AGENDA
COUNCIL COMMITTEE MEETING
MUNICIPAL DISTRICT OF PINCHER CREEK
October 11, 2022
2:00 pm
Council Chambers

1) Approval of Agenda

2) Delegations

    a) 2:00 – 2:30 Stacy McRae Allied Arts Council – Art for MD Building
    b) 4:30 – 5:00 Jeff Zukiwsky, AllOneSky and Tristan Walker, Municipal Energy Project Lead - Pincher Creek Climate Risk Assessment and Adaptation Plan

3) Round Table

4) Closed Session

    a) Capital Budget – FOIP Sec. 24
    b) Draft Utility Bylaw 1344-22 – FOIP Sec. 24
    c) A-ADMIN-003 Org Chart/Salary Grid – FOIP Sec. 24

5) Adjournment

Pincher Creek Climate Risk Assessment and Adaptation Plan

Project Overview

September 30, 2022

All One Sky Foundation, i*n partnership with t*he Prairie Adaptation Research Collaborative and the Resilience Institute is working with the Town of Pincher Creek and Municipal District (MD) of Pincher Creek to complete a climate risk assessment and adaptation plan. The overall project goal is to prioritize risks and develop a robust plan to adapt to climate change.

1 ORGANIZATION PROFILES

1.1 All One Sky Foundation

All One Sky Foundation is a not-for-profit, charitable organization established in 2010 to help vulnerable populations at the crossroads of energy and climate change. We do this through education, research and community-led programs, focusing our efforts on adaptation to climate change and energy poverty. Our vision is a society in which all people can afford the energy they require to live in warm, comfortable homes, in communities that are resilient and adapted to a changing climate.

1.2 Prairie Adaptation Research Collaborative

The Prairie Adaptation Research Collaborative (PARC) (www.parc.ca) is Canada's first regional climate centre. Established in 2000, it has executed over 100 research projects related to climate change, impacts and adaptation. Highlights include conducting the Climate Change Scenarios, Vulnerability and Impacts Assessment (2004-2008) for the Government of Alberta; producing the Biophysical Impact Assessment / SaskAdapt study (2006-10) for the Government of Saskatchewan; and leading the writing of the Prairies Chapter of the National Assessments (2006-08 and 2017-2020) for Natural Resources Canada. PARC has responded to over 400 requests for climate change information from government agencies, municipalities, industry, professional societies, community organizations, and NGOs. PARC maintains a climate data repository of regional climate model projections for the Prairie Provinces including maps, scatterplots and times series, and daily and monthly data. It also possesses a unique reconstruction of the Prairie paleoclimate based on dendrochronology (tree-ring dating) used to reconstruct past

temperatures, Prairie paleohydrology, and the frequency and severity of drought in the pre-instrumental record.

1.3 Resilience Institute

The Resilience Institute is a national charitable organization based in Alberta, Canada. Since our inception in 2014, our team at the Resilience Institute has focused its efforts on creating climate resilient futures and reducing risks to disasters. Our operating model consists of a small core team and network of diverse knowledge holders which enables us to be nimble and responsive to change while co-creating initiatives that are relevant to our partners. We work locally, nationally and globally with partners in government, local and Indigenous communities, academia, and other organizations on initiatives that build capacity in vulnerable communities and inspire personal, organizational, and community resilience. Unique to our work is that we actively weave Indigenous values with other ways of knowing to advance local change and inspire transformative thinking about the future.

1.4 Team structure

Our team will be coordinated by **Jeff Zukiwsky** who will serve as the primary contact point for the Pincher Creek project team. Jeff will act as the Project Manager overseeing all aspects of the project. Our core project team includes **Richard Boyd** (technical lead), **Dave Sauchyn** (climate science lead), and **Laura Lynes** (who will lead all First Nations engagement throughout the project). The core project team will be supported by:

- **Calvin Kwan**, a Climate Adaptation and Resilience Planner with All One Sky Foundation, will support research, planning and analysis;
- **Soumik Basu** (Prairie Adaptation Research Collaborative) will support the climate modelling and scientific research;
- **Jon Belanger** (Prairie Adaptation Research Collaborative), our GIS Analyst, will acquire and process the necessary data to produce hazard and vulnerability maps;
- **Elliot Fox** (The Resilience Institute) will act as the Indigenous Community Liaison; and
- **Brooklyn Rushton** (The Resilience Institute) will support First Nations engagement.

1.5 Project team bios

Short bios for our project team are provided below.

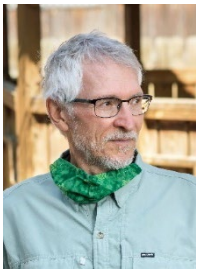
Jeff Zukiwsky, Director Climate Resilience and Adaptation, All One Sky Foundation

Jeff is a professional planner specializing in climate adaptation and resilience. For the past 14 years he has worked with communities and organizations across Canada to help them develop and implement strategies to reduce climate risk and vulnerability and manage climate change opportunities. Jeff is a strategic thinker with a unique ability to translate complex problems into simple solutions. At the community level, he has worked with over 40 municipalities, primarily in Alberta, supporting climate change risk and vulnerability assessments, adaptation and resilience planning, and implementation. Jeff has successfully managed dozens of climate adaptation and resilience projects. He currently lives in Fernie, BC.

Dr. Richard Boyd, Director Research and Economics, All One Sky Foundation

Richard is a nationally recognized expert on the economics of climate change, with 25 years' experience evaluating the costs of inaction, as well as the costs, benefits and distributional impacts of adaptation and mitigation actions to inform decision-making at all levels of government. His work focuses on climate change (economic) risk assessment and decision-making methodologies, and he has authored several resource guides on these topics, as well as serving as lead author for the "Costs and Benefits of Climate Impacts and Adaptation" chapter of Canada's national climate change knowledge assessment. Richard recently completed economic analyses of the physical risks of climate change for Calgary and Edmonton, and he is currently leading a study of the costs and benefits of adapting Calgary's public infrastructure to climate change. Since 2014 he has supported climate risk assessments and the development of adaptation strategies in over 15 municipalities in Alberta.

Dr. Dave Sauchyn, Director, Prairie Adaptation Research Collaborative (PARC)



David Sauchyn has been in various roles at PARC over the past 20 years, including Director since 2017. Dave is also Professor of Geography and Environmental Studies. He has been with the University of Regina since 1983. His research interests are 1) the climate and hydrology of the past millennium and how this knowledge of the past can inform our understanding of future climate and water supplies, and 2) planned adaption to minimize the adverse impacts of climate change on the natural capital of western Canada. Dave was the lead author of the Prairies Provinces chapter of the national assessment of climate change released in late 2020. Dave likes to run, frame buildings, and follow the exploits of his adult children.

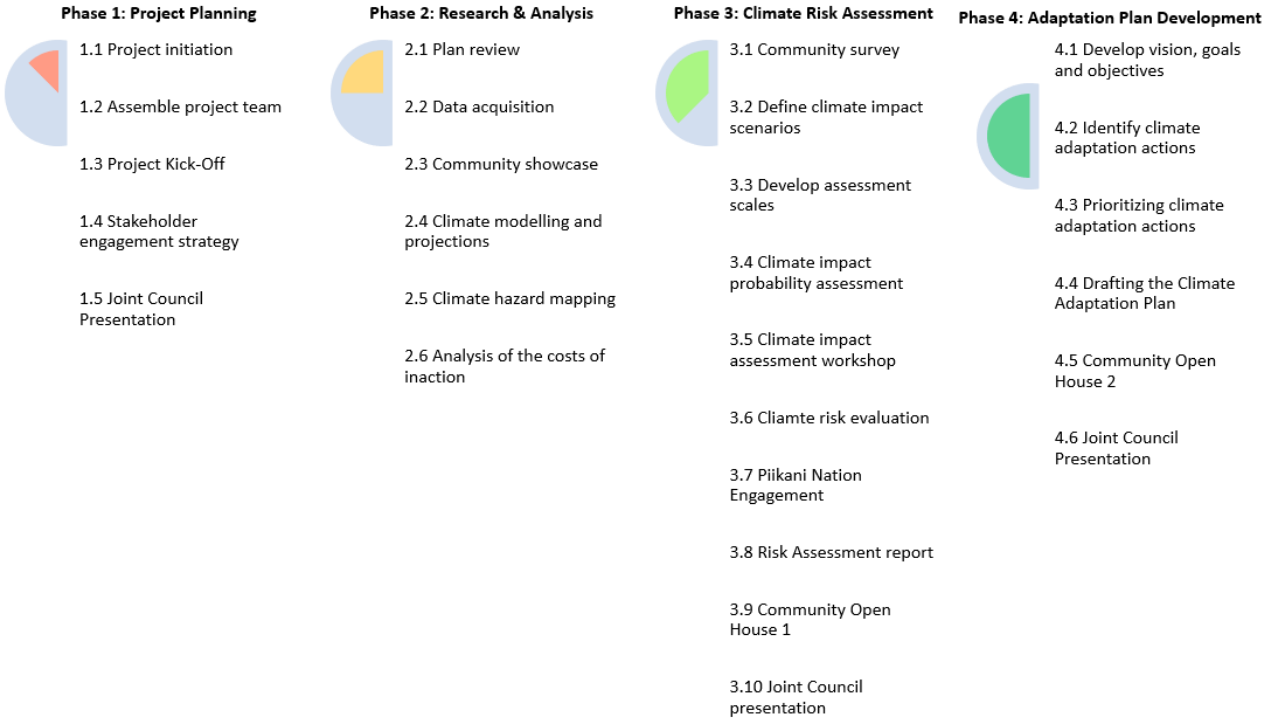
Laura Lynes, LLM – President / CEO, The Resilience Institute

Laura is the co-founder of The Resilience Institute. She holds a Master of Law with distinction in climate change law & policy and a master's degree in intercultural and international communications. She is a Focal Point of the UNFCCC Nairobi Work Programme. Laura received the Dean's Excellence Award at Strathclyde University Law School and prior to that, the American Sociological Association's Jane Goodall Fellowship for her work on perceptions on inclusion of large carnivores in communities. She has an extensive background partnering with Indigenous Peoples throughout Canada as a youth & family worker and a program lead on resilience building initiatives.

2 APPROACH

Our proposed approach to this project comprises four phases as outlined below and in Figure 1.

Figure 1 Proposed Project Approach



2.1 Phase 1: Project planning and onboarding

Task 1.1: Project initiation ✓ *[Complete – September 23, 2022]*

To initiative the project we held a meeting with the project contact (Tristan Walker) to discuss work planning and project scope. The scope of work for this project considers climate-related impacts affecting both (a) the "corporation" of Pincher Creek and the MD and (b) the broader community. Thus, the project will consider climate change impacts that may, for example:

- Affect the health and well-being of local residents and visitors;
- Cause damage to homes, public and private buildings, and other public and private infrastructure;
- Damage or impair the provision of local ecosystem goods and services; and/or
- Disrupt livelihoods and the local economy.

The geographic scope of the project is defined as the municipal boundaries of the MD, and limited to direct physical impacts of climate change within the Pincher Creek MD.

Actions identified in Phase 4 will include actions that the Town and MD can take to increase the resilience of both "corporations" and the broader community, directly or indirectly, to climate-related risks. When considering future climate change risks, we will look at climate changes under a scenario of 3°C global climate warming from pre-industrial times. Future time periods to be considered (e.g., 2040s, 2050s, 2060s, 2070s, 2080s) will be confirmed in Phase 2.

Task 1.2: Assemble project team ✓ *[Complete]*

The project team is assembled and includes:

- ?
- ?
- ?

We envision meeting with the Project Team on a regular basis throughout the project to support our core project team with ongoing work planning, project management and decision-making, and to address challenges as they arise. We propose to have bi-weekly (every 2 weeks) meetings with the Project Team.

Task 1.3: Project kick-off meeting [*Scheduled for October 3, 2022]*

Once the Project Team is assembled, we will hold a formal kick-off meeting for the project. The kick-off meeting will be an in-person meeting attended by our Project Manager (Jeff Zukiwsky) with members of the Project Team and other invited stakeholders. The goals of the kick-off meeting are to:

- Review the project goals.
- Review basin climate change and adaptation concepts and terminology
- Discuss the proposed workplan including timelines, key deliverables, and methodology for risk assessment and adaptation planning.
- Agree upon the project scope, including geographic boundaries, timeframe, and climate scenario(s) to be considered.
- Review the stakeholder engagement approach and communications strategy, including key stakeholders to be engaged, and the date, venues and approaches for key events.
- Agree on dates and times for Project Team meetings (bi-weekly)

Based on this meeting, we will update the project workplan and schedule. We will draw on our extensive experience in project management and coordination to ensure an effective flow of information between all project participants.

Task 1.4: Engagement and communications strategy [*In progress]*

Immediately following the kick-off meeting, we will prepare a draft document outlining the overall approach for engagement throughout the project. Communication and engagement with First Nations, the public and stakeholders are critical to the success of this project – both for information gathering on local climate impacts, adaptations and priorities, and to build long-term community support for recommended climate adaptation and resilience initiatives.

As outlined in the task descriptions below, the key First Nations, community and stakeholder engagement events for this project include:

- The community showcase event (Task 2.3) which is envisioned to include a field tour of the community to review hazardous areas and local vulnerabilities.
- A community survey (Task 3.1) designed to help our team and the project team understand community perceptions of climate risk and adaptation options.
- A series of workshops or meetings with key stakeholders at the Town and M.D. (including Joint Council) to complete the climate risk assessment:
    - Define climate change impact scenarios (Task 3.2);
    - Assess climate change risks (Task 3.5); and
    - Evaluate the results of the climate change risk assessment (Task 3.6).
- An engagement meeting with members of the Piikani Nation to provide an opportunity to give input on the climate risk assessment results and adaptation actions (Task 3.7)
- A community open house event to present results of the climate risk assessment and gather public input on priority risks and climate adaptation actions (Task 3.9)
- A series of climate adaptation action planning sessions, based on the thematic results of the climate risk assessment, with key stakeholders and Joint Council (Task 4.2).
- A community open house to present the results of the project and the Climate Adaptation Plan (Task 4.5).

In addition to the above, there are three presentations to Joint Council covering:

- The project workplan, schedule, deliverables and draft stakeholder engagement strategy (Task 1.5).
- The results of the climate change risk assessment process (Task 3.10).
- The results of the final Climate Adaptation Plan (Task 4.6).

We anticipate a mix of virtual and face-to-face meetings and workshops and will collaborate with the Project Team to finalize the engagement and communications strategy. It is our understanding that Joint Council meetings will be face-to-face, and that Joint Council meetings may not always be feasible. As such, budget has been allocated for individual presentations to the Town and MD Councils respectively as required.

Task 1.5: Presentation to Joint Council [*Scheduled for October 11, 2022]*

Following the kick-off meeting we will update the project workplan, schedule and deliverables to present to Joint Council. Following the presentation, further updates to the workplan, schedule and deliverables will be made to accommodate feedback from the Joint Council.

Phase 1 Key Deliverables:

1a) Stakeholder engagement and communications strategy.
1b) Updated workplan, schedule and deliverables based on feedback from the Project Team and the Joint Council.

2.2 Phase 2: Research and Analysis

The goal of Phase 2 is to gather and analyze all available data and information to support the project. This includes:

- Existing reports, plans, actions, strategies, and commitments which relate—directly or indirectly—to climate impacts and adaptation.
- Climate (observed) trends and future projection climate projections for the Pincher Creek MD (Task 2.4).
- Data and analysis to support hazard and exposure mapping and visualizations (Task 2.5).
- Data and analysis to estimate the "costs of inaction" for the Pincher Creek MD (Task 2.6).

This review will provide a summary of available climate trends and projections, and the overall state of climate impacts adaptation in the region and provide insights into the Town and MD's existing exposure and vulnerability to climate change, as well as the associated economic consequences.

Task 2.1: Document review

To develop a complete understanding of potential climate risks and vulnerabilities, and adaptation requirements, we will conduct a thorough review of existing reports, plans, actions, strategies, and commitments which relate—directly or indirectly—to climate impacts and adaptation.

This review will provide a summary of the overall state of climate impacts and adaptation in the region and provide insights into the Town and MD's existing vulnerability and preparedness to climate change.

Task 2.2: Data acquisition

The goal of this task is to acquire all data necessary and accessible to support and complete the climate change risk and adaptation action assessments:

- Data to support analysis of the "cost of inaction" (i.e., the economic consequences for the area that result from allowing climate change to continue unabated and without further planned

adaptation) in the face of further climate change – e.g., Census data, asset/infrastructure inventories, natural area/habitat inventories, tourism data, property tax assessment data, growth studies, etc.
- Data to support the creation of climate hazard mapping and related visualizations of priority risks.
- Data, reports or information on the consequences of historical climate-related events and impacts, such as flooding, wildfires, droughts, storms, etc.

For each of these areas, we will prepare a data request to discuss with the Project Team. The scope of the analysis and mapping will depend on the accessibility of locally held data—acknowledging that we will still be able to obtain a large volume of the required data from other public sources (e.g., Statistics Canada).

Task 2.3: Community showcase

We are proposing a community showcase event as a means of information gathering, sharing perspectives and building trust and cohesion amongst the Project Team, consulting team and others involved in the project. The event will start with a morning session focused on learning about the Pincher Creek area, and an afternoon field site visit to look at areas around the Town and MD focusing on important hazard or vulnerability areas or resilience initiative.

In the morning session we will invite representatives from the Town, MD and other stakeholders to 'tell us about your community'. This is an essential step in information gathering in this project and involves mini presentations by appropriate representatives to help our team, and everyone involved in the project, understand historic impacts, strengths, weaknesses, and future plans that might be related to climate change impacts and adaptation initiatives. We envision this as a fun and informative half-day session with mini-presentations on topics such as:

- The current state of local infrastructure (roads, water supply systems, stormwater, waste management, facilities, etc.) including major systems and potential local vulnerabilities;
- Emergency management capacity and event history;
- Community planning initiatives, including the community's growth management plan and vision, and major projects anticipated or underway;
- Local culture and quality of life, including recreation, socio-cultural organizations and events, and community social services and programs;
- Local environmental and conservation initiatives; and
- The local economy, it's drivers and potential vulnerabilities.

Through this session, we would hope to gain a better understanding of the current state of vulnerability and adaptation in Pincher Creek.

Task 2.4: Climate modeling and projections

This task involves compiling detailed projections of climate change for the Pincher Creek area. Numerical climate models are the main tools for making projections of future climate. Modelling centres throughout the world have built one or more climate models. Models are run multiple times because each run

represents a somewhat different future climate; the actual climate cannot possibly be known. Thus, there is range of future climate conditions, although the models agree on certain trends or shifts in climate.

Most climate risk assessments and adaptation plans are based on climate data that are extracted from models that replicate the climate of the entire world, so called Global Climate Models (GCMs). This includes the first set of climate change scenarios for Alberta, which were created by PARC for the Government of Alberta in 2005, and most other climate change studies since then. GCM data has a resolution in the range of 100-250 kilometers; this is the size of grid used to make the calculations. The public web sites[1] that provide climate change projections for Canada are based on GCM data that has been downscaled to 10 km resolution using the statistical relationship between the model output and weather station data. This information is reliable for single locations, for temperature variables and for areas of relatively uniform physiography and climate. For areas where the topography is varied, and for variables related to precipitation and extreme events, the preferred source of data is Regional Climate Models. RCMs solve the model equations on a finer grid (10-25 km). This results in much more data, and thus requires more computing resources, which PARC has the expertise and resources for.

We will develop a new set of high-resolution climate change projections for the MD of Pincher Creek using daily output for more than 20 climate variables from 11 RCMs. Another innovative aspect of our proposal is to derive the regional climate projections according to levels of global warming: 1.5 ^{o}C, 2 ^{o}C, and 3 ^{o}C compared to historical values for the period 1976 to 2005. An increase of 1.5 ^{o}C in global temperature (relative to pre-industrial levels) is the target under the Paris agreement (requiring net zero global CO2 emissions by 2050); +2 ^{o}C is considered dangerous global warming; and +3 ^{o}C is the "current policies" scenario - the trajectory the world is currently following. For each of these global warming scenarios, we will determine the local changes in specific climate variables (such as maximum and minimum temperatures, precipitation changes, etc.) We can define extremes of temperature and precipitation using standard thresholds or use values that have more meaning for local conditions as defined by local stakeholders. Similarly, we can add other variables (e.g., frost-free and growing degree days) and indices of climate extremes (e.g., drought and excess moisture) as suggested by MD and Town staff or local stakeholders.

The changes in each of the climate variables, for each of the 11 RCMs and three global warming scenarios, will be summarized in a climate projections Technical Memo for the Pincher Creek MD (tables and graphs), which will be provided to stakeholders in advance of the risk assessment workshop (Task 3.5).

Task 2.5: Climate hazard mapping

Based on the climate modelling and projections, and additional information compiled through Task 2.4, (Data acquisition), we will produce a set of customized and detailed maps of climate-related hazards for the Pincher Creek MD. The goal of the climate hazard mapping is to highlight, to the best degree possible local exposure to climate-related hazards, and the vulnerability of the Town and MD to climate change.

[1] For example, The Climate Atlas of Canada - https://climateatlas.ca/, and Climate Data Canada - https://climatedata.ca/.

We envision the maps to include existing and known hazards (such as results of the Pincher Creek Flood Study) and be overlaid with high-resolution climate projections for the MD of Pincher Creek. We will also overlay the climate hazard maps with layers of geospatial data on infrastructure, land use, elevation and drainage, etc. as a geographic baseline and to show the interaction of climate hazards with the local population and economic activities.

Maps will be produced in the ArcGIS Pro v. 2.9 Geographic Information Systems (GIS) platform and will be used to help local stakeholders understand and evaluate climate risks in Phase 3.

Task 2.6: Analysis of the "costs of inaction"

Given the potential magnitude of climate adaptation investment costs, there is a need to provide decision-makers—who face limited human and financial resources—with defensible economic information on projected costs and associated benefits to support adaptation investment decisions. A key piece of economic information used to persuade senior leadership and Council of the need and urgency to allocate resources to adaptation planning is the "cost of inaction"—i.e., the economic consequences that result from allowing climate change to continue unabated and without further planned adaptation. This information is used to inform the overall scale of investment in adaptation, the selection, timing and sequencing of specific adaptation options, and the distribution of adaptation costs and benefits between members of the community.

The goal of this task is to generate estimates of the economic impacts of climate change to multiple 'sectors' in the Town and MD. The sectors we will be able to include in the analysis will depend on the availability data – in particular, for municipal buildings and facilities, utilities (water, wastewater, stormwater and electricity T&D) and transportation (roads and rail) infrastructure, and natural assets. We will be able to determine the scope of the analysis of economic impacts following the data acquisition task.

In the assessment, we will also investigate the potential to include economic consequences for the agricultural sector and tourism sector in the region, integrating local information with the modelling approaches applied in studies reviewed for the "Costs and Benefits of Climate Impacts and Adaptation" chapter of the national climate change knowledge assessment, for which we were the lead author.

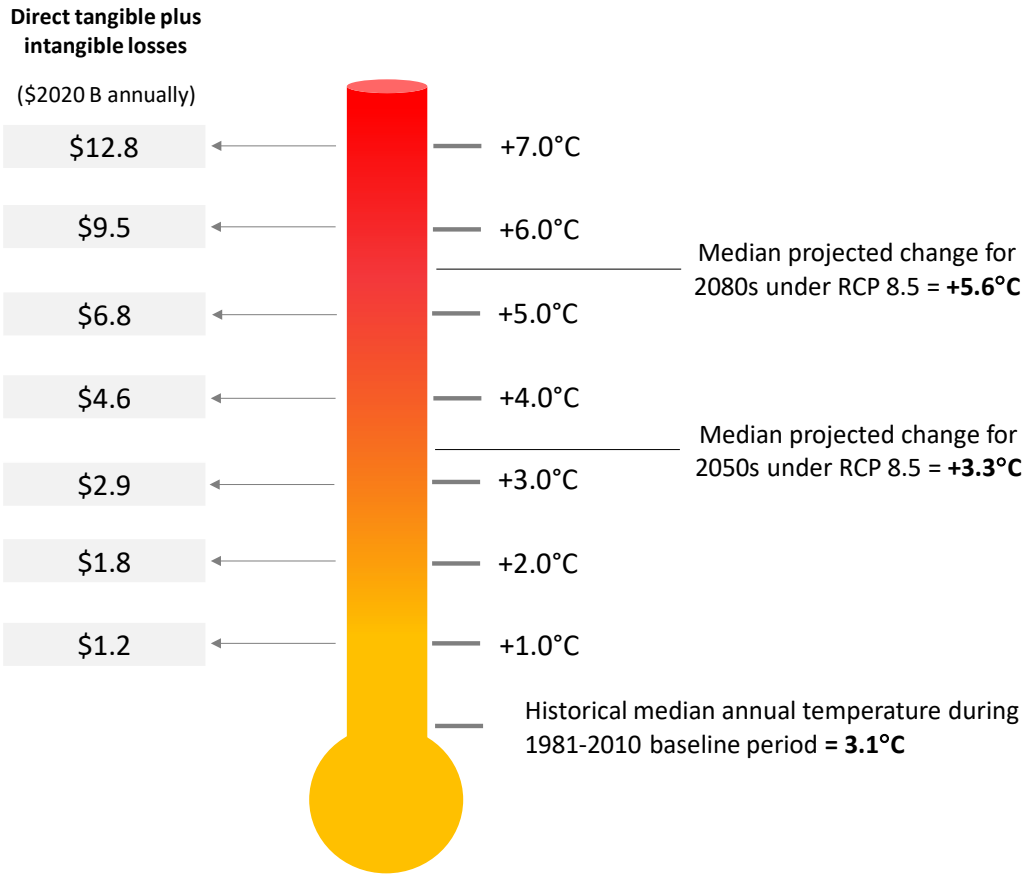
Our proposed methodology for this task—successfully applied in the Calgary and Edmonton studies—is best described as a multi-model, multi-sector approach, since the modelling approach applied to each sector is specific to that sector. In addition to estimating the direct tangible[2] and direct intangible[3] economic consequences of climate change for the Pincher Creek area, we will calibrate our regionalized

[2] These costs arise from the physical impacts of climate impact-drivers, such as damage or disruption, to (tangible) goods and services that can be traded in a market and thus have an observed price as a basis for monetization (e.g., costs incurred to repair or replace damaged homes, the medical treatment costs for heat stress, etc.).

[3] These costs arise from physical impacts to (intangible) items not bought or sold in a traditional market and thus with no readily observable price as a basis for monetization (e.g., ecosystem services, stress or pain levels, travel delays). Economists have developed multiple techniques to 'shadow price' these intangible (or non-market) impacts (e.g., the Value of a Statistical Life used to price the risk of premature death in a population).

input-output model of Alberta for the Town of Pincher Creek (Population Centre) and the Pincher Creek No.9 MD (Census Subdivision) so we may also estimate the associated macroeconomic impacts, including direct and indirect output, income, GDP, and tax effects for the regional economy.

The output of this task will be estimates of the economic costs of the status quo for Pincher Creek, in aggregate and by those sectors we are able to include in the analysis, for specific future time periods (e.g., the 2040s, 2050s, 2060s, etc.) relative to a climate baseline period, and for one future climate scenario (e.g., +3.0°C change in global mean temperature by the year 2100). We will summarize the results in tabular and graphical formats—an example from the City of Edmonton Study is shown blow:



Phase 2 Key Deliverables:

2a) State of Climate Adaptation Report, summarizing results from the Plan Review (Task 2.1), and Community Showcase (Task 2.2), and highlighting historic impacts, key vulnerabilities, and current plans, policies and strategies related to climate adaptation.

2b) A report outlining climate trends and projections for the Pincher Creek MD, including maps, figures and tables as needed (Task 2.5).

2c) Technical Memo documenting the methods and results of the "costs of inaction" analysis (i.e., the economic impacts of the physical risks of climate change within the Pincher Creek MD) (Task 2.6).

2.3 Phase 3: Climate Risk Assessment

The goal of Phase 3 is to identify, assess, and evaluate climate change risks (and opportunities) facing the MD and Town of Pincher Creek. The assessment will include consideration of all climate change-related impacts, and their effect (either positive or negative) on municipal buildings, facilities and infrastructure, municipal services, the health and well-being of residents and visitors, the natural environment, and the local/regional economy. Our approach to the risk assessment employs a 'best practice' methodology, which is based on our "*Climate Resilience Express – Community Climate Adaptation Planning Guide*" (https://mccac.ca/app/uploads/CRE_Planning-Guide_Final.pdf), which we developed for the Municipal Climate Change Action Centre and the Climate Resilience Capacity Building Program. Our work is also aligned with the recently published International Standards Organization (ISO) guideline 14092: Adaptation to Climate Change—Requirements and guidance on adaptation planning for local governments and communities, and with the Intergovernmental Panel on Climate Change's (IPCC) latest conceptualization of climate risk assessment methods.

This risk assessment includes three key workshops/meetings with the project team and local stakeholders:

- Workshop 1 – defining climate impacts and potential scenarios
- Workshop 2 - assessing the consequences of each climate impact scenario, through a participatory process with stakeholders
- Workshop 3 – evaluation of the risk assessment results

Task 3.1: Community survey

Prior to the risk assessment process, we will conduct a community survey to help us, and the project team elicit community perceptions of climate risk, vulnerability and adaptation.

Through the survey we will ask questions such as:

- How concerned are you about the following climate changes in Pincher Creek (increased precipitation and flooding, hotter and drier summers, water supply issues, more extreme weather, etc.)?
- Which of the following local services do you think will be most impacted by climate change (agriculture and food security, infrastructure, quality of life, the economy, the natural environment, etc.)?
- What are the most important action the MD and Town can take to manage climate change impacts in our region?

Our experience doing similar surveys in other communities shows that this community survey approach provides critical information to inform the climate change risk assessment process. It is assumed that the Town and MD will support the dissemination of the survey through, for example, advertising on the Town and MD website, on social media, and through dissemination of the survey to community contact lists.

Task 3.2: Define climate impact scenarios

The starting point for the risk assessment is a set of impact scenarios that characterize the cause-and-effect relationship, or impact chain, between climate changes, impacts, and the potential consequences of those impacts. To begin the process of defining climate impact scenarios, our team will compile a draft list of impact scenarios, based on information gathered during Phase 2 including the historical occurrence of climate-related events in the region, background research, and our experience working on climate adaptation plans with communities across Canada.

In addition to taking account local exposure to climate hazards, we will also consider the vulnerability (sensitivity and lack of coping capacity) of local services, infrastructure, populations and the natural environment. Vulnerability to a given climate impact influences the magnitude or severity of impacts and consequences. It is therefore important to characterize key vulnerabilities as part of the climate impact scenarios.

We will define the climate impact scenarios using thresholds of temperature, precipitation, or other variables (such as frost-free season length or meteorological drought) that are most relevant to local stakeholders and to the climate conditions of the Pincher Creek area.

Once drafted, we will meet with the project team to update and finalize the climate impact scenarios.

Task 3.3: Develop assessment scales

We will use a semi-quantitate approach to the risk assessment. This involves assigning categorical (very rare to almost certain) and numerical (1 to 5) values to the likelihood and consequence of each climate impact scenario. We will develop tailored rating scales for likelihood and consequence that are aligned with the Town and MD's existing risk management policies and practices. The assessment scales will be reviewed and agreed to by the Project Team at Workshop 1.

Task 3.4: Climate impact probability assessment

The goal of the likelihood assessment is to determine the likelihood of each climate impact scenario occurring, historically and in the future as a result of climate change. The likelihood assessment will be based on specifically defined climate impact thresholds, as determined at Task 3.1 and the development of climate impact scenarios. Where possible, we can utilize climate projection data to quantitatively determine the likelihood of each impact scenario, as an annual exceedance or non-exceedance probability. The estimated probabilities are then transcribed into a 1-5 score using the likelihood scale developed at Task 3.3.

In some cases, it may not be possible to quantify the likelihood of a climate impact scenario. In these cases, the 1-5 likelihood score will be based on best available research, and Pincher Creek's experience with climate impacts in the past, and the professional judgement of our project team.

The likelihood assessment will result in each climate impact scenario (and associated consequences) having an estimated likelihood of occurrence at a defined intensity level (or threshold). The estimated likelihoods will be validated with staff and stakeholders and form one part of the climate risk calculation.

Task 3.5: Climate impact assessment workshop

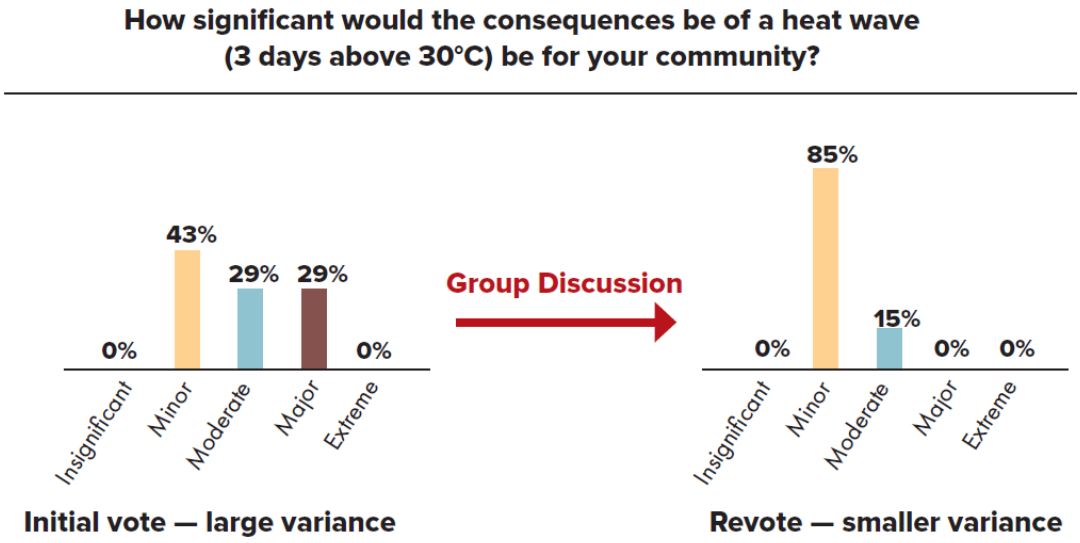
The goal of the climate impact assessment workshop is to determine the severity of all potential consequences of each climate impact scenario. A climate hazard (heat wave for example) or opportunity may have different consequences for public health & safety, municipal assets and services, the economy and natural environment. It is necessary to assess the severity of all potential consequences individually to determine priorities, and develop an adaptation plan that addresses specific, high priority consequences.

To complete the climate change risk assessment, we will facilitate an in-person workshop with municipal staff and stakeholders. Our tested method of engagement involves stakeholders in an evaluation exercise (voting) combined with facilitated dialogue that encourages the sharing of participants' expertise and perspectives to stimulate deeper analysis of climate change impacts. We will utilize digital voting software to assess the consequence of climate change impacts. The software records the scores assigned to each criterion and allows participants to view the collective results in real time. In cases where an initial vote produces a large variance in scores, we facilitate group discussion and participants are invited to re-vote. Group discussions provide critical information to support risk assessment, such as the frequency and severity of historic climate events and their consequences, and the vulnerability (sensitivity) of Municipal activities, assets and services to projected climate stressors.

In our experience, this digital voting approach is extremely effective in both achieving alignment on consequence scores (as illustrated in Figure 2), and more importantly, a shared understanding of local climate change risk and priorities for adaptation action planning.

Following the risk assessment, the likelihood and consequences scores will be combined to generate a numerical risk score for each impact scenario. These scores will be used to prioritize climate change risks, and to generate a heat map, or risk rating matrix, for Pincher Creek.

Figure 2: Example of achieving alignment in a climate change risk assessment through digital voting and discussion



Task 3.6: Climate risk evaluation

The result of the risk assessment process is a climate change risk matrix and/or rank-ordered risk-rating spectrum, which delineates between risks that pose an unacceptable threat to Pincher Creek, and those that do not. Impact scenarios with higher consequence and higher likelihood of occurrence represent larger risks for the region and will inform the selection of the top risks or themes for further assessment. But prior to identifying priorities to take forward, a risk evaluation and verification process will be conducted to verify the results of the risk assessment and the selection of priorities.

The risk evaluation allows staff and community working group stakeholders to review the relative ranking of climate change impacts and consequences and make well-reasoned arguments to adjust their scoring and ranking if they are judged—when viewed collectively—to have been either over or under-estimated in comparison to one another. We will conduct the risk evaluation process virtually.

Task 3.7: Piikani Nation engagement

Following the climate risk assessment process, we propose to host an engagement meeting with members of the Piikani Nation. The goal of this engagement is to provide the Piikani Nation with an opportunity to share their perspectives on climate risks facing Pincher Creek and to help identify climate adaptation actions that may involve collaboration with the Town and MD.

Task 3.8: Risk assessment report

The results of Phase 3 (the Climate Risk Assessment) will be compiled into a draft Climate Change Risk Assessment report. The contents of this draft report will be present to the public for comment and feedback at the first community open house (Task 3.9).

Task 3.9: Community open house 1

Following completion of the climate risk assessment, we propose to host a community open house event. The goals of the open house event would be to:

- Provide an overview and rationale for the climate adaptation planning process and answer questions from the public,
- Present the results of the climate modeling and projections (Task 2.4) to help community members understand basic climate science, future climate projections, and local impacts,
- Present results and gather public input on the climate risk assessment results and priority climate change risks facing the Town and MD, and
- Gather public input on potential climate adaptation actions that could be implemented by the Town and MD to address priority risks.

We will work with the Project Team to identify an appropriate venue(s), date(s) and time(s) for the community open house event. It is assumed that the Town and MD will support the advertising and dissemination of information regarding open house to the public.

Task 3.10: Presentation to the Joint Council

Once we hear from the public at the open house, we will update the Climate Change Risk Assessment report and present to Joint Council.

Phase 3 Key Deliverables:

3a) Report documenting the methods and results of the Climate Change Risk Assessment
3b) Excel file containing the consequence, likelihood and risk scoring.

2.4 Phase 4: Adaptation Plan Development

The goal of Phase 4 is to develop a climate adaptation plan for the Town and MD of Pincher Creek to address the priority risks and outcomes from Phase 3.

Task 4.1: Develop vision, goals and objectives

We will facilitate a meeting with the project team to develop the vision, goals and objectives for the Climate Adaptation Plan. This is one of the most important aspects of the process. It's important that the

project team, and hence the Town and MD "own" the resulting Plan. Collaborative development of the vision, goals and objectives allows stakeholders to see their role in building community resilience.

The vision, goals and objectives should align with existing initiatives and plans in the Town and MD such that the Climate Adaptation Plan can be 'mainstreamed' and integrated into existing plans and processes. Where possible, climate adaptation should be aligned with City planning processes, such as business planning, asset management, land use bylaws, municipal development policies, and so forth.

Task 4.2: Identify climate adaptation actions

The goal of this task is to identify actions to manage the priority risks from the climate change risk assessment process. To begin this process, our team will draft an initial list of potential actions drawing on our extensive experience having developed climate adaptation plans for over 40 communities across the country. Our assumption is that the actions will focus on what the Town and MD can implement to directly control risk (for example, Bylaws, policies, infrastructure and building upgrades, etc.) as well as how the Town and MD can support local business, individuals and organizations to adopt climate adaptation measures (for example, through incentives, public education program, local capacity building, etc.).

To identify adaptation actions, we will:

- Consider a variety of actions, including but limited to infrastructure upgrades, nature-based solutions, policies, projects, strategic planning, information gathering, education programs, etc.
- Propose actions under a set of climate adaptation "themes". In our recent experience, the themes from Canada's National Adaptation Strategy are a good starting point: 1) Resilient Built and Natural Infrastructure, 2) Thriving Natural Environment, 3) Health and Well-Being, 4) Disaster Resilience, and 5) Strong and Resilient Economy.
- Consider partnerships with local businesses and other organizations, First Nations, nearby communities, and other levels of government.
- Identify actions that also support the reduction of greenhouse gas emissions, including the abatement potential of those actions (low-medium-high).

Once our team has drafted an initial set of climate adaptation actions, we will host a series of climate adaptation planning meetings with the Project Team, as well as other key city staff and stakeholders. We recommend a series of planning sessions based on the themes identified above. The goal of the climate adaptation planning workshops is to identify feasible actions and verify the potentials actions that can be implemented by the Town and MD to manage climate the priority risks from the climate change risk assessment process. These planning sessions may be a mixture of virtual and face-to-face meetings, depending on interest and availability of stakeholders.

We will also, through the thematic workshops and through follow-up meetings, gather detailed information about each potential action, including a detailed description, the estimated cost, the timeline to implement the action, and the municipal department that would implement the action. This detailed information is essential to complete the action prioritization process at Task 4.3

Task 4.3: Prioritizing climate adaptation actions

The team will consolidate actions identified at the action planning workshops and use a multi-criteria cost-benefit framework to prioritize climate adaptation actions for Pincher Creek. Prioritizing climate actions should be based on all potential benefits (i.e., outputs) and all relevant costs (or inputs) needed to deliver those outputs. Our tested multicriteria-based approach to cost-benefit analysis (an example criteria and scoring scheme is shown in Figure 3) will support the prioritization of cost-efficient adaptation actions; this framework is used to calculate a benefit-cost ratio for each action, with those actions with the highest ratio prioritized. The criteria in Figure 3 are based on international best practice, as documented in the "Costs and Benefits" chapter of the national climate change knowledge assessment. Typically, we start with these criteria and adapt the definitions or add additional criteria to align with the decision-making needs of the community we are working with. In this case, we will ensure that any negative or positive impacts of identified adaptation actions for GHG emissions or carbon sinks are accounted for when scoring the "negative side-effects" and "co-benefits" criterion, respectively. Furthermore, we will add an "urgency" criterion that will enable us to assign higher priority to short- and medium-term actions vis-à-vis longer-term actions. We will also break the "lifecycle costs" criterion into OPEX and CAPEX and work with the Town and MD to define dollar levels of expenditure that would be considered "extreme" (score = 5) and "negligible" (score = 1). We will then use exponential interpolation to generate dollar values for intermediate levels (scores = 2, 3 and 4). This will enable us to generate the required cost estimates for the adaptation action plan.

Our team will do an initial scoring of the actions using the evaluation framework and will then host a workshop(s) with the Project Team, as well as other key city and MD staff and stakeholders to verify and update the results.

Figure 3: Example of a multi criteria analysis framework for prioritizing adaptation actions

Costs	**1**	**2**	**3**	**4**	**5**
Lifecycle costs	Low		Moderate		High
Negative side-effects	Negligible		Moderate		Major
Feasibility	High		Moderate		Low
Acceptability	High		Moderate		Low
Benefits					
Effectiveness	Low		Moderate		High
Equity	Poor		Neutral		Good
Flexibility	Low		Moderate		High
Co-benefits	Negligible		Moderate		Major

The result of task 4.3 is a priority list of climate adaptation actions that will be incorporated into the Climate Adaptation Plan.

Task 4.4: Drafting the Climate Adaptation Plan

Once the climate adaptation actions have been analyzed and prioritized using the multi-criteria cost-benefit framework (Figure 3 in task 4.3), we will begin drafting the Climate Adaptation Plan for Pincher Creek. Our experience with similar projects shows that reaching agreement on the final list actions will require several meetings and engagements with the Project Team.

The Final Climate Adaptation Plan will summarize all project tasks complete and include:

- An introduction section with information about the project scope, impetus for action (including the economic consequences of not adapting) and (high-level) methodology (with details in an Appendix).
- A summary of the community and stakeholder engagement required to develop the plan.
- Climate change projections for Pincher Creek MD and supporting (hazard, exposure and vulnerability) maps and visualizations (with details in an Appendix).
- The climate risk assessment outcomes.
- The recommended list of climate adaptation actions for the Town of Pincher Creek and MD of Pincher Creek. In this regard, we envision one Climate Adaptation Plan for Pincher Creek, under which there may be subsections highlighting specific actions for the Town and MD, if they are different.
- For each recommended climate adaptation action, the Plan will include detailed information such as:
    - The action type, for example, a plan, policy, program, education initiative, resource requirement, etc.
    - The implementation lead - the specific department or agency responsible for implementing the action.
    - Partners to support implementation.
    - The timeline to implement the action, for example ongoing, short-term, medium-term, long-term.
    - A cost estimate, which will be an estimated cost range for implementing the action, as well as potential funding sources.
    - Recommendations for monitoring of progress on achieving the goals of the climate adaptation plan, which could include indicators/metrics for monitoring local climate or environmental changes, the impact of climate hazards, the adoption and effectiveness of implemented climate adaptation actions, etc.

We have included budget in our fee proposal for the professional design of the Climate Adaptation Plan, and also for professional design of a succinct 2-page summary (or pamphlet) of the Climate Adaptation Plan.

Task 4.5: Community Open House 2

Once the Climate Adaptation Plan is drafted, we will host a second community open house event to present the plan to the public, discuss, and receive feedback. We anticipate that feedback could also be gathered through online methods, for example, a survey posted on the Town and MD website.

Task 4.6: Presentation to Joint Council

Once complete, we will present the final Pincher Creek Climate Adaptation Plan to Joint Council.

3 SCHEDULE

Our proposed project schedule is outlined in Table 1. The schedule also includes bi-weekly (every two weeks) meetings with the Project Team to support our team with work planning, project management and decision-making, and to address challenges as they arise.

Table 1 Proposed Project Schedule

Project Tasks	2022				2023				
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Phase 1: Project Planning and Onboarding									
1.1 Project initiation									
1.2 Assemble project team									
1.3 Project Kick-Off									
1.4 Stakeholder engagement strategy									
1.5 Joint Council Presentation									
Phase 2: Research and Analysis									
2.1 Plan review									
2.2 Data acquisition									
2.3 Community showcase									
2.4 Climate modelling and projections									
2.5 Climate hazard mapping									
2.6 Analysis of the “costs of inaction”									
Phase 3: Climate Risk Assessment									
3.1 Community survey									
3.2 Define climate impact scenarios									
3.3 Develop assessment scales									
3.4 Climate impact probability assessment									
3.5 Climate impact assessment workshop									
3.6 Climate risk evaluation									
3.7 Piikani Nation Engagement									
3.8 Risk Assessment report									
3.9 Community open house 1									
3.10 Joint Council presentation									
Phase 4: Adaptation Plan Development									
4.1 Develop vision, goals and objectives									
4.2 Identify climate adaptation actions									
4.3 Prioritizing climate adaptation actions									
4.4 Drafting the Climate Adaptation Plan									
4.5 Community Open House 2									
4.6 Joint Council Presentation									