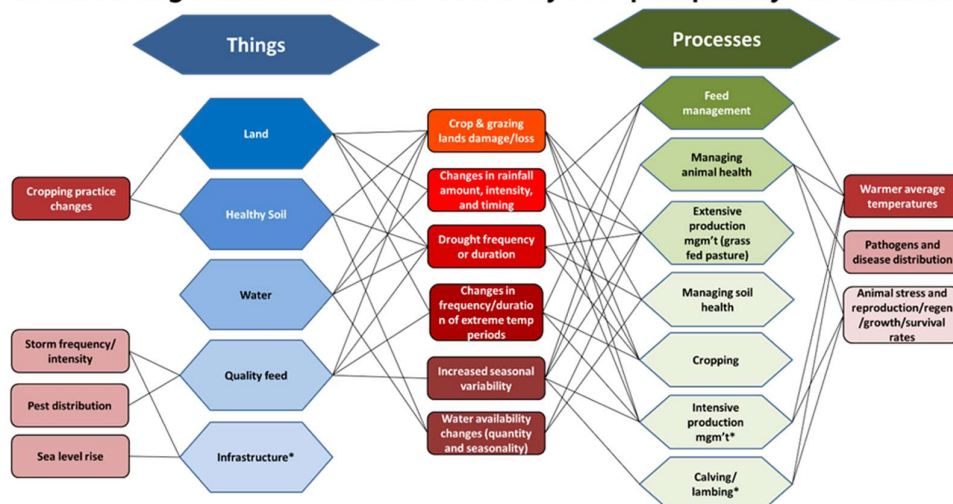
Things	Processes
Farm Families & Communities	Feed Management
Land	Managing Animal Health
Healthy Soil	Extensive Production Mgm't (grass fed pasture)
Water	Managing Soil Health
Quality Feed	Cropping
Infrastructure*	Intensive Production Mgm't*
	Calving/Lambing*

Key finding 2

What climate change impacts did survey respondents consider to be most threatening to the priority vulnerable things and processes?

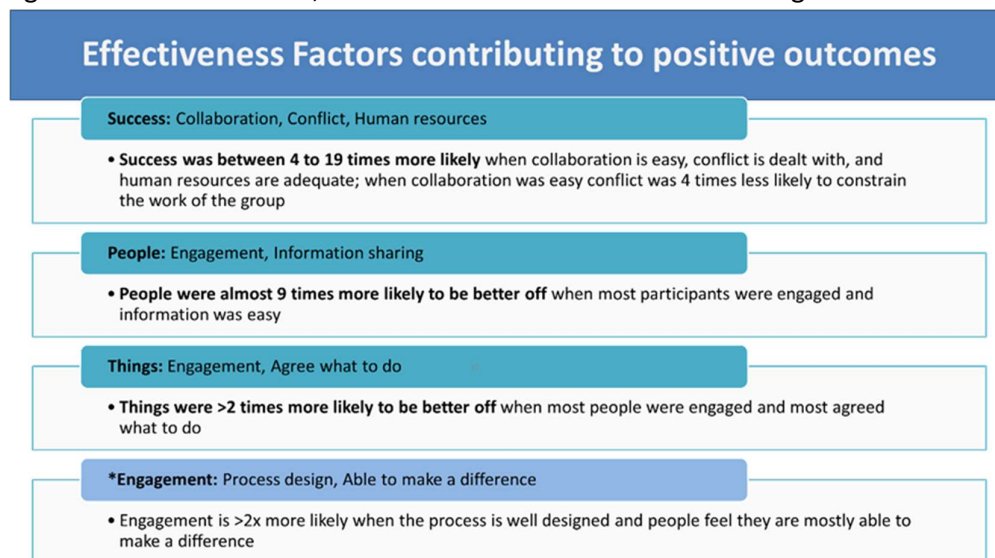
Top climate impacts effecting priority vulnerable things as well as processes included: crop and grazing lands damage/loss, changes in rainfall amount, intensity, and timing, drought frequency and duration, changes in frequency/duration of extreme temperature periods, increased seasonal variability and water availability changes. Top climate impacts effecting only priority vulnerable things include: cropping practice changes, storm frequency/intensity, pest distribution and sea level rise. Top climate impacts effecting only priority vulnerable processes include: warmer average temperatures, pathogens and disease distributions and animal stress and reproduction/regeneration/growth/survival rates.

Climate change factors viewed as most likely to impact priority vulnerabilities



Key finding 3**What helped or hindered the cattle and sheep sectors' ability to adapt to change?**

The cattle and sheep sectors' ability to successfully adapt to change was most largely influenced by people feeling engaged. Ensuring that people felt as though they could make a difference and having had a well-designed process promoted engagement within the sectors. The data also suggested that the cattle and sheep sector may have been better positioned for dealing with challenges when there were adequate human resources available, information sharing was easy, people agreed about what to do, and when conflict was not constraining.

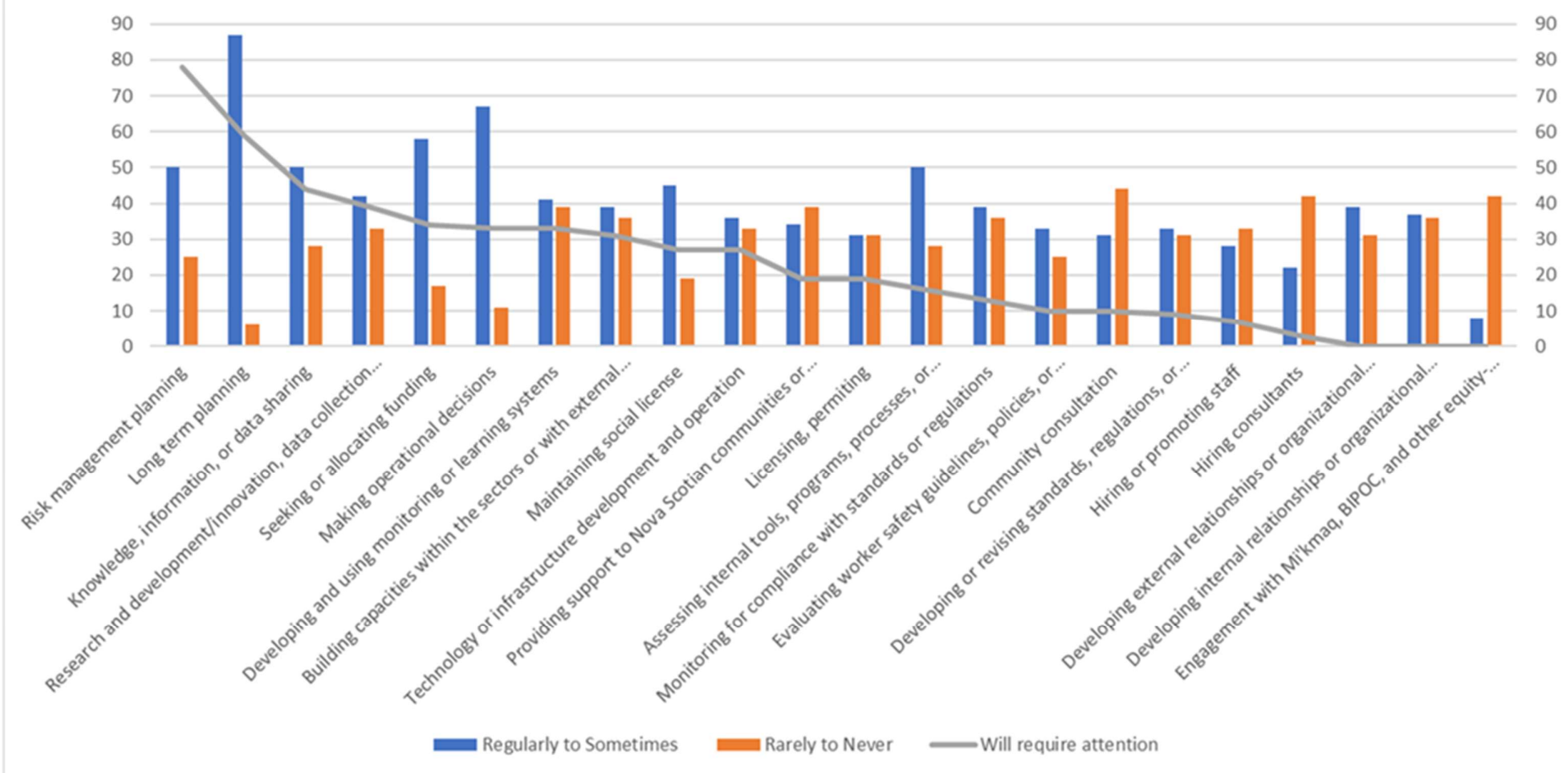


Key finding 4

How often climate change is considered on an individual basis and where the greatest climate change attention will be required within the next 30 years. Survey respondents were asked to indicate how often they consider climate change in a series of scenarios. Overall, survey respondents considered climate change regularly throughout the majority (16/22) of presented scenarios. Areas in which improvement on climate change consideration could be made included community consultation, hiring or promoting staff, hiring consultants and engagement with equity seeking groups.

In a separate question, survey respondents were asked to select the top five scenarios, from the previous question, in which the greatest attention for climate change will be required over the next 30 years. Risk management and planning was indicated as the area of greatest need for climate change consideration. Long term planning and knowledge, information and data sharing also ranked high in importance.

How frequently over the past year **respondents** have taken climate change into consideration in these situations (% of time) & what will require attention in the next 30 years for industry to be prepared for climate change



Appendix 4: Possible Activities

Implementing this strategy will position the cattle and sheep sectors well to thrive and expand in a changing climate. Successful implementation will require the engagement and commitment of key partners across the system coupled with activities that are best suited to achieve each short-term outcome. For each intermediate adaptation outcome theme area, Scan Team members brainstormed potential activities, which are presented below. This list is intended to help inform workplan development for strategy implementation but is not intended to be prescriptive or comprehensive.

Intermediate adaptation outcome theme area	Possible Activities
Sector leadership and partnership	<ul style="list-style-type: none">• Formation of governance structures• Communication of strategy by sector and governance
Enhancement and application of knowledge to support effective and sustainable climate change adaptation	<ul style="list-style-type: none">•
Adaptive and innovative services and programs	<ul style="list-style-type: none">• Identify the gaps in sector research needs.• Complete an inventory of the infrastructure that exists within the Maritime Region for research.• Improve the appreciation of sector research that is being completed at sites such as AAFC's Nappan site.• Create a catalog of current sector research projects underway• Create a catalog of research funding sources
Sustainable and Productive Sectors	<ul style="list-style-type: none">•

Appendix 5: Comprehensive List of Key Partners for Each Outcome Theme Area

Intermediate adaptation outcome theme area	Key Partners
Sector leadership and partnership	<ul style="list-style-type: none"> • Associations (Sheep Producers Association of Nova Scotia, Nova Scotia's Cattle Producers) • Extension services: including farm organizations such as Nova Scotia Federation of Agriculture and Nova Scotia Department of Agriculture • Innovative and progressive farmers: influencers who can bring others on board
Enhancement and application of knowledge to support effective and sustainable climate change adaptation	<ul style="list-style-type: none"> • Associations (Sheep Producers Association of Nova Scotia, Nova Scotia's Cattle Producers) • Extension services: including farm organizations such as Nova Scotia Federation of Agriculture and Nova Scotia Department of Agriculture • Key influential producer: play the critical role of early adopters and innovators that can lead by example • Provincial and federal governments: including NSDA, NSECC, and policy makers • Extension specialists and consultants: including veterinarians and Perennia • Sales representatives • Researchers: play an important role in innovation and development; this includes Agriculture and Agri-food Canada, Dalhousie University Agricultural Campus; living labs • Cattle and sheep sector commodity groups • Maritime Beef Testing Station: it is anticipated this will be expanded to include rams in addition to beef cattle • Influential representatives for Suppliers and processors • Other:
Adaptive and innovative services and programs	<ul style="list-style-type: none"> • Associations (Sheep Producers Association of Nova Scotia, Nova Scotia's Cattle Producers) • Extension services: including farm organizations such as Nova Scotia Federation of Agriculture and Nova Scotia Department of Agriculture • Although this list is the same as above, it is anticipated that there will be different people holding different roles within these organizations that should be involved in the implementation of this part of the strategy • Producer: play the critical role of early adopters and innovators that can lead by example • Provincial and federal governments: including NSDA, NSECC, and policy makers • Extension specialists and consultants: including veterinarians and Perennia • Sales representatives • Researchers: play an important role in innovation and development; this includes Agriculture and Agri-food Canada, Dalhousie University Agricultural Campus; living labs • Commodity groups • Maritime Beef Testing Station: it is anticipated this will be expanded to include rams in addition to beef cattle

	<ul style="list-style-type: none"> • Suppliers and processors
Sustainable and Productive Sectors	<ul style="list-style-type: none"> • Associations (Sheep Producers Association of Nova Scotia, Nova Scotia's Cattle Producers) • Extension services: including farm organizations such as Nova Scotia Federation of Agriculture and Nova Scotia Department of Agriculture • Representatives from across the system (see in Appendix 4): a team approach will be essential in order to understand the gravity of the situation the sectors face when it comes to climate change • Producers: they need to play a significant role • Consumers: essential because they hold purchasing power; it will be important to understand how to influence consumer choice/demand • Cattle and sheep sector-specific Social media: sites managed by industry associations: factual and relatable information needs to be shared through social media platforms • Government marketing groups such as the 'Buy Local' project.