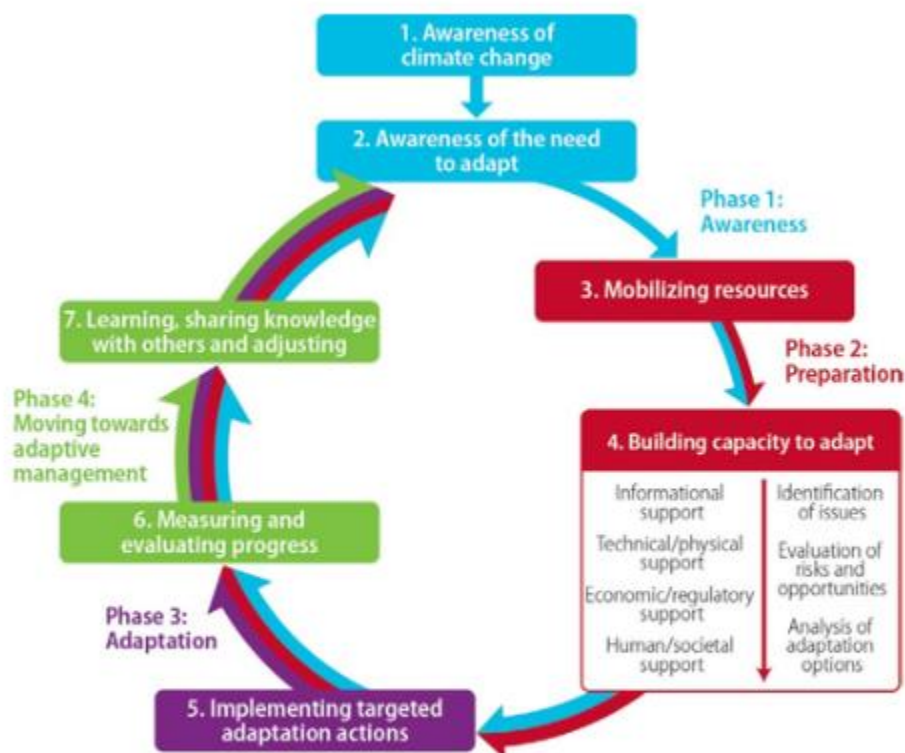


Climate Change Adaptation Assessment

Climate change adaptation starts with awareness of how climate impacts our assets and service areas, and generates knowledge and strategies for adapting our infrastructure and services to be more resilient.



SOURCE: NATURAL RESOURCES CANADA. (2014). CANADA IN A CHANGING CLIMATE: SECTOR PERSPECTIVES ON IMPACTS AND ADAPTATION.

The four distinct steps to assessing the effect of climate change on infrastructure and service areas include:

1. Record Climatic Changes – The data for determining climate changes in the region include engagement with local academic and environmental centres. More specifically, consultation will occur with the Prairie Climate Centre, based out of the University of Winnipeg, and the School of Environment and Sustainability at the University of Saskatchewan will provide the climate model for Saskatoon.

2. Define Climate Change Impacts on Service Areas – Climate change impacts to service areas and assets will be assessed to determine if assets and services are directly, indirectly or not affected by climate impacts. The analysis will assist with adjusting life cycle timelines for assets, such as maintenance, renewal and replacement timelines.

3. Vulnerability Assessment – Vulnerability is assessed through determining Sensitivity and Adaptive Capacity of the assets and service areas to the climate change (i.e. If the impact occurs, will it affect the functionality of the asset/ service area) and Adaptive Capacity of the assets and service areas (i.e. will the asset/service be capable of adjusting to the climate change impact with minimal cost and disruption).

Sensitivity Scale				
If the impact occurs, will it affect the functionality of the service area?				
No - Functionality will stay the same	Unlikely - Functionality will likely stay the same	Yes - Functionality is likely to get worse	Yes - Functionality will get worse	Yes - Functionality will become unmanageable
S1	S2	S3	S4	S5

Source: ICLEI Canada

Adaptive Capacity Scale				
Can the service area adjust to the projected impact with minimal cost and disruption				
No - Will require substantial costs (\$\$\$\$\$) and staff intervention	No - Will require significant costs (\$\$\$\$) and staff intervention	Maybe - Will require some costs (\$\$\$) and staff interventions	Yes - But will require some slight costs (\$\$) and staff intervention	Yes - No to little costs (\$) and staff intervention are necessary
AC1	AC2	AC3	AC4	AC5

Source: ICLEI Canada

The sensitivity and adaptive capacity of the assets and service areas will be combined, based on engagement with the work groups that oversee the assets and services to develop a vulnerability rating. Those assets and service areas that are rated as being significantly affected by climate change impact through their function and with significant cost and resources, will be rated as highly vulnerable. Highly vulnerable assets and services will be prioritized for requiring intervention to decrease risk to climate change.

Sensitivity and Adaptive Capacity Mix					
	S1	S2	S3	S4	S5
AC1	V2	V2	V4	V5	V5
AC2	V2	V2	V3	V4	V5
AC3	V2	V2	V3	V4	V4
AC4	V1	V2	V2	V3	V3
AC5	V1	V1	V2	V3	V3

Source: ICLEI Canada

4. Risk Assessment – Risk is determined by assessing Consequence (i.e. the community level consequence of climate impacts) and Likelihood (i.e. the probability and frequency of the impact).

Consequence is determined through evaluating six service areas within the community:

1. Health and Safety
2. Local Economy and Growth
3. Community and Lifestyle
4. Environment and Sustainability
5. Financial Impact on the Community
6. Public Administration

and five service areas within the municipal corporation:

1. Policy and Reputation Impact
2. Human Capital Impact
3. Infrastructure/ Service Delivery Impact
4. Citizen Impact
5. Financial Impact on Administration

An example of consequence impacts taken from the University of Saskatchewan pilot project is presented below:

Increases in Annual Temperatures	Increase in Summer Temperature			Increase in Annual Precipitation		Increase in 1-3 day Precipitation Totals	
Increased frequency of freeze/thaw cycles impacting road infrastructure	Increased risk of blackouts due to demand for electricity	Increased demand for water - irrigation and personal use	Higher risk of fires close to Saskatoon	Increased risk of flooding to basements, roads, and other infrastructure	Increased cost for storm water management	Increased risk of flooding to basements and roads, caused by sewer overflows or waste water bypasses	Increase in demand to city operations when responding to severe precipitation

Likelihood ratings are based on climate change impact information. It evaluates if a climate change impact is likely to be ongoing or unlikely to occur frequently.

Likelihood Rating	Recurrent Impact	Single Event
Almost Certain - 5	Could occur several times per year	More likely than not - probability greater than 50%
Likely - 4	May arise about once per year	As likely as not - 50/50 chance
Possible - 3	May arise once in 10 years	Less likely than not but still appreciable - probability less than 50% but still quite high
Unlikely - 2	May arise once in 10-25 years	Unlikely but not negligible - probability low but noticeably greater than zero
Rare - 1	Unlikely during the next 25 years	Negligible - probability very small, close to zero

Source: ICLEI Canada

Consequence ratings and Likelihood ratings are then combined to produce a score, such as the one below taken from the University of Saskatchewan pilot project. Events that indicate a high score will be prioritized for response to bring the risk to an acceptable level.

Climate Change Impacts	Consequence Rating Total	Likelihood Rating	Total Risk Assessment Score
Increased frequency of freeze/thaw cycles impacting road infrastructure	50	1	50
Increased risk of blackouts due to demand for electricity	90	3	270
Increased demand for water - irrigation and personal use	48	5	240
Higher risk of fires close to Saskatoon	70	5	350
Increased risk of flooding to basements, roads, and other infrastructure	60	5	300
Increased cost for storm water management	54	5	270
Increased risk of flooding to basements and roads, caused by sewer overflows or waste water bypasses	75	5	375
Increase in demand to city operations when responding to severe precipitation	72	5	360

The intent of climate change adaptation assessment on assets and service areas is meant to identify climate change impacts specific to Saskatoon, and the effect of those impacts. The analysis engages divisions at all levels to identify high-risk infrastructure or services, prioritize those high risk areas, and create an action plan to mediate the risk of climate change impacts on the community. The adaptation process is meant to collaborate closely with the Climate and Asset Management process to ensure that condition assessments, maintenance, renewal and replacement timelines and costing, and service levels consider changes in the climate as part of the full life cycle analysis. The Adaptation Strategy may also be able to identify where natural infrastructure may support built infrastructure in a more cost effective and resilient way.