

## UNIT SIX

A resource for  
building climate  
resilience in  
Alberta

# 6

## Assess climate risks and opportunities

### What this unit will help you do

You have been directed to this unit either because:

- ➔ You are looking to develop a complete Action Plan for your community through the full-day workshop; or
- ➔ You want to identify and prioritize potential climate risks and opportunities facing your community.

Before starting this unit you must know key projected climate and environmental changes for your area. If you do not have this information you will first need to obtain it from Unit 5. In addition, you will need to have defined the scope of the assessment and finalized the scales to be used to analyze the importance of identified risks and opportunities. If you have not done this already, you first need to go to Unit 4.

This module contains four core sections to help you:

- Section 1:** Understand the three-step process to assess climate risks and opportunities.
- Section 2:** Determine how projected future climate or environmental changes could impact your community, both positively and negatively.
- Section 3:** Prioritize the identified negative (risks) and positive (opportunities) impacts for your community.
- Section 4:** Agree priorities for action planning.

## At the workshop

The guidance and resources provided in this unit are used to support Session 3 at the workshop. Session 3 comprises two parts: (Part 1) identifying future climate impacts; and (Part 2) prioritizing climate risks and opportunities. A detailed agenda with timings for Part 1 and Part 2 is presented in Table 1 and Table 2, respectively. In total, it is recommended that 70 minutes is allocated to each part. Note that Part 2 is deliberately bisected by the lunch break. This is necessary to allow the facilitator time to analyze outputs from an exercise undertaken immediately before lunch, which serves as the starting point for an exercise that takes place directly after lunch.

Time	Workshop activity
<b>Session 3 - Part 1: Identify future climate impacts</b>	
10 mins	<p>Introduce Session 3 - Part 1 by stating the session objective: to determine how the projected climate or environmental changes for the area could impact the community.</p> <p>Group exercise: Introduce the goal of the group exercise and outline what is involved. Use <b>Slide 6-1</b> through <b>Slide 6-5</b>. Detailed instructions are provided with the slides below.</p>
30 mins	Ask participants to self-select themselves into groups, and to begin the exercise. The number of groups will depend on the number of participants. Aim for groups of 3-4 people.
25 mins	Invite each group to briefly report back on the impact events and consequences they identified for the community.
5 mins	Allow group to briefly review and finalize the list of impact-events.

**Table 1: Agenda with timings for Session 3 – Part 1 at the workshop**

Time	Workshop activity
<b>Session 3 – Part 2: Prioritizing climate risks and opportunities</b>	
10 mins	<p>Introduce Session 3 – Part 2 by stating the session objective: to prioritize the climate impacts identified in Part 1 in order to identify priority risks and opportunities for action planning.</p> <p>Individual exercise: Introduce the goal of the individual exercise and outline what is involved. Use <b>Slide 6-6</b> through <b>Slide 6-12</b>. Detailed instructions are provided with the slides below.</p>
25 mins	<p>First ask participants to find the risk and opportunity scoring sheet in their handouts, and second, write down the impact events as per the posted flip chart sheets onto their individual scoring sheets, with the numbers in the same order as the posted flip chart sheets.</p> <p>Taking one impact event at a time, lead a brief introduction and discussion, referring to the impact event-consequence notes on the posted flip chart sheets and ask if there is other knowledge in the group that would be important to inform the voting.</p>
45 mins	<p><b>Lunch break</b></p> <p>Input consequence and likelihood scores from each individual scoring sheet into spreadsheet provided with Action Kit, which will average the scores and determine where (which cell) on the risk or opportunity matrix the impact event should be placed.</p>
35 mins	<p>Present provisional risk scoring and opportunity scoring matrices on the wall.</p> <p>Plenary discussion: Lead discussion with workshop participants to review the location of each impact event on the matrices (and the underlying consequence and likelihood scores), and manually adjust any impact events that – in the opinion of the group -- may have been either over- or under-estimated in comparison to the others. Guidance on how to facilitate this discussion is provided below.</p>

**Table 2: Agenda with timings for Session 3 – Part 2 at the workshop**

## Section 1: Overview of process

The objective of Step 2 in the climate resilience action planning process is to identify, analyze and evaluate climate-related impacts that fall within the defined scope of the exercise, in order to identify priority risks and opportunities for action planning in Unit 7. This is achieved through three sequential tasks as shown in Figure 1. The three tasks are:

- 1: Identification:** Determine how projected future climate or environmental changes could impact your community, both positively and negatively.
- 2: Analysis:** Assign an importance score to each identified impact, based on local perceptions of the magnitude of potential consequences for the community (e.g., negligible, [...], major) and the likelihood of those consequences occurring (e.g., low, [...], high). The scores are used to generate a risk (or opportunity) matrix—a two dimensional representation of consequences plotted against likelihood (see Figure 2).
- 3: Evaluation:** Review the relative position of impacts in the matrix and manually adjust their location if they are judged—when viewed collectively—to have been either over- or under-estimated in comparison to one another.

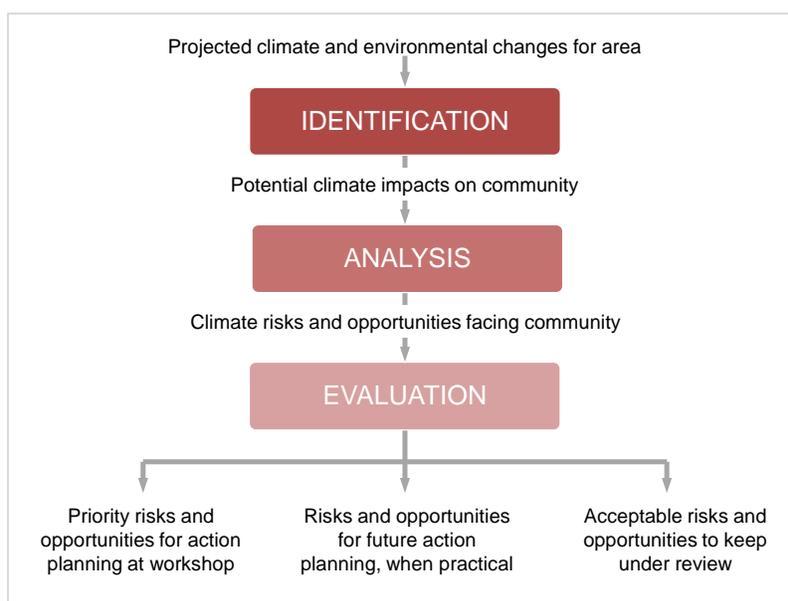


Figure 1: Climate Resilience Express process for risk and opportunity assessment

The position of impacts in the matrix dictates what happens next. Impacts in the red zone are the highest priorities for further investigation or management. These impacts have the largest consequences combined with a higher likelihood of occurrence. Impacts in the yellow zone represent the next priority for action. Impacts in the green zone represent broadly acceptable risks. No action is required now for these impacts beyond monitoring of the risk level as part of periodic reviews.

CONSEQUENCE	Major	Yellow	Yellow	Red	Red	Red
		Green	Yellow	Yellow	Red	Red
	Moderate	Green	Yellow	Yellow	Yellow	Red
		Green	Green	Yellow	Yellow	Yellow
	Negligible	Green	Green	Green	Green	Yellow
		Low		Moderate		High
LIKELIHOOD						

Figure 2: Example of a risk scoring matrix

In the remainder of this unit you are provided with guidance on how to perform each of these tasks within the workshop, in order to identify priority risks and opportunities for action planning.



**Risk:** The possibility of a negative climate-related impact on a community, expressed in terms of a combination of adverse consequences of an event and the associated likelihood.

**Opportunity:** The possibility of a positive climate-related impact on a community, expressed in terms of a combination of beneficial consequences of an event and the associated likelihood.

**Risk (opportunity) assessment:** The overall process of risk (opportunity) identification, analysis and evaluation.



If you want to learn more about climate change risk and opportunity assessment, look at:

- ✓ Alberta Sustainable Resource Development, 2010, Climate Change Adaptation Framework Manual, Edmonton, AB. [Pages 23-26.]
- ✓ Black, R., et al, 2010, Adapting to Climate Change: A Risk-based Guide for Local Governments, Volume 1. [Page 10-17.]
- ✓ Bowron, B. and Davidson, G., 2011, Climate Change Adaptation Planning: A Handbook for Small Canadian Communities, Canadian Institute of Planners, Ottawa, Canada. [Page 17-32.]
- ✓ ICLEI, Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation ICLEI Canada, Toronto, ON. [Page 37-42 and Worksheets 6(b), 7 and 8.]

If you want to learn more about methods for risk and opportunity assessment in general, look at:

- ✓ AUMA, Enterprise Risk Management Resource Guide, Alberta Urban Municipalities Association, Edmonton, AB. [Pages 22-30.]
- ✓ Australian Government Attorney-General's Department, 2015, Australian Emergency Management Handbook Series, National Emergency Risk Assessment Guidelines: Practice Guide, Canberra, AUS. [Pages 26-52.]

## Section 2: Task 1 - identify future climate impacts

The goal of Task 1 is to answer two questions:

- 1: How could projected climate or environmental changes impact our community?
- 2: What are the potential direct consequences for the local economy, the health and lifestyle of residents, the natural environment, and infrastructure, services and property?

These questions are answered at the workshop following the agenda in Table 1 and using, in sequence, **Slide 6-1** through **Slide 6-5**.

### ➔ Workshop slide: Key projected climate and environmental changes

The starting point for the exercise is the summary table of projected climate and environmental changes for your area. You will need to obtain the relevant table from Unit 5. For the purpose of the high-level risk screening employed by the Action Kit, this is the level of detail you will be working with.

#### Slide 6-1

#### Narrative

Projected climate and environmental changes for Area 1 for 2050s	
Climate changes	Environmental changes
Warmer temperatures, especially in summer	Longer growing season
Less precipitation in summer	Less available moisture
More periods of extreme heat, fewer spells of extreme cold	Regional shift towards grassland-dominated ecosystem
Increased precipitation in fall, spring and winter	More favourable conditions for invasive plants
Increase in the number of extreme precipitation events	Increased winter streamflow, earlier spring peak flow, decreased flow in summer
Less precipitation as snow	Fewer, smaller and less permanent wetlands
Increase in intensity of summer storms	Extended wildfire season

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**Slide 6-1** presents the climate and environmental changes projected for the local area.

The projected changes provide the starting point for identifying potential future climate impact events and associated consequences for the community.

You will find this table in your workshop handout.

Remember that the environmental changes result from the projected changes in temperature and precipitation patterns.



Remember to include the relevant table for your community in the workshop handouts.

The table in **Slide 6-1** is for Area 1 in. The relevant table (in PowerPoint format) for each area can be obtained from:



- Area 1: Appendix C
- Area 2: Appendix D
- Area 3: Appendix E
- Area 4: Appendix F

## ➔ Workshop slides: How to develop impact-consequence statements

**Slide 6-2** through **Slide 6-4** outline a simple approach to help workshop participants determine how projected climate and environmental changes could impact their community, whether positively and negatively.

### Slide 6-2

Identifying climate impacts and consequences

If the [...**climate or environmental change**...] happens, the impact could be [...**a weather-related event**...].

The [...**weather-related event**...] could result in direct consequences for our community related to [...**the economy, health & lifestyle, environment, and/or infrastructure, services or property**].

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### Narrative

**Slide 6-2** through **Slide U6-4** outline the process workshop participants should follow to identify local impacts and consequences from projected climate and environmental change. (This is the first step in the risk and opportunity assessment process shown in Figure 1.)

The aim of the exercise is for participants to make links between (a) a climate or environmental change, (b) an event impacting the community, and (c) associated consequences for the local economy, the health and lifestyles of residents, the natural environment, and infrastructure, services and property.

The slide illustrates the thought process for linking these three components.

When speaking to **Slide 6-2** it is crucial to make sure participants understand the difference between projected climate or environmental changes, impact events, and consequences.

Climate or environmental changes have the potential to produce specific (often weather-related) events to occur, such as floods, wildfires, intense storms or heatwaves, or to produce longer-term changes that result in, for example, a loss of existing tourism opportunities or opportunities for the introduction of new agricultural crops. These are “impact events”. Each of these events could have multiple consequences for the community. For example, a flood event might directly result in disruption to transport and economic activity, the destruction of critical infrastructure, damage to property and green spaces, injuries, trauma, etc.

Appendix G provides examples of how other communities in Alberta have drawn links between climate or environmental changes, impact events and consequences.





**Impact event:** An occurrence of a weather-related event (e.g., summer storms, wildfire, drought) or a gradual change in a particular set of circumstances (e.g., conditions suitable for a specific habitat or crop), resulting from projected climate or environmental changes. Impact events can lead to a range of adverse or beneficial consequences for communities.

**Consequence:** The outcome of an impact event for a community. A consequence can be certain or uncertain and have positive or negative effects.

**Risk (opportunity) identification:** The process of finding, recognizing and describing risks. It involves the identification of risk sources (in this case, projected climate or environmental changes), impact events and their potential consequences for communities.

**Slide 6-3**

**Narrative**

Identifying climate impacts and consequences	
<b>Projected change</b>	Warmer summer temperatures, more periods of extreme heat, less summer precipitation
<b>Event</b>	Wildfire
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Public safety</li> <li>• Smoke inhalation, poor air quality related illnesses</li> <li>• Disruption to economic activity</li> <li>• Impact to, loss of, trees and other wildlife habitat and ecosystems</li> <li>• Damage to property and infrastructure</li> <li>• Interruption to lifelines (power, communications)</li> <li>• Demands on emergency services (costs)</li> </ul>

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**Slide 6-3** presents the same thought process for linking projected climate or environmental changes to an event impacting the community and the associated consequences, but in the form of a table. The example shown is for a wildfire event.

Note that a weather-related event can be caused by a combination of projected climate changes.

**Slide 6-4**

**Narrative**

Identifying climate impacts and consequences	
<b>Projected change</b>	Warmer summer temperatures, less summer precipitation, reduced extent of glaciers
<b>Event</b>	Water supply shortages
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Inconvenience for residents (water bans)</li> <li>• Deterioration in, loss of, water-based recreation</li> <li>• Competition between residents, industry and other consumers</li> <li>• Decline in economic output, or increase in costs, for businesses that depend heavily on water</li> <li>• Deterioration in natural water sources, water quality and wetlands</li> <li>• Interruption to lifelines (water supply)</li> <li>• Costs to town (water treatment, landscaping)</li> </ul>

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**Slide 6-4** also presents the thought process in tabular form. The example shown is for water supply shortages.



All the tables summarizing projected changes, impacts and consequences generated at the four pilot workshops are available as PowerPoint slides in Appendix G. These could be made available to workshop participants to assist them with the exercise.

## ➔ Workshop slide: explaining the group exercise

The final slide for Task 1 explains the group exercise to be presented to participants.

### Slide 6-5

Task 1 group exercise

**Questions:**

How could projected climate or environmental changes impact [enter your community], positively or negatively?

What might some of the direct consequences be for the community?

Consider consequences for:

- ➔ The local economy
- ➔ Health & lifestyles of residents
- ➔ Natural environment
- ➔ Infrastructure, services and property

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### Narrative

**Slide 6-5** introduces the group exercise for the risk and opportunity identification task (Task 1 in the risk assessment process).

In small groups of ideally 3-5 people, participants will answer two questions:

1. How could projected climate or environmental changes impact our community, positively or negatively?
2. What might some of the direct consequences be for the community?

When identifying consequences for the community, it is often easier to think about potential effects on each of the four areas listed.

Detailed instructions are provided below.



You could make the tables in Appendix G (summarizing projected changes, impacts and consequences generated at the four pilot workshops) available to workshop participants as a handout to assist them with the exercise.

Total time for this exercise is 70 minutes, broken down as follows:



- ✓ 10 minutes to explain the exercise and work through two examples
- ✓ 30 minutes for participants to work in small groups
- ✓ 25 minutes for group report back
- ✓ 5 minutes to review and finalize the list of impacts



Flip charts (one per group)

Markers (at least one per group)

Tape (you will need tape to attach flip chart paper to a wall in the room)

### Instructions for starting group exercise

Once you have introduced the exercise, ask participants to self-select themselves into small groups of 3-4 people. Indicate where in the room each group should gather.

Provide each group with a flip chart (or flip chart paper) and a marker, and ask them to divide each sheet they use into three sections (climate or environmental change, impact event, consequences), reflecting the table shown in **Slide 6-4** and **Slide 6-5**.

Divide the climate and environmental changes across the groups, assigning an equal number to each group. If there are 12 projected changes and four groups, each group will work on three changes.

Ask each group to answer the two questions on the slide, starting with what they judge to be the most highly relevant project change for their community. (Some projected climate or environmental changes for the area may be of little relevance to your community and can be left out of the discussion.) Groups should record the discussion on the flip chart paper provided. Tell participants that you will be collecting the flip chart paper after the exercise and taping it to the walls for reference during Task 2.

Encourage participants to refer back to the inventory of past (extreme) weather events and community impacts identified during Session 1 of the workshop. Remind participants to consult the tables from Appendix G as they tackle the exercise, if these tables are made available.

Tell participants they have 30 minutes for this exercise, after which you will ask the groups to report back (so identify who will record the group's discussion and report back).



### Instructions for reporting back

After 30 minutes, ask the groups, one at a time, to report back on the impact events and associated consequences they identified for the community. You should capture the identified impact events on a flip chart for Task 2; you do not need to capture the associated consequences (an example from the Black Diamond and Turner Valley workshop is shown in Figure 3). Below are a few tips to help you generate a practical list of impact events for Task 2:

- Accurately define the impact event. Ask “does this impact event, as specified, have the identified consequences for our community?”
- Try to define the impact event at an appropriate scale—not too specific (stormwater flooding at the corner of 5<sup>th</sup> and Main), not too broad (flooding).
- Number the impact events. Numbering each impact event, starting from 1, will help with the individual exercise during Task 2.
- Separate risks from opportunities. Again, doing so will help with the individual exercise during Task 2.
- Define each impact event as “trending” (denote with a “T”) or “recurring” (denote with an “R”). These different types of impact event are defined below.

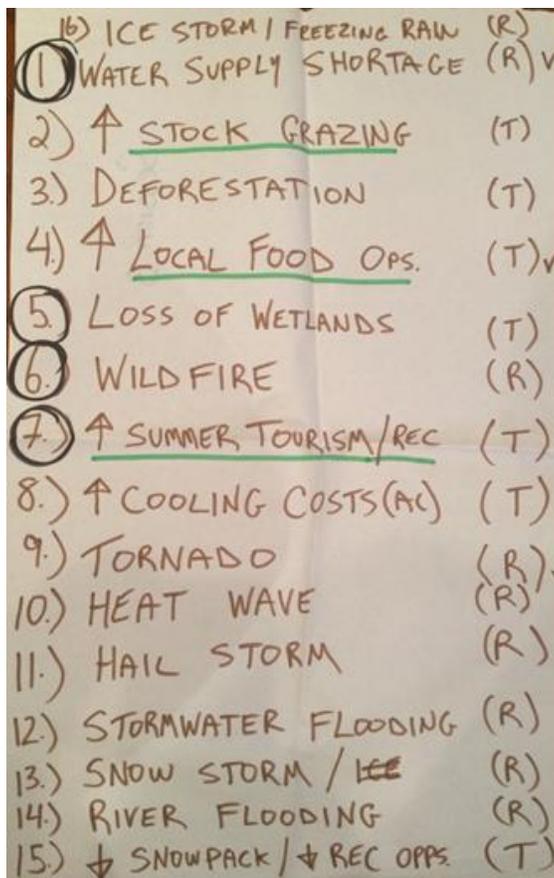
You ideally want to end up with approximately 12-15 impact events. Allow 30 minutes for the report back, but take the last 5 minutes to review and finalize the list of 12-15 impacts, before moving on.

At the end of the report back, tape all of the group flip chart sheets to the wall, in numbered order, to facilitate the analysis of impact events during Task 2.



**Recurring impact:** An impact best thought of as a recurring event, with potential to happen multiple times over a given time frame. For example, severe storms, river flooding, stormwater flooding, heatwaves, etc. all return with different frequencies over a defined time period.

**Trending impact:** An impact best thought of as happening once or at one point over a defined time period, typically as the result of a gradual shift in the climate over time. For example, loss of habitat or a winter tourism opportunity, or the opportunity to successfully grow a new crop, may not happen until changing climate conditions reaches certain thresholds or trigger points.



**Notes:** "T" denotes a trending event; "R" denotes a recurring event; the green underline identifies opportunities; and the black circles indicate the impacts that were identified as priorities for action planning after evaluation task. "Up" arrow indicates increase in event, "Down" arrow shows decrease in event (Task 3 below)

**Figure 3: Capturing identified impact events as groups report back during Task 1 (example from the pilot workshop at Black Diamond and Turner Valley)**

## Section 3: Task 2 - analyze the impact events

The goal of Task 2 is to prioritize the identified negative (risks) and positive (opportunities) impact events for your community, by analyzing the magnitude of potential consequences for the community and the likelihood of those consequences occurring.

This is achieved at the workshop following the agenda in Table 2 and using, in sequence, **Slide 6-6** through **Slide 6-12**.

➔ Workshop slide: Introduce concept of risk (opportunity) matrix

### Slide 6-6

### Narrative



**Slide 6-6** shows the end goal of the risk and opportunity assessment, which is to construct a risk and opportunity matrix for all the impact events identified during Session 3, based on your analysis of their potential local consequences and likelihood of occurrence.

The overall goal of climate resilience action planning is to identify risks (and opportunities) that have relatively high consequences and a relatively high likelihood of occurrence.

Action planning is then focused on managing these “priority” risks and opportunities. With risks, for example, the goal of action planning is to move the risks down and left towards the green area (by reducing the consequences, the likelihood, or both).

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Although not shown, the opportunity matrix is identical in structure—the only difference is the colouring of the zones: dark blue as opposed to red; light blue as opposed to orange; and grey as opposed to green.

In case you are asked, we suggest:



For **risks**: Impact events in the red and yellow zones are priorities for further investigation or management. Impact events in the red zone represent the highest priorities for action. Impact events in the green zone represent broadly acceptable risks. No action is required now for these impact events beyond monitoring of the risk level as part of periodic reviews.

For **opportunities**: Impact events in the dark blue and light blue zones are priorities for further investigation or promotion. Impact events in the dark blue zone represent the highest priorities for action. Impact events in the grey zone represent marginal opportunities. No action is required now for these impact events beyond monitoring of the level of opportunity as part of periodic reviews.

These suggested courses of action are discussed in Unit 7.

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**Risk (and opportunity) analysis**: The process through which the level of risk (or opportunity) is determined, taking account of possible consequences should the risk (or opportunity) materialize, the likelihood that those consequences may occur, and any existing or planned actions to manage the risk (or opportunity).



**Risk matrix**: A table that combines the (largely negative) consequence scores and likelihood scores assigned to impact events to determine the level of risk facing a community, which ranges from low (green) to high (red).

**Opportunity matrix**: A table that combines the (largely positive) consequence scores and likelihood scores assigned to impact events to determine the level of opportunity facing a community, which ranges from low (grey) to high (dark blue).

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## ➔ Workshop slides: Introduce scales used to “score” impact events

To determine priority risks and opportunities for action planning, workshop participants must assign a consequence level and likelihood level to each of the identified impact events. The consequence and likelihood levels are then combined in Task 3 to derive an overall risk (or opportunity) level, which dictates where the impact event is placed in the risk (or opportunity) matrix.

Assigning a consequence level to an impact event is accomplished by “scoring” the severity of anticipated consequences for the community on a scale from 1 to 5; likelihood levels are similarly assigned.

To help ensure the scoring of consequence and likelihood levels by workshop participants is done in a consistent manner, the Action Kit provides standardised scales with descriptions that delineate between consequence and likelihood levels. These scales are presented in the next three slides, **Slide 6-7** through **Slide 6-9**.

### Slide 6-7

### Narrative

Consequence scale for risks		
Score	Descriptor	Definition
1	<b>Negligible</b>	<ul style="list-style-type: none"> <li>Negligible impact on health &amp; safety and quality of life for residents</li> <li>Very minimal impact on local economy</li> <li>Insignificant environmental disruption or damage</li> <li>Slight damage to property and infrastructure, very short-term interruption of lifelines, or negligible cost to municipality</li> </ul>
2	<b>Minor</b>	<ul style="list-style-type: none"> <li>Some injuries, or modest temporary impact on quality of life for some residents</li> <li>Temporary impact on income and employment for a few businesses, or modest costs and disruption to a few businesses</li> </ul>
3	<b>Moderate</b>	<ul style="list-style-type: none"> <li>Isolated but reversible damage to wildlife, habitat or and ecosystems, or short-term disruption to environmental amenities</li> <li>Damage to property and infrastructure (incl. critical facilities and lifelines), short-term interruption of lifelines to part of community, localized evacuations, or modest costs to municipality</li> </ul>
4	<b>Considerable</b>	<ul style="list-style-type: none"> <li>Many serious injuries, illnesses or fatalities, or long-term impact on quality of life for most residents</li> </ul>
5	<b>Major</b>	<ul style="list-style-type: none"> <li>Long-term impact on businesses and economic sectors, major economic costs or disruption</li> <li>Widespread and irreversible damage to wildlife, habitat and ecosystems, or long-term damage, disruption to environmental amenities</li> <li>Widespread damage to property &amp; infrastructure (incl. critical facilities and lifelines), extensive and long-term interruption of services, widespread evacuations, or major cost to municipality</li> </ul>

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**Slide 6-7** shows the consequence scale to be used for scoring the severity of risks.

The consequence scale has 5 levels, ranging from 1 to 5, with 1 being “negligible” and 5 being “major”.



The selection of the consequence scale is discussed in Unit 4. The scale in **Slide 6-7** is the scale that was found to work best at the four pilot workshops.

Pick one of the outcome categories, such as “health and lifestyles” (top bullet point in each consequence level), and walk through the descriptions provided at each level, so participants can see how the descriptions progressively become more severe from “negligible” to “major”.

**Slide 6-8**

**Narrative**

Consequence scale for opportunities		
Score	Descriptor	Definition
1	<b>Negligible</b>	<ul style="list-style-type: none"> <li>Increase in income / jobs for a <i>few</i> businesses</li> <li>Lifestyle improvement for <i>some</i> residents</li> <li>Cost savings to municipality, businesses or residents</li> </ul>
2	<b>Minor</b>	
3	<b>Moderate</b>	<ul style="list-style-type: none"> <li>Increase in income / jobs for a <i>sector</i></li> <li>Lifestyle improvement for a <i>select group</i> of residents</li> <li>Cost savings to municipality, businesses or residents</li> <li><i>Short-term</i> boost to reputation and image of municipality</li> </ul>
4	<b>Considerable</b>	
5	<b>Major</b>	<ul style="list-style-type: none"> <li>Increase in income / jobs for <i>key sectors</i> of local economy</li> <li>Lifestyle improvement for a <i>majority</i> of residents</li> <li>Cost savings to municipality, businesses or residents</li> <li><i>Long-term</i> boost to reputation of municipality</li> </ul>

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**Slide 6-8** shows the consequence scale to be used for scoring the benefits of opportunities.

Again, the consequence scale for assessing opportunities has 5 levels, ranging from 1 to 5, with 1 being “negligible” and 5 being “major”.



The scale in **Slide 6-8** is the scale that was found to work best at the four pilot workshops.

Pick one of the outcome categories, such as “local economy” (top bullet point in each consequence level), and walk through the descriptions provided at each level, so participants can see how the descriptions progressively become more positive from “negligible” to “major”.

**Slide 6-9**

**Narrative**

Likelihood scale for recurring and trending impact events			
Score	Descriptor	Recurring events	Trending events
		(how frequent)	(how probable)
1	<b>Low</b>	Once in 50 years or more	<i>Very unlikely</i> – less than 5% chance of occurrence in next 50 years
2		Once in 10 to 50 years	<i>Unlikely</i> – 5% to 35% chance of occurrence in next 50 years
3	<b>Moderate</b>	Once in 5 to 10 years	<i>Possible</i> – 35% to 65% chance of occurrence in next 50 years
4		Once in 1 to 5 years	<i>Likely</i> – 65% to 90% chance of occurrence in next 50 years
5	<b>High</b>	Up to once per year	<i>Almost certain</i> – 95% or greater chance of occurrence in next 50 years

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**Slide 6-9** shows the likelihood scale to be used for scoring the chance of risks or opportunities occurring at the level anticipated.

To maintain consistency with the consequence scales, the likelihood scale also has 5 levels, ranging from 1 to 5, with 1 being “low” and 5 being “high”.

The scale also has 2 columns, one for the recurring impact events identified during Session 3 and one for trending impact events identified during Session 3.



The selection of the likelihood scale is discussed in Unit 4. The scale in **Slide 6-9** is the scale that was found to work best at the four pilot workshops.

You may wish to check again with participants that they understand the distinction between recurring and trending impact events (as defined in the main text above).



**Consequence level:** The potential outcomes of an impact event for the community *if* it happens, given existing and planned management actions; described as the consequences to the local economy, the health and lifestyles of residents, the natural environment, and infrastructure, services and property.

**Likelihood level:** The chance of the impact event happening and causing these potential outcomes, given the existing and planned management actions.

**Risk level:** The combination of consequence and likelihood levels for an impact event.

➔ **Workshop slides: Introduce individual exercise to score impact events**

**Slide 6-12** outlines the individual exercise for scoring the identified impact events, which involves recording scores in a worksheet that participants are provided (shown in **Slide 6-10**).

**Slide 6-10**

**Narrative**

**Slide 6-10** show the worksheet to be used for assigning likelihood and consequence scores to risks and opportunities.

An example “scoring” of two impact events is shown.

Instructions for the exercise are provided shortly, but it essentially involves:

- 1 Writing the impact events identified in Session 3 into the worksheet, and indicating whether they are recurring events (with an “R”) or a trending events (with a “T”). This will help you select the appropriate column in the likelihood scale.
- 2 Taking each impact event in turn, first, use the appropriate consequence scale to assign a consequence score, and second, use the appropriate likelihood scale provided to assign a likelihood score.

After participants have done this for all identified impact events, the completed worksheets will be collected.

Individual exercise – scoring the identified risks and opportunities

Enter climate-related impact events	Recurring or trending event (enter R or T)	Consequence score (enter 1, 2, 3, 4, or 5)	Likelihood score (enter 1, 2, 3, 4, or 5)
1 Freezing rain storm	R	3	5
2 Increase in summer tourism	T	4	3
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

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To illustrate the thought process for scoring risks and opportunities, consider the freezing rain storm example in **Slide 6-10**. When scoring consequences, the first thing to do is read through the descriptions in the consequence scale for risks (**Slide 6-7**) and determine which of the bullet point descriptions is most relevant. You will notice that each bullet point relates to health and safety, the economy, the environment, and property and infrastructure. You may judge that a freezing rain storm will primarily damage (say) property and infrastructure. Hence, you would look at the bullet point in each row that relates to property and infrastructure. After looking at these points in the scale, you may decide that a freezing rain storm would cause “moderate damage to property and infrastructure, short-term interruption of lifelines to part of community, localized evacuations, or modest costs to municipality”, which corresponds to a consequence score of “3”. So long as you would not consider impacts to health and safety, the economy, or the environment to be greater than “moderate”, you would assign a freezing rain storm a consequence score of “3”.

To assign a likelihood score, first confirm whether the impact event is recurring or trending. A freezing rain storm is a recurring event, since it has the potential to happen multiple times over a given time frame. Therefore, the relevant likelihood scale to use is the “recurring events” column. In this example, you may judge that by the 2050s a freezing rain storm hitting the community and having “moderate” consequences will happen up to once per year. Hence, you would assign a freezing rain storm a likelihood score of “5”.

You would work through a similar thought process for each impact event.

**Slide 6-11**

**Narrative**

What does the risk matrix look like now

CONSEQUENCE	Major (5)					
	(4)			Increase in Summer Tourism		
	Moderate (3)					Freezing Rain / Ice Storm
	(2)					
	Negligible (1)					
		Low (1)	(2)	Moderate (3)	(4)	High (5)
		LIKELIHOOD				

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**Slide 6-11** shows how the information from the worksheets in the example on **Slide 6-10** is used to develop a risk matrix.

In the example, a freezing rain/ice storm was judged to have a consequence level of 3 and a likelihood level of 5. An increase in summer tourism was judged to have a consequence level of 4 and a likelihood level of 3.

You can see how the combination of the consequence and likelihood levels is used to place each impact event in the risk matrix.

The results of the exercise to follow will be used to build such a matrix for both climate risks and opportunities facing your community.

**Slide 6-12****Narrative**

Individual exercise – scoring the risks and opportunities

**Consequence score:** If the impact event happens in the future (the 2050s), how severe would the consequences be for our community?

**Likelihood score:** How likely is this level of consequence in our community?

*In answering both questions assume business-as-usual*

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**Slide 6-12** provides instructions for the individual exercise to assign consequence and likelihood scores to the identified impact events from Session 3.

Taking each impact event one at a time, each participant by themselves should answer two questions:

1. If the impact event happens in the future (the 2050s), how severe would the consequences be for our community?

And then:

2. How likely is this level of consequence in our community?

Answer both questions assuming business-as-usual for the community – i.e., assume the community will continue to grow and develop as planned, and no new, unplanned actions will be taken to manage the identified impact event.

Detailed instructions are provided below.



When assigning a consequence score to a risk or opportunity, you might suggest participants assign the score for the highest consequence anticipated. For example, if a participant believes one of the categories (health and lifestyles, local economy, etc.) should be assigned a score of five (e.g., because of major consequences for the health of residents), then the score assigned to the impact event should be five even though the other categories may score lower on the consequence scale. This is equivalent to planning for the “worst-case” scenario.

When analyzing the likelihood for an impact event, you should remind participants to consider it to be the likelihood of the described consequences occurring as a result of the event.

First, ask participants to take their worksheet and, in the first column, write down the impact events identified during Session 3 as they appear on the posted flip chart sheet (similar to Figure 3). Write them down in the same numbered order. You may want to suggest that participants place an “O” beside opportunities, to clearly distinguish them from risks. In the second column they should record whether the impact event is trending (“T”) or recurring (“R”).

From here, there are two approaches you can follow:

### **Approach 1**

Instruct participants to start at the top, with the first impact event (#1 on the list), and use the consequence scale provided to assign a score, from 1 to 5, to the impact event. Remind them to assume business-as-usual for the community when assigning the score. Further remind participants to look at the impact event-consequence notes on the posted flip chart sheets around the room. Record the score in the appropriate (third) column of the worksheet.

Next, instruct participants to assign a likelihood score to the impact event. Remind them the score should reflect the likelihood of the assigned level of consequence being realized in the community—again, assuming business-as-usual. Further remind participants to use the appropriate column in the likelihood scale, depending on whether the risk or opportunity is trending (“T”) or recurring (“R”). Record the score in the appropriate (fourth) column of the worksheet.



Continue like this until all identified impact events have been scored. When finished, hand in your completed worksheet. Remind participants they have 25 minutes to complete the exercise.

You may wish to instruct participants to tackle all risks first, followed by all opportunities. This will save them flipping back and forward between consequence scales.

### **Approach 2**

An alternative approach was found to work very well at the pilot workshops, but it places greater demands on the facilitator.

Take each impact in turn and lead a brief introduction and discussion, referring to the impact event-consequence notes on the posted flip chart sheets around the room. Ask if there is other knowledge in the group that is pertinent to the scoring of consequences and likelihood. There may be a subject matter expert in the group.

After each discussion, ask participants to, first, record their consequence score, and second, record their likelihood score on worksheet, before moving on to the next impact event. Repeat for all identified impact events. As you do so, keep an eye on the clock; you only have 25 minutes, so keep the discussions short.

Mention that the results will be analyzed over lunch and used to construct a risk and opportunity matrix. After lunch, the matrices will be reviewed as a group.



Total time for this exercise is 35 minutes, broken down as follows:

- ✓ 10 minutes to explain the exercise, discuss the scales and work through the examples
- ✓ 25 minutes for participants to fill out their individual scoring worksheets



Worksheets for recording consequence and likelihood scores (one per participant)

Pens



A blank worksheet for assigning consequence and likelihood scores to impact events is provided in Appendix K.

## Section 4: Task 3 - evaluate the risks and opportunities

The purpose of the evaluation task is to use the outcomes of the risk and opportunity analysis to help make decisions about which risks and opportunities need management or further investigation, and the priorities for action planning. This is accomplished in three stages:

- 1: Create a risk matrix and, where relevant, an opportunity matrix;
- 2: Review the relative position of impact events in the matrices with workshop participants, and manually adjust their location if they are judged—when viewed collectively—to have been either over- or under-estimated in comparison to one another;
- 3: From among the key risks and opportunities, select priorities for action planning at the workshop, based on participants' views.

The evaluation task guides you on how best to expend the limited resources of, or available to, your community, by determining priorities for action planning.

### ➔ Creating the risk and opportunity matrices

At the end of Task 2 each participant will have handed in their scoring worksheet. You now need to input the information on these worksheets into the Risk and Opportunity Scoring Spreadsheet, which is available at Appendix L. Appendix L contains two spreadsheets: (1) a blank template (file name: Risk and Opportunity Scoring Spreadsheet (blank)); and a completed example (file name: Risk and Opportunity Scoring Spreadsheet (example)). You will want to download the “blank” version. For each risk and opportunity, this spreadsheet will average the individual scores provided by each participant and tell you in which cell on the matrix a specific risk or opportunity should be placed. The entire process will take roughly 20-30 minutes,

depending on the number of participants. You will need to do this over the lunch break in the full-day workshop.

Full instructions for using the Risk and Opportunity Scoring Spreadsheet are provided in the “Instructions” sheet of the workbook. It is currently set up to work with a maximum of 24 impact events and 25 participants. In the “Cell Labels for Matrices” sheet you will find the output you need to create a risk matrix and an opportunity matrix. Consider the example in Figure 4, which shows the output for 15 impact events; 12 risks and 3 opportunities. We recommend that you use the average score across all participants to decide where each impact event should be placed in the risk or opportunity matrix. The average includes the scores reported by every participant as part of the calculation, in contrast to the mode or most popular score, which only captures the views of a selection of participants.

For example, the first impact event, “water supply shortages”—a risk—would be placed in cell 19 of the risk matrix (see Figure 5). Further, the fifteenth impact event, “increased summer tourism and recreation”—an opportunity—would be placed in cell 12 of the opportunity matrix (see Figure 5).

	Description of impact event	Risk (R) or opportunity (O)	Relevant matrix to place impact event	MODE	AVERAGE
				Cell number in relevant matrix	Cell number in relevant matrix
1	Water supply shortage	R	Risk matrix	14	19
2	Loss of forests	R	Risk matrix	11	12
3	Loss of wetlands	R	Risk matrix	13	13
4	Wildfire	R	Risk matrix	13	13
5	Increased cooling costs	R	Risk matrix	19	14
6	Tornado	R	Risk matrix	13	14
7	Record temperature, extreme heat events	R	Risk matrix	18	19
8	Hail storm	R	Risk matrix	24	18
9	Stormwater flooding	R	Risk matrix	9	9
10	Heavy snowfall event, blizzard	R	Risk matrix	19	14
11	Creek flooding	R	Risk matrix	18	18
12	Reduced traditional winter recreation	R	Risk matrix	18	13
13	New crop types	O	Opportunity matrix	13	18
14	Increased agricultural productivity	O	Opportunity matrix	19	14
15	Increased summer tourism and recreation	O	Opportunity matrix	13	12
16	NONE	NONE	NONE	NONE	NONE
17	NONE	NONE	NONE	NONE	NONE
18	NONE	NONE	NONE	NONE	NONE
19	NONE	NONE	NONE	NONE	NONE
20	NONE	NONE	NONE	NONE	NONE
21	NONE	NONE	NONE	NONE	NONE
22	NONE	NONE	NONE	NONE	NONE
23	NONE	NONE	NONE	NONE	NONE
24	NONE	NONE	NONE	NONE	NONE

Figure 4: Cell Labels for Matrices sheet from the Risk and Opportunity Scoring Spreadsheet (example) found at Appendix L

<b>CONSEQUENCE</b>	Major	<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>25</b>
		<b>4</b>	<b>9</b>	<b>14</b>	<b>19</b>	<b>24</b>
	Moderate	<b>3</b>	<b>8</b>	<b>13</b>	<b>18</b>	<b>23</b>
		<b>2</b>	<b>7</b>	<b>12</b>	<b>17</b>	<b>22</b>
	Negligible	<b>1</b>	<b>6</b>	<b>11</b>	<b>16</b>	<b>21</b>
		Low		Moderate		High
<b>LIKELIHOOD</b>						

**Figure 5: Cell numbers in both risk and opportunity matrices**

Three options for creating a risk or opportunity matrix were trialled at the pilot workshops. These are shown in Figure 6:

- 1:** Use tape to draw the matrix on a large wall, and then write the impact events on index cards and stick them to the wall in the appropriate cells of the matrix (Panel A in Figure 6). The matrix is best prepared before the workshop starts.
- 2:** Use markers to draw the matrix on to a large sheet of paper or cardboard and then write the impact events on sticky notes to attach to the paper in the appropriate cells of the matrix (Panel B in Figure 6). Again, the matrix is best prepared before the workshop starts.
- 3:** Use PowerPoint to draw the matrix in advance of the workshop, then type the number ID corresponding to each impact event in the appropriate cell of the matrix; typing the full impact event is typically not practical (Panel C in Figure 6).

Creating the matrix on a large wall worked best at the pilot workshops—primarily because the index card with impact events provided a clear visual signal to participants, who could then readily move index cards around the matrix during the next stage of the exercise.



Instead of creating both a risk matrix and an opportunity matrix, you may wish to create a single matrix and use different coloured index cards, sticky notes, markers, or fonts to distinguish between risks and opportunities.



You will need to download the Risk and Opportunity Scoring Spreadsheet found in Appendix L.



Tape, index cards, markers, reusable adhesive putty

Or

Flip chart sheet or cardboard, markers, sticky notes

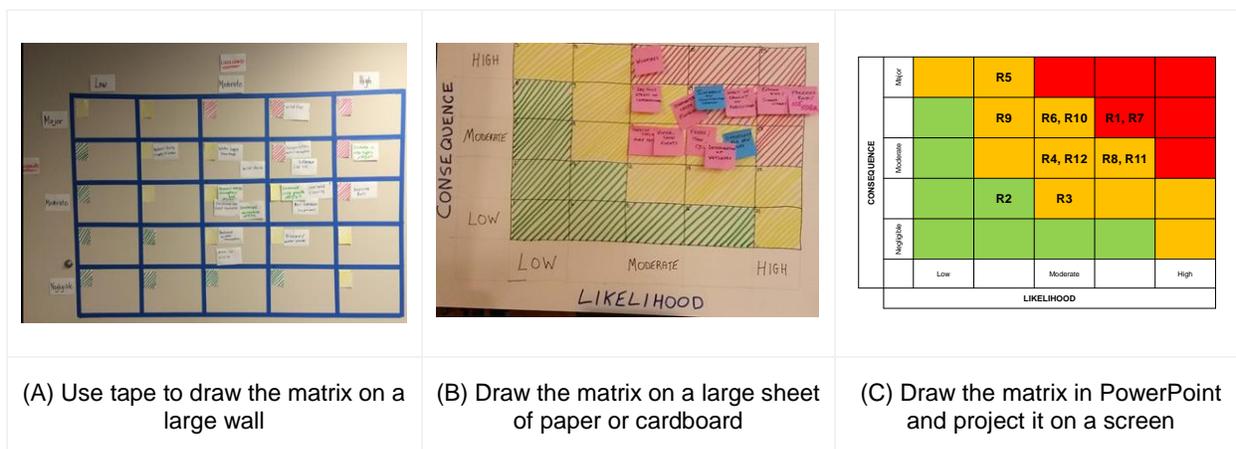


Figure 6: Three options for creating a risk or opportunity matrix at the workshop

- ➔ Review the relative position of impact events in the matrices and select priorities for action planning

After you have created the risk and opportunity matrix you are ready to reconvene the workshop.

The next stage in the evaluation process involves reviewing the relative position of impact events in the matrix with all workshop participants, and manually adjusting their location if they are judged to have been either over- or under-estimated in comparison to one another. Once the position of risks and opportunities in their respective matrix is finalized, participants will need to decide which risks and opportunities will be prioritized for action planning at Session 4 of the workshop. This is all accomplished through a plenary discussion. Instructions are provided below.

Once the workshop reconvenes, ask participants to gather around the wall matrix. (The instructions below assume you are using a large wall matrix; but it is equally applicable if you opted to use one of the other forms of matrix.)

Remind them of the objective: to review the relative position of impact events in the matrix when viewed collectively, and manually adjust the location of any impact events judged to have been either over- or under-estimated in comparison to one another.

Remind participants that risks and opportunities selected for action planning will come from the uppermost right-hand corner of the matrix; these should be the most important risks and opportunities facing the community.

Identify the risk with the highest consequence level and the highest likelihood level. You can use this risk as a reference point for adjusting the other risks, where justified. Ask participants if this risk will have the most severe consequences for the community, compared to the other identified risks? Ask if there are any experts in this area or who have previous experience in managing this risk; it is important to listen to the opinions of these participants.

If a *good* argument is made to move it, and this is *generally accepted* by participants, then move the risk to the new consequence level. Otherwise, leave the risk where it is. If you adjust the consequence level, you will also need to ask if the likelihood level is still appropriate. Again, if a *good* argument is made to adjust the likelihood level, and this is *generally accepted* by participants, then move the risk to the new likelihood level. Otherwise, leave the risk where it is.



Once you have tackled all risks in the highest consequence level, move down to the next consequence level and repeat the process. Then progress to the next consequence level. And so on.

Repeat the entire process for opportunities.

Once the position of risks and opportunities in their respective matrix is *generally acceptable* to participants, you need to decide as a group which risks and opportunities are to be taken forward to action planning at Session 4 of the workshop.

If time was not an issue, you would action plan for all risks in the red and orange zones (and all opportunities in the dark blue and light blue zones). However, at the full day workshop, there is only sufficient time to action plan for 3-5 risks and opportunities, depending on the number of participants (you will want groups of 3-5 participants per risk or opportunity). All identified risks and opportunities are nonetheless documented in the Action Plan, with recommendations for further analysis and follow-up.

With participants still surrounding the wall matrix, identify the 3-5 risks and opportunities with the highest consequence levels and the highest likelihood levels, and ask participants which of these they want to take forward to the action planning session at the workshop. Suggest to participants that they may wish to leave for now, risks and opportunities:

- That are already a focus of significant investigation or management by the municipality; or
- Where the person with responsibility for that area or the relevant local expert is not at the workshop.



Total time for the plenary discussion is about 25 minutes; the last 5 minutes are used to select priorities for action planning.



**Risk evaluation:** The process of comparing the results of the risk analysis to confirm the risk (or opportunity) level assigned to each impact event, in order to determine priorities for action planning.

You now have a list of prioritized climate risks and opportunities facing your community.

To develop actions to manage the most important risks and opportunities and to select the most promising actions, go to Unit 7.

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