



Local Climate Change Adaptation Planning in Manitoba

IISD REPORT



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Published by the International Institute for Sustainable Development

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Local Climate Change Adaptation Planning in Manitoba

January 2019

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Summary

The best available climate projections suggest that communities throughout Manitoba must prepare for significant climatic changes in the coming decades (Prairie Climate Centre, n.d.). As part of these preparation efforts, municipalities should be considering the anticipated impacts of climate change in their key planning documents and identifying actions to reduce risks and adapt to these changes. To assess the extent to which Manitoba's municipalities are preparing for climate change by incorporating climate risks and adaptation needs into local planning documents, the Climate Change and Air Quality Branch of Manitoba Sustainable Development commissioned the International Institute for Sustainable Development (IISD) to undertake this review.

The study reviewed a sample of local plans from across Manitoba, consisting of 20 development plans, five emergency plans and five integrated watershed management plans. Among the plans reviewed, five development plans, zero emergency plans and two integrated watershed management plans explicitly considered the need to adapt to climate change. Among these, only the Gillam Development Plan and the Carrot-Saskatchewan River watershed plan highlighted general climate change trends for their region, although neither referenced specific climate projection data or cited specific sources to support their statements. These two plans were also the only ones to identify specific biophysical risks and socioeconomic or ecological vulnerabilities that climate change may bring to their communities. These two plans as well as the development plan for the RM of Rhineland and the Towns of Plum Coulee, Gretna and Altona (RPGA) were the only ones to establish actions to address vulnerabilities to climate change. No plans committed to taking actions to better understand the risks or vulnerabilities to their communities caused by climate change.

All plans contained content that could strengthen a community's capacity to adapt to climate change. However, they were not connected explicitly to the reduction of climate change-related risks. For example, one of the most important policies contained in development plans states that development should not take place on land that would be affected by a 1-in-100-year flood unless sufficient flood-proofing is undertaken. In more recent development plans the standard has been increased to a 1-in-200-year flood or flood of record. This type of policy may become increasingly valuable as the climate changes. However, as calculation of this standard is based on historic water level information, it may become less reliable as the frequency and/or magnitude of flooding is altered by a less predictable climate. There is research being done to help understand and predict how climate change will affect future flood frequency from both rivers and rainstorms. Updating development policies to require a higher minimum flood protection standard is an adaptation measure that can provide a greater degree of protection in the face of the uncertainty of future flood magnitude and frequency in a changing climate.

All five emergency plans outlined response procedures for flooding and extreme weather in general, but only Winnipeg's plan considered drought. While none explicitly considered climate change, some planners may be altering their emergency operations in response to observed climatic changes. Research that goes beyond examining formal plans is required to assess the extent to which these actions are occurring.

Most of the integrated watershed management plans attached timelines and geographic target areas to each action, which improved clarity of planned activities compared to development and emergency plans. Unlike the development plans, most of the watershed plans specified the need for *sustainable* drainage, including water retention capacity.

The Carrot-Saskatchewan River Integrated Watershed Management Plan contained the broadest look at climate change adaptation. It considers the potential for climate change to exacerbate risks related to flooding, drought, extreme weather, wildfires and disease pressure. It also identifies priority actions to manage these risks (Kelsey Conservation District, 2015).



To address the gaps identified, this report recommends that the Province of Manitoba work with the Canadian Centre for Climate Services (Government of Canada, 2018) and the Prairie Climate Centre to help municipalities and watershed districts use local climate change projections to assess and mitigate risks. Climate change adaptation considerations should be incorporated into the templates for development plans, emergency plans, integrated watershed management plans, and any other relevant tools to provide municipalities and watershed districts with a helpful structure.

Further insights into municipal efforts to address climate change risks could be gained by examining a broader sample of local plans. Examining implementation tools such as zoning by-laws and annual budgets also could be useful to verify whether municipalities and watershed districts are acting on the content of their plan. A survey of local officials could offer insight into formal and informal aspects of climate change adaptation awareness, needs and efforts among Manitoba communities.



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1.0 Introduction

In the coming decades, climate change is expected to bring a variety of economic, social and ecological changes to Manitoba and the rest of Canada. Hotter summers and more variable and more extreme weather could lead to impacts that include melting permafrost, increased pressures from pests and invasive species, and increased risk of droughts and floods (Prairie Climate Centre, n.d.).

These projections suggest that communities throughout Manitoba must prepare for significant climatic changes in the coming decades. As part of these preparation efforts, municipalities should be considering the anticipated impacts of climate change in their key planning documents and identifying actions to reduce risks and adapt to these changes. However, there is a lack of knowledge regarding to what extent Manitoba's municipalities are preparing for climate change. To address this challenge, the Climate Change and Air Quality Branch of Manitoba Sustainable Development commissioned the International Institute for Sustainable Development (IISD) to assess the extent to which climate change risks and adaptation needs are currently being incorporated into municipal planning documents.



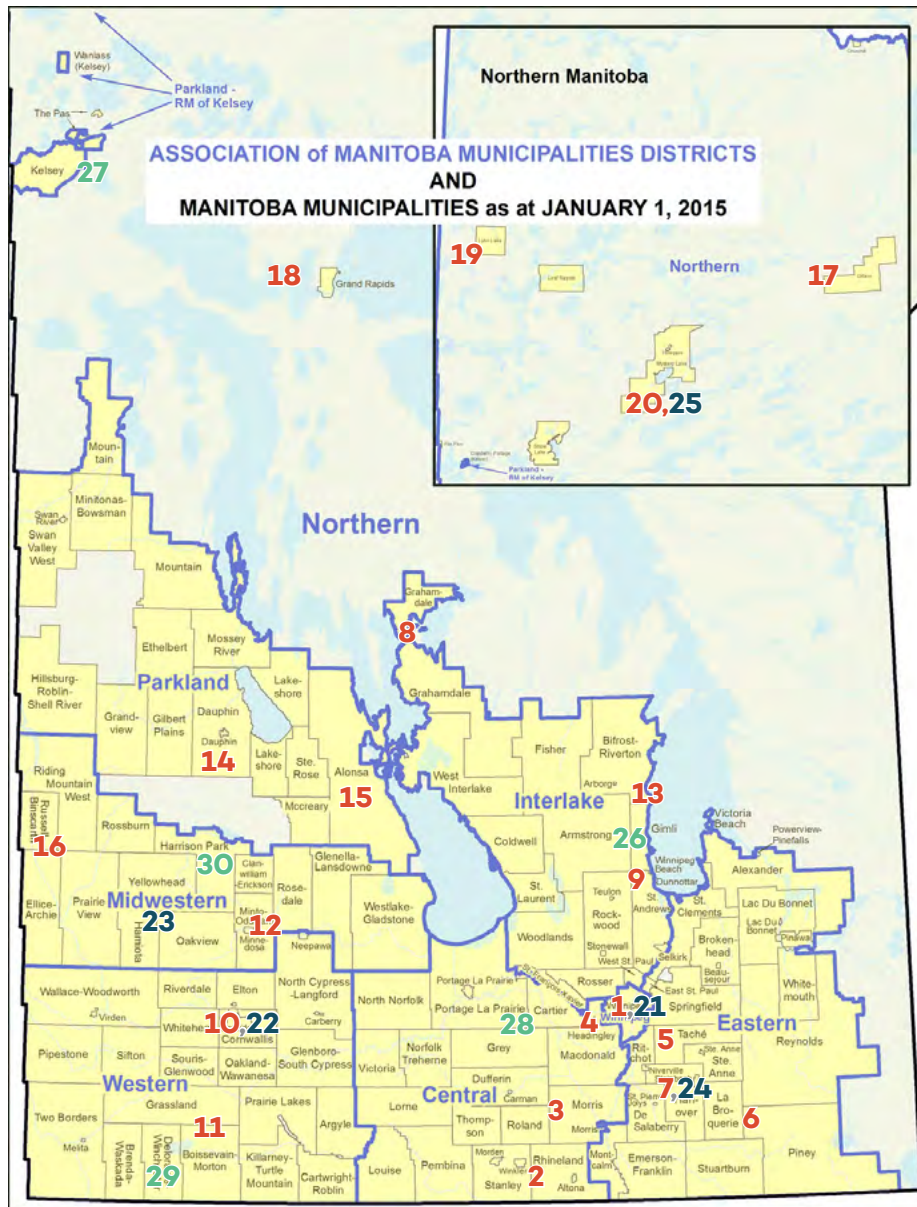
2.0 Methods

2.1 Sample Selection

This study reviewed a sample of different types of local plans from across Manitoba to assess the degree to which the need to adapt to climate change has been considered and acted upon. In total, 20 development plans, five emergency plans and five integrated watershed management plans were reviewed. Each of these types of plans serves different purposes. Development plans guide decision making for growth and development. They set out the purpose and objectives of the jurisdiction, direct sustainable land use and development, and set forward measures for implementing the plan (Government of Manitoba, 2005). As forward-looking documents, they guide where new investment will be made and have limited impact on existing land-use activities. Emergency plans outline a jurisdiction's response to and recovery from disasters and emergencies. They identify who implements which activities under which conditions using set procedures (Manitoba Emergency Measures Organization, 2018). Integrated watershed management plans contain a long-term strategy for coordinating land use, water management and related resources by stakeholders within a particular watershed (Manitoba Sustainable Development, n.d.).

For all three types of plans, the sample was assembled to cover approximately all regions of the province, as shown in Figure 1. For the sample of 20 development plans, two to three plans were selected from each district as defined by the Association of Manitoba Municipalities. Four plans from the north were selected on account of the vast size of the region. Of the development plans sampled, 13 were created by individual municipalities and seven were created by planning districts.

As listed in the References section, Manitoba Municipal Relations provided most development plans, and several were found online. All emergency plans were found on municipal websites. Most watershed plans were accessed through the Manitoba Sustainable Development website, with several coming from the websites of watershed districts (formerly known as conservation districts).



LEGEND

Development Plans (DPs)

1. OurWinnipeg
2. RM of Rhineland and the Towns of Plum Coulee, Gretna and Altona Planning District DP
3. RM of Morris DP
4. RM of Headingley DP
5. RM of Taché DP
6. RM of La Broquerie DP
7. City of Steinbach Official Community Plan
8. RM of Grahamdale DP
9. Village of Dunnottar DP
10. Brandon & Area Planning District DP
11. Morton-Boissevain Planning District DP
12. Tanner's Crossing Planning District DP
13. Eastern Interlake Planning District DP
14. City of Dauphin DP
15. RM of Alonsa DP
16. Tri-Roads Planning District DP
17. Town of Gillam DP
18. Grand Rapids Basic Planning Statement
19. Town of Lynn Lake DP
20. Thompson Planning District DP

Figure 1. Map of plans reviewed

Source: Base map retrieved from Association of Manitoba Municipalities (2015).

Emergency Plans

21. Winnipeg Emergency Preparedness Program
22. Brandon Emergency Preparedness Program
23. Midwest Emergency District Emergency Plan
24. Steinbach & Hanover Taché Emergency Plan
25. Thompson Emergency Plan

Integrated Watershed Management Plans (IWMPs)

26. Willow Creek IWMP
27. Carrot-Saskatchewan River IWMP
28. La Salle River IWMP
29. East Souris River IWMP
30. Little Saskatchewan River IWMP



2.2 Assessment Criteria

All plans were assessed using the criteria presented in Table 1. These criteria were selected because they represent a gradient of awareness to action; from recognition of the potential risk posed by climate change to demonstration of evidence-based decisions to take action to reduce these risks.

Table 1. Criteria used to assess the extent to which climate change risks and adaptation needs have been incorporated into selected municipal plans in Manitoba.

Criteria	Assessment description or indicator
Climate change is recognized as a risk	Does the plan make any explicit mention of climate change as a risk?
Mentions specific climate-related trends and data	e.g., Our region is projected to see increased winter and spring precipitation in the coming decades.
Identifies specific biophysical risks due to a changing climate	e.g., increase in extreme heat days; greater risk of extreme weather events; shorter freeze-up.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	e.g., water scarcity; invasive species; reduction in tree cover; stress on livestock; loss of winter roads.
Establishes specific adaptation-related actions to address the identified vulnerabilities	For example: <ul style="list-style-type: none"> • Vulnerability and risk assessments • Research to develop knowledge and understanding • Monitoring efforts to better understand risks associated with climate change • Capacity building efforts such as technical training • Knowledge products for practitioners (e.g., resources, guides, tools) • Implementation of physical structure to reduce climate change impacts/risks • Actions that engage the community to better respond to climate change • Workshops or conferences • Changes in policy or codes
Identifies specific vulnerable sectors/areas on which to focus planned actions	For example: <ul style="list-style-type: none"> • Agriculture • Government capacity • Climate information (cross-sectoral) • Education • Economics • Water • Infrastructure (transport, buildings) • Indigenous Peoples • Ecosystems • Health • Energy production (oil & gas, hydro) • Mining



Criteria	Assessment description or indicator
Identifies specific timelines for adaptation actions	e.g., Adaptation actions 1 and 2 will be completed within two years.
Identifies financial resources for planned adaptation actions	e.g., Identifies a specific source of funding to support adaptation action 1.
Mentions other relevant climate change adaptation plans or initiatives	e.g., A development plan references the local emergency plan which provides the climate change adaptation content.

Plans were assessed in terms of whether they (1) considered the need to adapt to climate change and (2) considered specific climate change-related risks or outlined actions to be taken. Plans were only assigned:

- “Yes” (or Y) if the content explicitly stated its connection to climate change adaptation.
- “Generally” (or G) if the plans noted climate-related risks but not climate change and/or actions with the potential to support the community’s ability to adapt to a changing climate, even if unintentionally.
- “No” (or N) if they did not consider climate change or climate-related risks.

In this way, the review captures both explicit and implicit efforts to adapt to climate change.

A summary analysis for each plan is presented in Annex 1 of this document.



3.0 Key Observations

As shown in Figure 2, among the 30 plans reviewed, only seven explicitly considered climate change adaptation, either by identifying risks, outlining policies or actions, or both.

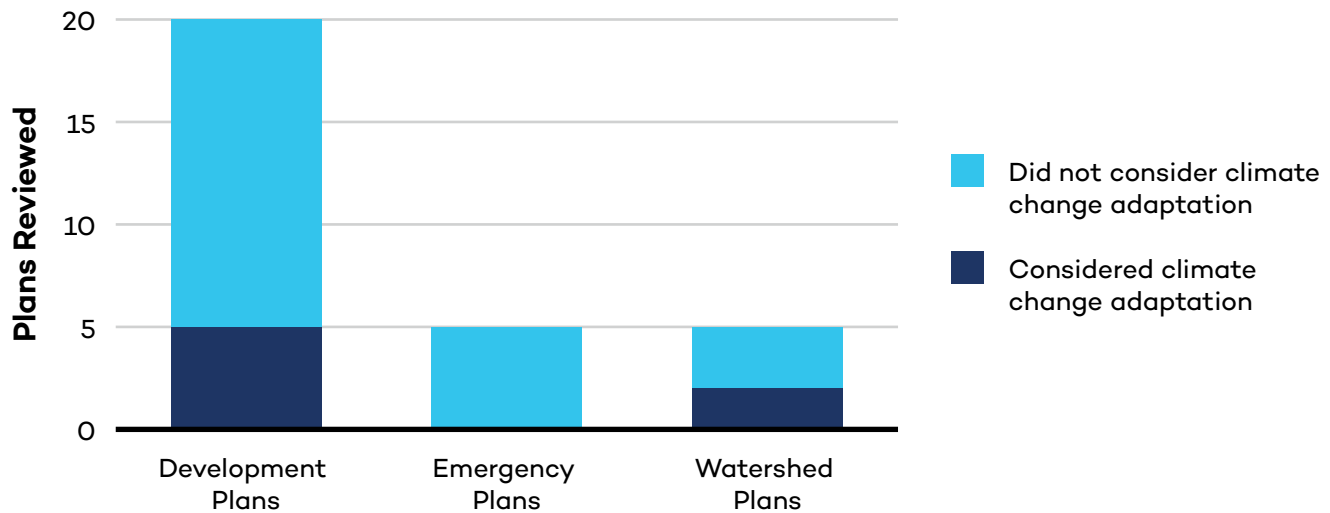


Figure 2. Plans considering climate change adaptation

Only two plans highlighted general climate change trends for their locations—the Gillam Development Plan and the Carrot-Saskatchewan River watershed plan. Neither of these plans referenced specific climate projection data or cited specific sources for their information. These same two plans were the only ones to identify risks and vulnerabilities related to climate change, but they did not provide evidence that their risk assessment process was systematic and robust. The location of these communities in northern and central Manitoba respectively, where the impacts of a changing climate might be more clearly observed, may have contributed to their greater attention to climate change trends and risks.

Three plans established actions to address vulnerabilities to climate change: the two previously mentioned as well as the development plan for the RM of Rhineland and the Towns of Plum Coulee, Gretna and Altona (RPGA). In contrast to *addressing* vulnerabilities, no plans established any actions to better *understand* the biophysical risks or socioeconomic/ecological vulnerabilities to their communities caused by climate change.

As described in the following sections, plans that considered climate change adaptation tended to be newer than plans that did not. Therefore, it is helpful to examine the timelines to review and update plans as a proxy for the time that may be needed to better incorporate climate change adaptation into local planning. Seventeen development plans committed to a review within five years of the adoption of the development plan by-law, which is the default timeline set by *The Planning Act* for development plans that do not specify a timeline. Two plans strayed from the default by choosing seven years and one chose 10 years. Two of five emergency plans committed to an annual review while the other three make no mention of a timeline. Two integrated watershed management plans commit to a review within 10 years, two commit to five years, and one does not provide a timeline.

Looking at the climate risks considered in the plans, it can clearly be observed that municipalities acknowledged the risk arising from flooding, whether in association with climate change or not. Flood-related risks were identified



in all of the development, emergency and integrated water management plans reviewed. This finding is perhaps not surprising given the extent to which rural municipalities and urban areas in Manitoba have been adversely impacted by overland flooding and heavy rainfall events over the past decade or so.

Other climate-related risks received less attention in the plans. Of note is the low level of attention given to drought-related risks in development plans (3 of 20 plans) and emergency plans (one of five plans). In contrast, all five integrated watershed management plans noted risks and/or actions related to drought, with one linking this risk to climate change. This finding is most concerning given the devastation caused by drought on the Prairies in the 20th century and the potential for drought to return, fuelled by climate change. However, it is only in recent years that information related to how climate change will impact flood/drought cycles has been made available.

3.1 Development Plans

Among the 20 development plans reviewed, only five explicitly considered the need to adapt to climate change, namely the plans for Winnipeg, RPGA, La Broquerie, Steinbach and Gillam.

As summarized in Table 2, all of the plans gave some attention to flood risks, reflecting requirements in the Provincial Planning Regulation of *The Planning Act*.¹ Two plans explicitly considered flooding in the context of climate change. The remaining 18 plans considered flooding in general but did not consider how climate change may exacerbate this risk. Two plans considered drought generally, and one considered how drought may be exacerbated by climate change. None considered the risks associated with warming summers or winters. Two plans considered wildfires in general and two considered fires in connection to climate change. Two plans considered extreme weather in general, while three considered extreme weather in the context of climate change. One plan considered the effect climate change may have on increasing disease pressures.

Among the two development plans that established actions to adapt to climate change, neither connected these actions to budget allocations or specific timelines, other than stating that municipal capital expenditure plans should conform to the development plan. Further research is required to determine if funds and timelines have been identified in the implementation tools connected to these plans, such as by-laws and municipal capital and operating budgets.

One of the most important policies contained in development plans states that development should not take place on land that is vulnerable to flooding, with the standard typically being land that would be affected by a 1-in-100-year flood, or more recently a 1-in-200 year flood, unless sufficient flood-proofing is undertaken. While this type of policy may become increasingly valuable as the climate changes, determination of what constitutes a 1-in-100 year flood is based on recorded historical water level data. This calculation therefore does not anticipate the complex changes to hydrology anticipated to occur due to climate change, which is leading to less confidence in the accuracy of the calculated flood probability.

Rather than trying to determine the complex and uncertain effect that an altered climate will have on the frequency and magnitude of flooding, one adaptation that can help to address the uncertainty is to adopt a higher flood protection standard for developments. Adoption of a higher minimum flood protection standard will provide a greater absolute level of protection and a reduced risk of a flood event that exceeds the level of protection. In a number of recent studies, the Government of Manitoba has received recommendations to adopt a higher 1-in-200 year flood as the minimum flood protection standard. The new 1-in-200 year flood protection standard is being applied in provincially regulated Designated Flood Areas along the Red River north and south of Winnipeg, flood risk-mapping programs and provincial inputs into local development plans. It is also applied to specific

¹ Under Manitoba's Provincial Planning Regulation, development plan by-laws are to be general consistent with Provincial Land Use Policies, which include specific guidance regarding appropriate flood protection and mitigation measures to be followed to avoid flooding and erosion (Government of Manitoba, 2011).



development projects where the development plan directs municipalities to contact provincial departments regarding construction in a flood-prone area. While this recommendation was not predicated entirely on the effect of climate change, it can still be seen as a useful climate change adaptation that would better enable municipalities to manage the risk of more frequent and/or larger flooding events driven by a less predictable climate.

Many plans contained standard policies requiring private developments to provide drainage plans. Some plans committed to improving public drainage infrastructure. However, few plans specified the need for *sustainable* drainage design including flow control and water storage capacity. Without making these requirements clear, communities may move flooding issues downstream rather than addressing them on a watershed level. A lack of sustainable water management may increase both flood and drought risks as climate change brings increased moisture in the winter and spring followed by drought in the summer (for example, see Prairie Climate Centre, 2016). To address this concern, the Provincial Planning Regulation could be updated to more clearly state how development should address both flood and drought risks.

Many plans contained policies such as “promote the restoration and maintenance of wetland habitats to offset the demand for increased drainage requirements and drainage infrastructure” (RM of Taché, 2016, p. 10), although many were generalized to protecting “areas of ecological significance” or similar wording. Protecting and restoring natural assets like wetlands could be a cost-effective and ecologically impactful way to manage water, which could support risk reduction as climate change brings more floods and droughts to Manitoba communities. Aside from Gillam’s plan, no other development plans considered how these “areas of ecological significance” may be affected by a changing climate.

The wording of many development plans was very similar. A representative from Manitoba Municipal Relations confirmed that this is due to municipalities and planning districts relying on templates created by the provincial government and consulting firms. It is possible that implementation tools connected to these plans (such as by-laws and development agreements) have been customized to a greater degree for local conditions, but further research is required.

Based on a review of the sampled plans, the average year of completion for all plans that considered climate change is 2012. This is two years more recent than the average completed year of plans that did not consider climate change, which was 2010 (excluding the Grand Rapids development plan as an outlier that was completed in 1980). This difference in averages suggests that newer plans are more likely to consider climate change adaptation in some form. However, this shift appears to be happening slowly. Among the three newest development plans in this review—Headingley, Taché and Alonsa each completed theirs in 2016—none mention climate change in any way.

**Table 2. Overview of Development Plans**

Plan	Year approved	Considers need to adapt to climate change	Climate change risks considered and/or actions outlined					
			Floods	Drought	Extreme weather	Extreme heat	Wildfires	Pests/disease
OurWinnipeg	2011	Yes	G	N	G	N	N	N
RPGA	2012	Yes	Y	Y	Y	N	N	N
RM of Morris	2015	No	G	N	N	N	N	N
RM of Headingley	2016	No	G	N	N	N	N	N
RM of Taché	2016	No	G	G	G	N	N	N
RM of La Broquerie	2012	Yes	G	N	N	N	N	N
City of Steinbach	2015	Yes	Y	N	Y	N	Y	N
RM of Grahamdale	2006	No	G	N	N	N	N	N
Dunnottar	2006	No	G	N	N	N	N	N
Brandon & Area	2013	No	G	G	N	N	N	N
Morton-Boissevain	2010	No	G	N	N	N	N	N
Tanner's Crossing	2004	No	G	N	N	N	N	N
Eastern Interlake	2011	No	G	N	N	N	N	N
Dauphin	2010	No	G	N	N	N	G	N
Alonsa	2016	No	G	N	N	N	N	N
Tri-Roads	2005	No	G	N	N	N	N	N
Gillam	2012	Yes*	G	N	Y	N	Y	Y
Grand Rapids	1980	No	G	N	N	N	N	N
Lynn Lake	2009	No	G	N	N	N	G	N
Thompson	2013	No	G	N	N	N	N	N
Total "Yes" (Y = Considered the climate risk with an explicit connection to climate change)			2	1	3	0	2	1
Total "General" (G = Considered the climate risk, but not how climate change may alter it)			18	2	2	0	2	0
Total "No" (N = Did not consider the climate risk at all)			0	17	15	20	16	19

* Also considered the effect on infrastructure of melting permafrost due to climate change.



3.2 Emergency Plans

None of the five emergency plans reviewed explicitly considered the potential implications of a changing climate on emergency operations and identified actions to reduce growing climate-related risks, as outlined in Table 3.

All five emergency plans considered extreme weather and flooding in terms of outlining response procedures for residents and emergency services. Four of five considered wildfires, while two considered disease pressure (pandemics) and extreme heat.

Table 3. Overview of climate change references in reviewed emergency management plans

Plan	Year approved	Considers need to adapt to climate change	Climate change risks considered and/or actions outlined					
			Floods	Drought	Extreme weather	Extreme heat	Wildfires	Pests/disease
Winnipeg	2017	No	G	G	G	G	N	G
Brandon	Unspecified	No	G	N	G	G	G	G
Midwest	2005	No	G	N	G	N	G	N
Steinbach & Hanover	2015	No	G	N	G	N	G	N
Thompson	2016	No	G	N	G	N	G	N
Total “Yes” (Y = Considered the climate risk with an explicit connection to climate change)			0	0	0	0	0	0
Total “General” (G = Considered the climate risk, but not how climate change may alter it)			5	1	5	2	4	2
Total “No” (N = Did not consider the climate risk at all)			0	4	0	3	1	3

Only Winnipeg’s emergency plan considered drought. In the four communities that did not consider drought in their emergency plans, it is possible that drought preparation and response is handled by other formal or informal procedures, particularly if emergency plans are intended to focus on sudden and short-term emergencies. Further research is required to see if this is the case and whether other Manitoba communities consider drought in their emergency plans.

Like the development plans, none of the emergency plans reviewed connected adaptive (or any) actions to budget lines or specific timelines. Most emergency plans focused on general response procedures for all types of emergencies.

The Winnipeg and Brandon plans were the most robust in terms of both breadth and depth. They covered more types of emergencies that could be exacerbated by climate change (see the examples in the previous paragraph) and they went into greater detail for flooding, providing more information to help residents prepare and respond.

3.3 Integrated Watershed Management Plans

Two of the five watershed plans reviewed explicitly considered climate change adaptation. The La Salle River plan referred to climate change mitigation but not adaptation.



As summarized in Table 4, three of the plans consider flooding and droughts in general, but do not consider extreme weather, heat, wildfires or disease pressure. The Willow Creek plan does the same, except for making “climate change resilience” one of the goals of its surface water management plan.

Table 4. Overview of extent to which climate change considered in the integrated watershed management plans reviewed

Plan	Year approved	Considers need to adapt to climate change	Climate change risks considered and/or actions outlined					
			Floods	Drought	Extreme weather	Extreme heat	Wildfires	Pests/disease
Willow Creek	2012	Yes	Y	G	N	N	N	N
Carrot-Sask. River	2015	Yes	Y	Y	Y	N	Y	Y
La Salle River	2010	No*	G	G	N	N	N	N
East Souris River	2006	No	G	G	N	N	N	N
Little Sask. River	2011	No	G	G	N	N	N	N
Total “Yes” (Y = Considered the climate risk with an explicit connection to climate change)			2	1	1	0	1	1
Total “General” (G = Considered the climate risk, but not how climate change may alter it)			3	4	0	0	0	0
Total “No” (N = Did not consider the climate risk at all)			0	0	4	5	4	4

* Only considered mitigation and not adaptation to climate change.

Most of the plans attached timelines and geographic target areas to each action, which improved clarity regarding planned actions in comparison to development and emergency plans. Of course, each type of plan serves a different purpose and cannot follow the exact same format, but watershed plans tended to be more informative for the purposes of this review.

Unlike the development plans, most of the watershed plans specified the need for sustainable drainage, including water retention capacity.

The Carrot-Saskatchewan River Integrated Watershed Management Plan stands out among the rest, having considered the risks of climate change exacerbating flooding, drought, extreme weather, wildfires and disease pressure. The plan also outlines a number of actions to respond to these risks, such as “investigate adaptation strategies to mitigate potential climate change impacts ... review emergency plans to mitigate against major flooding and drought occurrences” influenced by climate change (Kelsey Conservation District, 2015, p. 32).

The two watershed plans that considered climate change adaptation were also the two newest plans among the five reviewed—the Carrot-Saskatchewan River plan was completed in 2015 and Willow Creek in 2012. This suggests that consideration of climate change adaptation is becoming increasingly common in watershed planning over time, but a larger sample of watershed plans is needed to verify this trend.



4.0 Recommendations

To address the gaps identified in the *Key Observations* section, this report recommends that the Province of Manitoba:

1. Incorporate climate change adaptation considerations into the templates for development plans, emergency plans, integrated watershed management plans and any other relevant plans. Given that many municipalities and watershed districts already rely on templates to guide development of their plans, this action will provide them and the consultants they engage with a helpful structure to follow.
2. Work with the Canadian Centre for Climate Services (Government of Canada, 2018) and the Prairie Climate Centre to help municipalities and watershed districts use local climate change projections to assess and mitigate risks. Similar guidance should also be provided to those that support and influence the development of municipal plans, such as consulting engineering firms.
3. Continue working to understand the types of resources and tools that municipalities and watershed districts need to better integrate climate change adaptation into their local planning processes.
4. Review existing land-use regulations and licensing processes, such as in relation to drainage, to assess the extent to which they are consistent with one another and help advance efforts to build climate resilience and promote sustainable practices.

Congruently, this report recommends that Manitoba municipalities, planning districts and watershed districts work with the Province of Manitoba, the Canadian Centre for Climate Services, the Prairie Climate Centre, consultants and other relevant organizations to:

5. Incorporate local climate change projections for the coming decades into development plans, emergency plans, integrated watershed management plans and other local planning processes.
6. Integrate systematic and robust risk and vulnerability assessments into local plans, including consideration of local climate change projections.
7. Develop or refine actions and policies within local plans to mitigate the risks and vulnerabilities identified and connect actions to funding and timelines.



5.0 Conclusions

This study aimed to assess the degree to which climate change adaptation is being considered in local development plans, emergency plans and integrated watershed management plans in Manitoba. Among the sample of 30 plans reviewed, several have recognized the risks associated with climate change and some have identified actions to address these concerns. However, the majority contain no explicit consideration of the risks posed by climate change or actions to mitigate these risks.

Of course, some communities may be making efforts to adapt to climate change that are not reflected in their formal plans. For example, although online materials for Winnipeg's Emergency Preparedness Program do not mention climate change, the city's emergency preparedness co-ordinator Randy Hull told Global News in 2014:

Typically we plan for [floods] as being a spring event, but now with climate change, we're thinking of the heavy, heavy rain events especially when they happen in North Dakota which is 80 per cent of the watershed of the Red River. In 2005 and 2010, we've had major events on our rivers within Winnipeg and they've been in the months of June and July which is not the norm. So now when we think of our preparation, we don't just make sandbags to be on the ready for March and April; we have sandbags on the ready for June, July, and August (Mortillaro, 2014).

This points to the need for further research to assess the extent to which adaptation actions are being implemented but are not reflected in existing planning documents. A broader sample of local plans including additional types of plans and tools (e.g., zoning by-laws, annual budgets, etc.) could be informative. As well, a survey of local officials could offer insight into formal and informal aspects of climate change adaptation efforts among Manitoba communities.



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Annex 1. Full Review of Plans

A1.1 Development Plans

A1.1.1 OurWinnipeg

Organization	City of Winnipeg
Year completed	2011
Description	OurWinnipeg presents a 25-year vision “intended to guide everything the city does. It provides a vision and policies that influence the delivery of City services, how we get around the city, and decisions about how the city grows.” The city has begun a process to review and update the plan.
Source	http://www.winnipeg.ca/interhom/cityhall/ourwinnipeg/

Criteria	Assessment
Climate change is recognized as a risk	Yes, but primarily from a mitigation perspective. However, this statement is relevant to adaptation: “Both globally and locally, people are feeling the effects of climate change.”
Mentions specific climate-related trends and data	No, but the plan summarizes historical climate data, including average summer and winter temperatures and sunshine levels.
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan identifies flood vulnerabilities and protective assets: “Winnipeg is located in the wide, nearly-flat Red River Valley. Because of its extremely flat topography, heavy clay soils and substantial snowfall, Winnipeg is subject to annual flooding. A system of dikes and diversions, including the 47 km-long Red River Floodway, are used to manage water in the city. Drainage must always be dealt with thoughtfully here, evidenced by the city’s comprehensive land drainage system. This system requires space, and is comprised of many retention structures including innovative constructed wetlands.”



Criteria	Assessment
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No, not explicitly connected to climate change adaptation, but relevant city-wide policies include:</p> <ul style="list-style-type: none"> • “Enhance and maintain stormwater management and flood protection systems.” • “Focus a significant share of growth to Centres and Corridors in a manner that ... encourages a built form that supports a pedestrian-friendly environment while incorporating climate-sensitive site and building design.” It is unclear whether this refers to climate change mitigation, adaptation, or both. • “Maintain emergency planning efforts to prevent hazards from developing into disasters and to reduce the effects of natural hazards including extreme weather” <p><i>Sustainable Water and Waste</i>, one of the OurWinnipeg direction strategies, contains relevant policies such as:</p> <ul style="list-style-type: none"> • The Basement Flooding Protection Program which educates homeowners on preventive measures • The basement flooding relief program to enhance sewer capacity in combined sewer areas and older separate sewer areas • Continual updating of the city's GIS-based flood manual • Tree planting and landscaping to enhance water retention • Retrofitting flood protection infrastructure
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No, only that OurWinnipeg is a 25-year vision for the city.
Identifies financial resources for planned adaptation actions	No, only that the implementation plans for OurWinnipeg will be implemented through the city's budgeting process.
Mentions other relevant climate change adaptation plans or initiatives	No, but the plan makes general connections such as “implementation plans will ... be integrated with other strategic plans.”

A1.1.2 RPGA Development Plan

Organization	RPGA Planning District
Year completed	2012
Description	The Rural Municipality (RM) of Rhineland and the Towns of Plum Coulee, Gretna, and Altona formed the RPGA Planning District on January 1, 2010 to ensure that “long-term land-use planning is done on an integrated and regional basis.” The RPGA Planning District completed a development plan in 2012.
Source	https://www.gov.mb.ca/mr/land_use_dev/pubs/rpga_development_plan.pdf



Criteria	Assessment
Climate change is recognized as a risk	Yes—goal 3c is to “Build infrastructure and develop to a standard that is resilient and adaptable to changes in future climate” and goal 4b is to “promote the agrarian culture and economy” by managing “population growth in a way that respects the ‘right to farm’ and producers’ ability to adapt to changes in climate, the economy, and animal husbandry and production techniques.”
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No—the plan only implies certain risks through its goals and policies such as increased flooding and drought.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No—the plan only implies certain vulnerabilities, such as inadequate infrastructure, through its goals and policies.
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>Yes — the plan lists 31 pages of development policies, some of which are explicitly connected to goal 3c or 4b. For example:</p> <p>Flood mitigation:</p> <ul style="list-style-type: none"> • “Naturalize land drainage and ensure there is capacity to withstand extreme weather events (3b, 3c, 3d).” • Drainage plans are required in certain cases for livestock operations (2.3.21.2 d) as part of a development agreement and for “major commercial or industrial development of Agro-Industrial areas” as part of a secondary/concept plan (2.3.24 b). • “5.3.23 Leave lands that flood significantly in a natural state or develop it only for low-intensity uses such as recreation, grazing, or cropping (3b, 3c).” <p>Drought resilience:</p> <ul style="list-style-type: none"> • “3.3.27 Proactively plan and implement water reservoir capacity and water pump upgrades. (1a, 1b, 1c, 1d, 1e, 3c).” <p>Adaptation planning:</p> <ul style="list-style-type: none"> • “5.3.26 Prepare for a future increase in extreme weather events such as drought and flash flooding (3c, 3d)” • “5.3.42 Build resilient infrastructure systems by assessing risks, including those related to natural events and changing weather patterns, and creating emergency plans (3c, 3d)”
Identifies specific vulnerable sectors/areas on which to focus planned actions	Yes—goal 4b focuses on agriculture and climate change adaptation. The plan focuses much attention on drainage planning and infrastructure for both urban and rural areas of the planning district.
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No
Mentions other relevant climate change adaptation plans or initiatives	Yes: “5.3.42 Build resilient infrastructure systems by assessing risks, including those related to natural events and changing weather patterns, and creating emergency plans (3c, 3d)”



A1.1.3 RM of Morris Development Plan

Organization	Rural Municipality of Morris
Year completed	2015
Description	<p>This plan aims to reduce uncertainty to the public and private sectors regarding the future use of land and resources in the RM.</p> <p>The objectives are to: serve as a framework for formulating development policies and decisions; identify factors relevant to the use and development of land; identify the critical problems and opportunities concerning the development of land in the RM of Morris, and related social, economic and environmental considerations; establish the desired characteristics, patterns and timing of future land development, and related social, economic and environmental effects; establish and specify programs and actions necessary for implementing the Development Plan; establish approaches to consulting and coordinating with planning districts and other municipalities immediately abutting the RM of Morris, on the use and development of land; and identify matters of provincial concern, which affect the use of land and other resources within the municipality.</p>

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan makes many considerations for flooding in general, as described in the next several rows.



Criteria	Assessment
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No, but the plan aims to reduce flood vulnerabilities in general:</p> <ul style="list-style-type: none"> • “Non-agricultural development should be encouraged to locate outside the floodplain and within the flood protection dikes. Flood-proofing will be required for any non-agricultural development, including agro-commercial or industrial development that occurs within the floodplain.” • “Where a parcel of land is being subdivided and it contains an area(s) that in the opinion of Council is unsuitable for development by reason of being flood-prone, a natural drainage course or otherwise unsuitable due to its topography, this area may be required to be dedicated as Public Reserve (open space) in accordance with the provisions of The Planning Act. These open space areas should be maintained in an undeveloped state or used for low-intensity uses such as recreation or wildlife habitat.” • “Council should encourage the retention of wildlife habitat and the preservation of native vegetation in the form of natural treed areas or un-cleared land along creeks, drains, unused road allowances or other areas that are not suitable for agriculture or which may create more benefit when left in a natural state.” • “Council should work with the Province to develop infrastructure that will maintain viable transportation, power and communication linkages in major flood events, including maintaining supply and distribution linkages.”
Identifies specific vulnerable sectors/areas on which to focus planned actions	<p>No, not explicit to climate change, but it does for flood risk in general: “Based on the extent of the 1997 Flood in Manitoba, approximately 60% of the RM of Morris is now within the Red River Valley Designated Flood Area.” The plan provides maps of the Red River Valley Designated Flood Area, which could see increased flooding in the decades to come due to climate change.</p> <p>The plan notes that dike upgrades and additions have been made around Rosenort, but “certain industrial operations within that Urban Centre have ongoing concerns, and experience considerable impacts related to road closures in major flood events.”</p>
Identifies specific timelines for adaptation actions	<p>No, but it states that “while the Development Plan is comprehensive and long-term in scope, it provides specific policies to guide decisions on development in the next five years.”</p>
Identifies financial resources for planned adaptation actions	<p>No, only that “Council should consult the Development Plan and related strategies when revising the municipalities annual (5) Five-Year Capital Expenditure Program.”</p>
Mentions other relevant climate change adaptation plans or initiatives	<p>No</p>



A1.1.4 RM of Headingley Development Plan

Organization	Rural Municipality of Headingley
Year completed	2016
Description	The plan seeks to “preserve and develop what is desirable in the Municipality” including well-developed public services, natural riverbanks and semi-rural neighbourhoods. “As Headingley moves forward it will enhance and add recreational lands and facilities, plan for schools, picnic grounds and a town site in order to maintain the outstanding community environment it currently enjoys.”
Source	http://headingley.municipalwebsites.ca/Editor/images/Headingley%20Development%20Plan%20-%20By-Law%206-2014.pdf

Criteria	Assessment
Climate change is recognized as a risk	No, only that <i>The Climate Change and Emissions Reduction Act</i> is one of many provincial acts that impact land development.
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan identifies general flood vulnerabilities: “Hazards lands are those lands along the Assiniboine River subject to potential flooding, erosion and bank stability problems.” The plan notes that the RM has “slow drainage due to flat topography and clay soils.”
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but the plan states that “developments that would drain or fill any significant wetland or marshland area should be prohibited.” The plan states that “in order to avoid personal loss and hardship it is necessary to avoid development of hazard lands or to ensure that adequate measures are taken to reduce or eliminate the hazard” (see the hazard lands definition in the previous row). The plan also includes the standard policy that “developments shall not be allowed in areas subject to flooding, erosion, or bank instability unless detailed analysis of the specific site provided by a qualified engineer can prove the development to be safe from the aforementioned hazards.” The requirement for drainage planning with new development is incorporated into policies throughout the plan in a standard format.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, only that “the RM of Headingley shall consult the Development Plan when revising the annual five-year capital expenditure program.”
Mentions other relevant climate change adaptation plans or initiatives	No



A1.1.5 RM of Taché Development Plan

Organization	Rural Municipality of Taché
Year completed	2016
Description	The plan aims to (1) create great places to live, work, play and visit; (2) create a vibrant community where agriculture, resource development, and residents coexist in a peaceful, environmentally safe and orderly manner; (3) ensure the RM is environmentally responsible, resilient and sustainable; and (4) strengthen and diversify the economy, while ensuring a fiscally strong RM.
Source	http://cms.rmtache.ca/Editor/images/Notices/R.M.%20of%20Tach%C3%A9%20Development%20Plan%20By-law%20No.%205-2016.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No, but the plan notes the climate conditions of the recent past: <ul style="list-style-type: none"> extremely cold winters and warm summers mean annual temperature of 2.4°C mean annual precipitation which increases slightly from 504 mm in the west to 510 mm in the east average frost-free period ranging from 118-115 days
Identifies specific biophysical risks due to a changing climate	No, but the plan notes that the climate and geography make the RM susceptible to flooding, blizzards and tornadoes.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan notes that the RM is close to the Red River Floodway and has poor natural drainage caused by flat topography. Portions of the RM are often subject to flooding from the Seine River. The plan notes the RM's "extensive network of agricultural drains, particularly in the west."



Criteria	Assessment
<p>Establishes specific adaptation-related actions to address the identified vulnerabilities</p>	<p>No, but various objectives and policies in the plan are relevant.</p> <p>The plans objectives include:</p> <ul style="list-style-type: none"> • “Promote land use and development that minimizes risks to people, property and water quality from hazards related to flooding, erosion, and bank instability.” • “Manage surface drainage and enhance flood protection on a watershed basis.” • “Promote emergency planning to respond to extreme weather events, like flooding, tornadoes, and drought.” <p>Unlike many other development plans, Taché’s uses a 200-year flood instead of a 100-year flood as the standard for flood protection structures in certain areas.</p> <p>Relevant policies include:</p> <ul style="list-style-type: none"> • “Subdivision in the Escarpment Area may be permitted on a limited basis, provided the proposed uses are compatible with agricultural and resource extraction uses and meet the following criteria” including “the proposed lot is not located in poorly drained areas, swampland, marshland, on deep peat or organic soils, or in areas subject to ponding or flooding”. • “Promote the restoration and maintenance of wetland habitats to offset the demand for increased drainage requirements and drainage infrastructure.” • The plan contains standard policies such as “land subject to flooding should be left in its natural state or only developed for low-intensity uses such as open space recreation, grazing, copping, forestry, and wildlife habitat.”
<p>Identifies specific vulnerable sectors/areas on which to focus planned actions</p>	<p>No, but the plan identifies that portions of the RM are often subject to flooding from the Red River and Seine River.</p>
<p>Identifies specific timelines for adaptation actions</p>	<p>No</p>
<p>Identifies financial resources for planned adaptation actions</p>	<p>No, only that this plan should guide the capital expenditure plans of the “RM, higher levels of government and their departments, school boards, health authorities, and other agencies with a stake in the development and growth of the RM.”</p> <p>In addition, the plan notes that the RM can use capital levies to “cover certain capital costs related to the subdivision of land” including “infrastructure upgrades and maintenance”.</p>
<p>Mentions other relevant climate change adaptation plans or initiatives</p>	<p>No, but the plan states that the RM should “develop and continuously update a strategy for emergency preparedness, particularly in regards to natural hazards such as flooding, tornadoes, and other extreme weather events.”</p> <p>The plan also has a policy to “coordinate with both the Cooks Creek and Seine-Rat River Conservation Districts for drainage and watershed management.”</p>



A1.1.6 RM of La Broquerie Development Plan

Organization	Rural Municipality of La Broquerie
Year completed	2012
Description	This plan aims to guide the RM to “build competitive and healthy communities” that “integrate physical development with environmental, social and economic perspectives in decision making.”
Source	http://labroquerie.municipalwebsites.ca/Editor/images/Documents/Development_Plan_20-11_6-14.pdf

Criteria	Assessment
Climate change is recognized as a risk	Yes: one of the plan’s development management policies is to reduce “energy use and adapt to climate change by designing Principal Centres and Rural Residential Areas as bicycle and pedestrian friendly” (RM of La Broquerie, 2012). While the climate change mitigation aspect of this policy is clear, the adaptation benefit is unclear.
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but one policy aims to protect “the riparian zone along the Seine River, associated creeks, and tributaries to ensure riverbank stabilization, flood risk reduction and natural area protection by designating riverbank lands within 100 metres of the average high water mark of rivers and streams as an Environmental Policy Area.” As well, the plan lists standard policies that are relevant, including: <ul style="list-style-type: none"> • “Proposals for development in flood plain hazard areas shall be referred to the appropriate government department for review prior to approval by Council.” • Requiring Concept Plans for larger developments within Principal Centres which guides a number of aspects including land drainage. • “Rural residential development will not be allowed to locate in areas prone to flooding.” • The definition of hazard lands includes those which would be flooded by a 100-year flood or greater. • “Preserve and enhance the urban and rural forests by ... Reducing the risks to life, health, safety, property and ecosystem health, that are associated with flooding, erosion and contaminated lands.”
Identifies specific vulnerable sectors/areas on which to focus planned actions	No



Criteria	Assessment
Identifies specific timelines for adaptation actions	No, but the plan provides development guidance “over the next seven-year planning horizon.”
Identifies financial resources for planned adaptation actions	No, but the plan states that the RM Council will “integrate the Municipal Operating and Capital budgets with the Development Plan’s Policies and Objectives to identify servicing priorities for capital and maintenance expenditures.”
Mentions other relevant climate change adaptation plans or initiatives	No



A1.1.7 City of Steinbach Official Community Plan

Organization	City of Steinbach
Year completed	2015
Description	This plan guides development for Steinbach in order to “maintain and promote a safe, affordable, environmentally responsible community that prides itself on sustainable growth, a diverse economy and being an inclusive, generous community.”

Criteria	Assessment
Climate change is recognized as a risk	Yes — although “climate change” is not explicitly mentioned, the plan notes that infrastructure should be “designed with changing weather patterns to withstand extreme weather events.”
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	Yes: one of the plan’s safety policies is to “make certain appropriate infrastructure is included in the planning of newly developed areas and ensure infrastructure is designed with changing weather patterns to withstand extreme weather events to allow the Police and Fire services to properly carry out their services (e.g., adequate street lighting levels, fire hydrant spacing, water storage reserve, water pressure etc.)” Another policy states that “the current practice of separating the land drainage and wastewater sewer systems in all developed portions of the City will be continued in all new developments.” As well, the plan contains standard policies such as requiring large developments to create concept plans that include drainage designs.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, only that “capital expenditure programs of the City of Steinbach shall be consistent with the provisions of the Plan.”
Mentions other relevant climate change adaptation plans or initiatives	No, but one of the plan’s policies is to “ensure that emergency services plans are updated as new development occurs.”



A1.1.8 RM of Grahamdale Development Plan

Organization	Rural Municipality of Grahamdale
Year completed	2006
Description	This plan guides development for the RM of Grahamdale.
Source	http://cms.grahamdale.ca/_docs/DevPlanOriginalText_954c647325.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No, not specific to climate change, but the plan outlines climate data for the recent past, including the mean annual temperature, mean annual precipitation and average frost-free period.
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan notes that there is considerable flooding in certain areas of the RM, including the lake and river shorelines. "Just over 12% (30,638 ha (75,706 ac)) of the soils in Grahamdale are affected by Wetness, where soil landscapes are poorly drained and/or are more than 50% wetlands."
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but the plan calls for public shoreline reserves to preserve natural habitat that reduce flooding and erosion. The plan recognizes the value of trees and forests in mitigating floods and outlines policies to protect these natural assets. The plan includes a number of standard policies to discourage development on flood-prone land (the 100-year flood standard is used) or require flood protection structures. The plan lists specifications for flood protection structures based on the development type. Standard policies are also listed to protect existing natural drainage and require drainage plans for new development.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, not explicitly related to climate change, but the plan identifies flood-prone areas.
Identifies specific timelines for adaptation actions	No, only that "the Development Plan is subject to review by the municipality at least once every five years."
Identifies financial resources for planned adaptation actions	No, but the plan notes that "the Council may take advantage of funds that are available from senior levels of government to assist in implementing programs necessary to achieve the objectives and policies of the Development Plan." The plan also contains the standard policy that the RM "should consult the Development Plan when revising its annual five-year capital expenditure programs."
Mentions other relevant climate change adaptation plans or initiatives	No



A1.1.9 Village of Dunnottar Development Plan

Organization	Village of Dunnottar
Year completed	2006
Description	This plan guides development for the Village of Dunnottar.
Source	http://cms.dunnottar.ca/Editor/images/Development%20Plan.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but flooding and erosion are identified as general vulnerabilities, not specific to climate change.
Establishes specific adaptation-related actions to address the identified vulnerabilities	“The practice of using existing marshes or restoring previously drained marshes and natural low areas may be encouraged where appropriate.” The plan contains policies similar to many development plans, including discouraging development on any lands that would be flooded by a 100-year flood.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but on Map 5, the plan identifies hazard lands, defined as “lands subject to flooding, ponding, bank instability, shoreline erosion, flowing wells, high susceptibility to groundwater pollution and poor subsoil characteristics for building purposes.”
Identifies specific timelines for adaptation actions	No, only that the plan must be reviewed every five years at minimum.
Identifies financial resources for planned adaptation actions	No, not explicitly connected to climate change, but the following policy is relevant: “Where the dedication of land pursuant to The Planning Act would serve no purpose, the Council may require a cash payment in lieu of such dedication as provided for by The Planning Act. Funds obtained in this manner are to be used to acquire blocks of land for public use adjacent to Lake Winnipeg Shoreline as land becomes available.”
Mentions other relevant climate change adaptation plans or initiatives	No



A1.1.10 Brandon & Area Planning District Development Plan

Organization	Brandon & Area Planning District
Year completed	2013
Description	This document coordinates land-use planning for the City of Brandon and the RMs of Cornwallis and Elton.
Source	http://www.brandon.ca/images/pdf/developmentServices/planning/By-laws/bapd_DevelopmentPlan2013.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No explicit connections to climate change adaptation are made, but the following objectives and actions seek to build resilience against floods and droughts, which is relevant to climate change adaptation:</p> <p>“protect people and property from damages that may result from flooding, erosion, and other natural hazards.”</p> <p>“minimize public expenditures for protection or disaster assistance in areas subject to flooding, water erosion, bank instability, landslide or subsidence.”</p> <p>“Rigorous development regulations will be implemented within flood-prone areas. The Development Plan includes a new flood map for Brandon that includes higher flood elevations than past development plans. Intensive development shall be directed away from the flood-prone areas depicted in the maps and allow only limited development for the areas protected by dykes.”</p> <p>“All flood-prone lands as indicated on Reference Map 7, should be restricted to natural use areas, public open space, recreation areas and sports fields or certain types of agricultural uses.”</p> <p>Drought resilience: “Environmentally sensitive practices such as xeriscaping will be encouraged in the development of parks and greenspaces.”</p> <p>Xeriscaping is defined as “landscaping with slow-growing, drought tolerant plants to conserve water and reduce yard trimmings.”</p> <p>Drainage plans are required for all types of development. The plan contains provisions to preserve natural drainage areas.</p>
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but the plan includes a map of flood-prone areas, including from 1-in-100-year floods.



Criteria	Assessment
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No
Mentions other relevant climate change adaptation plans or initiatives	No

A1.1.11 Morton-Boissevain Planning District Development Plan

Organization	Morton-Boissevain Planning District
Year completed	2010
Description	<p>This plan guides development for the Municipality of Boissevain–Morton. The plan’s vision has two primary elements:</p> <ul style="list-style-type: none"> • “Recognition that agriculture remains the essential cornerstone of the district’s economy and that land-use policies should strive to protect today’s agricultural industry and encourage its opportunities for future growth • Recognition that re-population is critical to maintaining the district’s economic and social lifestyles and that policies to achieve land-use diversification will be a necessary part of this local revitalization.”

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan outlines the general types of hazard lands, including lands prone to flooding, erosion and landslides. This is standard practice for many of the development plans reviewed.



Criteria	Assessment
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No, but one of the objectives for Urban Agricultural Areas is to “preserve natural water catchment areas that should not be developed because of their importance to the drainage system of the Town and surrounding areas.” Several other fairly standard mentions are made of drainage; i.e., that drainage patterns must be considered for new developments.</p> <p>“Proposed developments should not obstruct, increase or otherwise adversely alter water and flood flows and velocities”</p> <p>As with certain other development plans, this one directs development away from hazard lands, including “Lands subject to flooding—all lands which would be flooded by the 100-year flood, or by a recorded flood exceeding the 100-year flood or a flood specified by the Department of Water Stewardship in areas affected by flood control works.”</p>
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, only that councils should consult the development plan when revisiting their annual five-year capital expenditure program.
Mentions other relevant climate change adaptation plans or initiatives	No



A1.1.12 Tanner's Crossing Planning District Development Plan

Organization	Tanner's Crossing Planning District
Year completed	2004
Description	The plan guides development for "the Town of Minnedosa, the Town of Rapid City, the Rural Municipality of Minto and the Rural Municipality of Odanah."

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No, but the plan identifies related risks: "The river system in the planning district also represents some significant safety concerns for nearby developments, as periodic flooding events may expose structures to significant damage."
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but the plan includes policies to reduce the impact of floods: <ul style="list-style-type: none"> • "Development will generally not be allowed within any of the following hazardous areas: (a) Any land which would be flooded by the 100 year flood; (b) Any riverbank area which would be eroded or become unstable due to the action of water contained in an adjacent waterway within the next 50 years; or (c) Any land subject to other hazards such as instability, landslides or subsidence – where the actual effects of such hazards have occurred or have been predicted." • "Livestock operations shall not be allowed within any area which has been designated as subject to flooding, based on information provided by Manitoba Water Stewardship. • "preserve the natural capability of the Little Saskatchewan River to convey floodwater."
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but flood-prone areas are identified.
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No. The plan only notes the importance of capital works programs aligning with the development plan.
Mentions other relevant climate change adaptation plans or initiatives	No, but the plan is meant to connect to capital works programs and other planning mechanisms of the member communities.



A1.1.13 Eastern Interlake Planning District Development Plan

Organization	Eastern Interlake Planning District
Year completed	2011
Description	<p>This plan guides development for the RMs of Gimli, Bifrost, Village of Riverton, and the towns of Arborg and Winnipeg Beach.</p> <p>The plan's objectives are to: protect Lake Winnipeg, support economic development and protect renewable resources, protect and grow agriculture, efficiently grow the urban centres, accommodate non-farm rural development, structure residential and recreation land use in Gimli, plan for long-term service delivery, protect natural resources, and conserve energy and utilize renewable energy in new developments.</p>
Source	http://www.interlakeplanning.com/assets/by-laws/by-law%2002-2010%20eipd%20development%20plan%20-%20completed%20doc.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No, but the plan identifies flood-prone areas.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but the plan states that "Development will generally be directed away from hazard areas. Hazard Lands include the following: a) ... all lands which would be flooded by the 100-year flood, or by a recorded flood exceeding the 100-year flood ... b) ... all lands which would, within a 50-year period, be eroded or become unstable due to the action of water contained in an adjacent waterway or waterbody; c) Lands subject to other hazards such as landslides or subsidence, e.g., those lands where actual effects of such hazards have occurred or have been predicted."
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, only that capital works and expenditure programs of the member communities should conform to this plan.
Mentions other relevant climate change adaptation plans or initiatives	No, but see the previous row.



A1.1.14 City of Dauphin Development Plan

Organization	City of Dauphin
Year completed	2010
Description	This plan guides development for the City of Dauphin. The plan's vision is to promote "well-planned, environmentally sound and economically sustainable growth [that] will add to Dauphin's strengths and enable its vision to continue to be achieved."
Source	http://www.dauphin.ca/wpcontent/uploads/2013/04/Development_Plan_2010.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No, but the plan identifies flooding as a major risk.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but the following policies could support climate change adaptation: <ul style="list-style-type: none"> • "Ensure the quantity and rate of delivery [of the water supply] is adequate to meet present and future domestic and fire protection needs." • Various policies to discourage development or take the necessary precautions in flood-prone areas. • Require drainage plans and promote retention pond systems.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but the plan identifies flood-prone areas as those "which lie in a northeasterly direction from the Second Avenue NW bridge, below an elevation of 294.2 metres."
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, but as with many development plans, this plan states that capital works programs should conform to the plan.
Mentions other relevant climate change adaptation plans or initiatives	No



A1.1.15 RM of Alonsa Development Plan

Organization	RM of Alonsa
Year completed	2016
Description	This plan guides development in the RM of Alonsa. The plan's goals are to: (1) promote sustainable cottage communities; (2) promote recreational opportunities on Lake Manitoba; (3) promote sustainable agriculture; (4) plan for a diverse economy; (5) plan for age-friendly communities; and (6) preserve hazard lands.
Source	https://rmofalonsa.files.wordpress.com/2017/04/alonsa-development-plan-2016.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the 2011 and 2014 floods are identified as recent issues. General vulnerabilities are identified that could be exacerbated by climate change. For example: "31% of soils in the RM are Class 5 or lower due to excess wetness, stoniness and droughtiness."
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but a number of policies are listed to require drainage plans and maintenance and to discourage development in flood-prone areas. For example, as with a number of other development plans, this plan states that "No permanent structure shall be built below the 100 year flood level, or on land subject to flooding, poor drainage, or shoreline erosion, unless the hazard has been mitigated through protection measures."
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but a map of the 2011 flood is provided.
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, but one objective is to "ensure that local land-use planning is coordinated with the municipal capital and financial plans."
Mentions other relevant climate change adaptation plans or initiatives	No



A1.1.16 Tri-Roads Planning District Development Plan

Organization	Tri-Roads Planning District
Year completed	2005
Description	This plan guides development for “the Rural Municipalities of Russell, Shellmouth–Boulton and Silver Creek, the Village of Binscarth and the Town of Russell.”

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No, but the plan identifies flooding and erosion as general risks.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but the plan aims to direct development away from hazard areas, including “all lands which would be flooded by the 100-year flood, or by a recorded flood exceeding the 100-year flood”
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but the plan provides tools to address areas vulnerable to flooding and other risks. For example: “Municipal zoning by-laws may establish agricultural zones that distinguish between lands that have significantly different environmental considerations. These environmental considerations may include, but are not limited to, such factors as groundwater quality, quantity and sensitivity, flood risk and surface water sensitivity, as well as the protection of high-quality aggregate resources.”
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No. In general, the plan states that “Council(s) should consult the development plan when revising the annual five (5) year capital expenditure program.”
Mentions other relevant climate change adaptation plans or initiatives	No



A1.1.17 Town of Gillam Development Plan

Organization	Town of Gillam
Year completed	2012
Description	This plan identified three major issues impacting future development: the lack of choice in housing, the lack of land for development and the lack of a sense of community for all citizens.
Source	http://www.townofgillam.com/_assets/Downloads/development/FINAL%20-%20Gillam%20Dev%20Plan.pdf

Criteria	Assessment
Climate change is recognized as a risk	Yes—goal 3 of the plan is to “develop Gillam in a manner that respects the unique environment and natural features of the land in this region of northern Manitoba” including by constructing “infrastructure and buildings to a northern standard that is resilient and adaptable to changes in future climate.”
Mentions specific climate-related trends and data	Yes, but minimal—“Average temperatures are expected to increase in northern Manitoba”
Identifies specific biophysical risks due to a changing climate	Yes, but minimal—e.g., “warmer winter temperatures”
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	Yes—“a changing climate can have major impacts on the community. Gillam lies north of the permafrost line that runs through the boreal forest in the area. As temperatures increase, permafrost becomes more unstable and can exacerbate issues related to buckling and deteriorating road foundations, railway tracks, bridges, and building foundations. Winter road infrastructure is also threatened by warmer winter temperatures. Increased forest fire risk, insect outbreaks, and extreme weather events can also affect Gillam as average temperatures rises.”
Establishes specific adaptation-related actions to address the identified vulnerabilities	Yes—the plan’s principles include “development standards ensure new development respects climate conditions and the community’s preferred aesthetics.” The following policies are related to this principle and goal 3: <ul style="list-style-type: none"> • “Roads should not be paved with a hard surface in order to withstand climate conditions and avoid higher maintenance costs” (3.3.13) • “Periodically review street construction and maintenance standards for best practices with regard to northern standards and changing climates” (5.3.48) • “Adopt building standards above building code that reflect soil and permafrost conditions for foundations. Periodically review these standards as climate changes” (5.3.18) • “Encourage the Office of the Fire Commissioner to consider standards above building code that reflect soil and permafrost conditions for foundations and to periodically review these standards as climate changes” (5.3.23) • “Encourage the Office of the Fire Commissioner to review the water infrastructure standards in the Building By-law periodically to ensure appropriate standards are in place for northern and changing climates” (5.3.52)



Criteria	Assessment
Identifies specific vulnerable sectors/areas on which to focus planned actions	Yes: the policies listed in the previous row cover transportation, commerce, housing and water infrastructure.
Identifies specific timelines for adaptation actions	No—only that “once this Development Plan is adopted, any development or land-use change must be generally consistent with this plan.”
Identifies financial resources for planned adaptation actions	No—only that “the Town of Gillam, other levels of government and their departments, school boards, health authorities, Manitoba Hydro, and other agencies with a stake in the development and growth of the municipality should consult the Development Plan when revising capital plans.”
Mentions other relevant climate change adaptation plans or initiatives	Not explicitly connected to climate change, but the plan states that “secondary plans provide more guidance on development issues. Council may, by by-law, adopt a secondary plan to deal with objectives and issues in a part of the municipality, including, any matter”

A1.1.18 Grand Rapids Basic Planning Statement

Organization	Local Government District of Grand Rapids
Year completed	1980
Description	<p>This plan guides development for the Local Government District of Grand Rapids, but also encourages coordination with the Grand Rapids Indian Band, the Government of Manitoba, the Government of Canada and Manitoba Hydro.</p> <p>The plan identifies a “low standard of living” as a primary concern and sets four objectives: develop and maintain a desirable living environment; have available sufficient residential land to satisfy the requirements of all present and prospective community residents; have available a sufficient variety of residential land to satisfy the life style requirements of all potential community residents; and facilitate all residential areas to be serviced with essential municipal services.</p>

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan identifies flooding and erosion as general risks.



Criteria	Assessment
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but the plan contains relevant policies such as: <ul style="list-style-type: none"> • “Notwithstanding the policies and land-use designations contained in the Grand Rapids Basic Planning Statement, no development will be permitted in the hazardous areas or in areas unsuitable for a proposed development, such as flood-prone areas, erosion prone slope lands, marsh areas, and other similar areas.” • “Development should be restricted on lands subject to periodic flooding, poor soil and/or water table conditions, or other characteristics adversely affecting the installation of roads, services, foundations, or other facilities.”
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but the plan identifies areas of the district that are well drained and areas that are poorly drained.
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, but the plan states that it should be used in coordination with public works programs among other tools.
Mentions other relevant climate change adaptation plans or initiatives	No, but the plan mentions other tools that should be used in coordination with this plan: zoning by-laws, subdivision regulations, building regulations, public works programs, provincial land-use regulations, renewable resource use, quarry and mining resource use, development agreements and land acquisition.

A1.1.19 Town of Lynn Lake Development Plan

Organization	Town of Lynn Lake
Year completed	2009
Description	This plan guides development for the Town of Lynn Lake. Relevant objectives include: (1) promote a humane, functional and attractive environment that is responsive to the needs of the residents; (3) encourage sustainable development by providing a balance between the rehabilitation of older areas of the community while providing for a variety of new lifestyle options; (5) promote co-operation and coordination between the citizens of Lynn Lake and the Provincial Government, Council requests circulation on matters relating to the development of land within 50 kilometres from their municipal boundary; (6) determine the suitability of lands for intensive development prior to designating or approving land uses; (8) ensure that any and all proposed developments are in the best interests of the community and residents for both the short and long term; (9) ensure all development proposals are reviewed with particular attention paid to ensuring the balance between the man-made and natural environment; and (10) protect sensitive or fragile environments from destructive development.



Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	<p>No, but one of the goals listed is to “protect people and property from damages that may result from fire, flooding, erosion, soil instability and other natural hazards as well as to protect environmentally sensitive areas.”</p> <p>As well, one of the concerns listed in the plan is “to ensure that an adequate and efficient water supply, sanitary sewer system, storm drainage and waste disposal is provided for all existing and future developments.”</p>
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No, but relevant policies include:</p> <ul style="list-style-type: none"> • “For roads designed using surface drainage methods such as ditches, culverts and shoulders of sufficient width and structural strength shall be provided to ensure ease of maintenance and to reduce long-term costs.” • “Land that is unstable or subject to natural hazards such as flooding or erosion shall be retained for: natural or open areas; park or resource harvesting; other development or use that would be compatible with the risk; or where the hazard has been eliminated or protected against.”
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, but the plan indicates that it should be used to assist capital works decisions among other types of decisions.
Mentions other relevant climate change adaptation plans or initiatives	<p>No, but the plan contains several references that are standard in most development plans:</p> <ul style="list-style-type: none"> • The plan references its relation to relevant provincial acts and regulations; and • The plan “establishes objectives, principles and policies to assist in making decisions regarding land use, capital works, zoning, re-zoning, approval of subdivisions, development agreements, etc. The decisions made should conform to the objectives, principles and policies laid out in this document.”



A1.1.20 Thompson Planning District Development Plan

Organization	Thompson Planning District
Year completed	2013
Description	<p>This plan guides development for the City of Thompson and the Local Government District of Mystery Lake.</p> <p>The plan's objectives are to: (1) promote economic diversification; (2) provide effective and efficient district-wide services in accordance with financial capabilities; (3) provide an economic plan that reflects the nature of the planning district; (4) ensure that the City of Thompson continues to play an important role in the future economic growth of Northern Manitoba and beyond; (5) maximize development opportunities in all sectors for the benefit of the planning district and its residents; (6) encourage communication and coordination between the various agencies within the planning district with regards to recreational opportunities.</p>
Source	https://thompson.municipalwebsites.ca/Editor/images/documents/Planning%20and%20Development/Development%20Plan%20Final.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No, but a number of relevant policies are listed that could support adaptation if climate change exacerbates flooding in the area:</p> <ul style="list-style-type: none"> • “No permanent development will be permitted in areas that are: a) Subject to flooding; or b) Low lying, marshy, erosion prone or of an unstable nature.” • Regarding seasonal resort developments, “A public reserve shall be provided in conjunction with water related developments, the depth of which shall be based upon adequate access, scale of proposal, vegetation preservation, and physical characteristics such as gradient and flood susceptibility.” • In terms of road development, “Storm water flows in developed areas will need to be maintained to the pre-development flow rate.” • Any new industrial park sites shall “c) ensure that storm water management issues are addressed through site design and grading.”
Identifies specific vulnerable sectors/areas on which to focus planned actions	No



Criteria	Assessment
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No
Mentions other relevant climate change adaptation plans or initiatives	No, but it references the Provincial Planning Regulation and several other relevant tools.

A1.2 Emergency Plans

A1.2.1 Winnipeg Emergency Preparedness Program

Organization	City of Winnipeg
Year completed	2017
Description	The aim of this program is to “provide and support effective planning, disaster management, and education services to enable the citizens of Winnipeg to prepare for, respond to, and recover from a major disaster.” The program provides a variety of resources on its website, EmergWeb. Parts of this site were last updated in 2017.
Source	http://www.winnipeg.ca/epp/

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No, but EmergWeb provides historical flood information and flood protection tips.
Identifies specific biophysical risks due to a changing climate	No, but the City created an emergency preparedness guide intended for a variety of emergencies including blizzards, tornadoes, ice storms, hail, heavy rains, floods, wind storms, fires, droughts, heat, and pandemics, any of which could be exacerbated by climate change.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but EmergWeb provides resources for residents to prepare for flooding.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but EmergWeb provides a tool for residents to assess whether their home is at risk for flooding.



Criteria	Assessment
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No, but EmergWeb notes that the City has invested \$37 million in permanent flood protection since the 1997 flood.
Mentions other relevant climate change adaptation plans or initiatives	No, but EmergWeb references federal emergency preparedness resources.

A1.2.2 Brandon Emergency Preparedness Program

Organization	City of Brandon
Year completed	Unspecified
Description	The Brandon Emergency Preparedness Program outlines emergency response procedures and public preparedness information. “The current version of the Brandon Emergency Plan has been used as a model for other small cities in Manitoba. It outlines the requirements of a program that is integrated with the community as it works towards improving emergency preparedness, response, recovery and mitigation. This requires a coordinated community approach to public information, response training and early warning.”
Source	http://emerg.brandon.ca/

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No



Criteria	Assessment
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No, but the plan offers guidance for certain emergencies that may become more prevalent in a changing climate:</p> <p>The Emergency Preparedness Program includes tips for:</p> <ul style="list-style-type: none"> • Responding to a pandemic; • Avoiding heat stroke; • Flood preparation and response; and • Dealing with severe weather, including blizzards, heavy snowfalls, freezing rains, wind chill, severe thunderstorms, heavy rains, tornadoes, winds and heat.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No
Mentions other relevant climate change adaptation plans or initiatives	No



A1.2.3 Midwest Emergency District Emergency Plan

Organization	Midwest Emergency District
Year completed	2010
Description	<p>The Midwest Emergency District is comprised of the Town of Hamiota and the municipalities of Blanshard, Hamiota, Miniota and Woodworth.</p> <p>“This Emergency Plan was developed to provide direction in response to an emergency that exists or is imminent, or a disaster has occurred or threatens. This plan will not prevent nor reduce the possibility of an emergency occurring, but will aid in providing a coordinated response in an effort to reduce human suffering and loss, or damage to property and the environment.”</p>
Source	www.hamiota.com/news/Midwest%20District%20Emergency%20Plan.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but an Incident Action Plan was created for forest/bush fires, which could be exacerbated by climate change. As well, the Incident Action Plan for a utility outage identifies possible causes of the outage: “severe weather problems, such as blizzards, rainstorms, hail, high winds, and tornadoes.”
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No, except for basic procedures outlined for the Incident Action Plans mentioned in the previous row.</p> <p>The plan lists important contact information including sandbag suppliers in case of flooding.</p> <p>The plan mentions that amateur severe weather spotters are present in more than 40 communities across Southern Manitoba with training provided by the Canadian Weather Amateur Radio Network (CANWARN).</p>
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but some of the incidents listed in the Incident Action Plans, such as forest/bush fires, identify crop damage and road/railway closures as possible effects.
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No
Mentions other relevant climate change adaptation plans or initiatives	No



A1.2.4 Steinbach & Hanover Emergency Plan

Organization	City of Steinbach & RM of Hanover
Year completed	2015
Description	<p>The plan outlines general emergency procedures for the City of Steinbach and RM of Hanover.</p> <p>Emergency Action Guidelines have been completed for eight types of emergencies. These guidelines identify the potential causes of the emergency, the resources available for response, and a response procedure checklist.</p> <p>Steinbach also completed a Hazard Analysis to assess the potential impacts of six major hazards.</p>

Criteria	Assessment
Climate change is recognized as a risk	No—but several of the emergency action guidelines and hazard analyses are relevant: flooding, severe storms and wildfire.
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No—but the guidelines for flooding, severe weather, and wildfire, and the hazard analysis for winter storms and severe summer storms/tornadoes are relevant to adaptation.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No—but the hazard analysis for winter storms and severe summer storms/tornadoes assessed the vulnerabilities from extreme weather events in the past 6 to 10 years.
Establishes specific adaptation-related actions to address the identified vulnerabilities	No—not explicitly connected to climate change, actions are identified that could be relevant. For example: “provision of electrical support services” is one of the potential actions to respond to winter storms.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No—not explicitly connected to climate change, but the hazard analysis identify possible major effects of emergencies on infrastructure, emergency services and other sectors, as well as specific areas of concern within Steinbach and Hanover.
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No
Mentions other relevant climate change adaptation plans or initiatives	No—not explicitly connected to climate change, but the hazard analysis contains actions such as “assist the Southern Regional Health Authority Emergency Response Plan.”



A1.2.5 Thompson Emergency Plan

Organization	City of Thompson
Year completed	2016
Description	This plan “will aid in providing a prompt and coordinated response, thereby reducing human suffering and loss or damage to property and the environment.”
Source	http://www.thompson.ca/p/disaster-plan

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but among the 11 emergencies identified as high priority for Thompson, several are relevant to climate change: forest fires, floods, and tornadoes/windstorms. The plan is designed with these high priority emergencies in mind.
Establishes specific adaptation-related actions to address the identified vulnerabilities	No—the plan provides only general emergency procedures and contact information.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No
Mentions other relevant climate change adaptation plans or initiatives	No



A1.3 Integrated Watershed Management Plans

A1.3.1 Willow Creek Integrated Watershed Management Plan

Organization	East Interlake Conservation District
Year completed	2012
Description	<p>“This 10-year plan outlines actions for the protection, conservation and restoration of land, water and aquatic ecosystems in the Willow Creek watershed. ... The plan focuses on addressing the five land and water priorities identified by watershed residents” — protect and enhance drinking water quality, surface water management, surface water quality, soil and shoreline management, and wildlife and fish habitat.</p> <p>The Willow Creek watershed is located in Manitoba’s Interlake region, containing all or parts of the RMs of Armstrong, Gimli, Rockwood and St. Andrews.</p>
Source	https://www.gov.mb.ca/sd/waterstewardship/iwmp/willow_creek/willow_creek.html

Criteria	Assessment
Climate change is recognized as a risk	Yes—but only one explicit mention, identifying “climate change resilience” as one of the goals of holistic surface water management.
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No—not explicitly connected to climate change, but the plan identifies risks to the watershed for each of its five priorities, many of which are relevant to climate change adaptation.
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	<p>No—not explicitly connected to climate change, but the plan identifies “possible future drought conditions, reduced groundwater recharge or over consumption” as a concern expressed by some residents.</p> <p>In terms of existing challenges, the plan notes that “the frequency and extent of flooding [of residential and agricultural lands] has increased in recent years due to a combination of water-logged soils, higher-than-normal amounts of precipitation and unplanned and inadequately maintained drains.”</p>
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No—not explicitly connected to climate change, except for a general reference to climate change resilience as a goal of surface water management. However, the plan lists actions for each of its five priorities on pages 50–57, many of which are relevant to climate change adaptation.</p> <p>For example, the plan identifies the need for “accurate elevation data, such as LiDAR surveys” to improve management of natural water retention areas, and “the construction of control structures as mechanism to draw down water volumes in dry periods.”</p> <p>The plan also considers drought resilience, noting that “even though overall water consumption is much less than the available water supply, water conservation practices such as reduced water use for lawn care and the installation of low-flow water fixtures and water saving appliances are important.” The plan proposes to “educate watershed residents on water conservation practices such as the installation of low-flow water fixtures, water saving appliances and xeriscaping.”</p>



Criteria	Assessment
Identifies specific vulnerable sectors/areas on which to focus planned actions	<p>No—not explicitly connected to climate change, but the five priorities of the plan (see description) could constitute areas vulnerable to climate change. The plan identifies target locations for all actions listed on pages 50–57.</p> <p>As well, the surface water management plan within priority 2 delineates four zones, each with their own vulnerabilities and actions needed:</p> <ul style="list-style-type: none"> • Zone 1: Natural Upland Habitat and Rangeland—Balance agricultural production and natural areas • Zone 2: Agriculture Production—Improve surface water management to support cattle production • Zone 3: Annual Cropland—Improve surface water management to support annual crop production • Zone 4: Urban and Rural Communities—Improve shoreline condition and upgrade major outlets
Identifies specific timelines for adaptation actions	<p>Yes—“Progress and success of the plan’s implementation will be assessed on an annual basis. Watershed report cards will be distributed to residents every three to five years. After five years of implementation, the plan may be revised if watershed issues or priorities have changed or if new actions are required. A new plan will be developed in 10 years.”</p>
Identifies financial resources for planned adaptation actions	<p>No</p>
Mentions other relevant climate change adaptation plans or initiatives	<p>Yes—the plan mentions its close linkage with development plans in the watershed. On page 48, the plan lists 13 recommendations for Rural Municipalities and Planning Districts to help advance the five priorities of the watershed.</p>



A1.3.2 Carrot-Saskatchewan River Integrated Watershed Management Plan

Organization	Kelsey Conservation District
Year completed	2015
Description	This plan aims to “positively influence land and water management, with a focus on protecting water, aquatic ecosystems and drinking water sources in the Carrot-Saskatchewan River Watershed ... It will serve as a tool for residents, government agencies and other stakeholders, allowing for coordinated decision making across the watershed.”
Source	http://kelseyconservationdistrict.com/docs/carrot_skriver_final.pdf

Criteria	Assessment
Climate change is recognized as a risk	Yes: “Local Indigenous people from Opaskwayak Cree Nation, Mosakahiken Cree Nation and the Northern Affairs community of Moose Lake have been involved throughout development of this IWMP. Traditional knowledge and valuable insight supported key action development of this plan, including aquifer protection targets, climate change adaptation considerations and Traditional Knowledge incorporation into development planning for future sustainable development efforts.” “Incorporating a more holistic approach to surface water management considers aquatic health, water quality, potential climate change impacts, recreational opportunities and flood mitigation protection measures.”
Mentions specific climate-related trends and data	Yes: “Climate change projections for this region generally indicate an increase in temperature and more extreme weather events. Overall, climate change projections for Manitoba illustrate a greater impact in the northern parts of the province. Impacts include more extreme weather and precipitation events, an increased average temperature and a higher likelihood of drought. Temperatures are also projected to rise more in the winter, affecting snowpack levels.” No citation is listed.
Identifies specific biophysical risks due to a changing climate	Yes: See the previous row.



Criteria	Assessment
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	<p>Yes: “Periods of extended drought may negatively impact wildlife habitat and alter migration patterns for sensitive species. Drought will create an environment more susceptible to erosion, forest fires, disease, and invasive species. In terms of agriculture, warmer and longer growing seasons could be beneficial for crop growth, and subsequently shorter and milder winters may be positive for livestock. However, extreme rainfall events and drought occurrences could significantly decrease agricultural productivity, resulting in significant economic losses. Water storage and drainage systems may not be suited to handle future climatic conditions. The Carrot-Saskatchewan River Watershed may appear very different from its now water-rich state. Adaptive techniques and water conservation strategies, such as those applied in a Water Soft Paths approach, may be required to instill climate change resilience in the watershed. Aboriginal communities and traditional knowledge of Elders should be included in any climate change adaptive strategies.”</p> <p>One of the plan’s key actions is to “investigate adaptation strategies to mitigate potential climate change impacts, including more extreme weather events, increased flows, agricultural impacts and infrastructure considerations”</p> <p>The plan also identifies that climate change is impacting wildlife in the watershed, causing “an increase in forest fires, ungulate diseases and parasites”</p>
Establishes specific adaptation-related actions to address the identified vulnerabilities	Yes, but only commitments to develop more detailed actions—see the previous row.
Identifies specific vulnerable sectors/areas on which to focus planned actions	Yes: the list of actions includes geographic areas to target.
Identifies specific timelines for adaptation actions	<p>Yes: some actions include timelines; e.g., “Form a team of local stakeholders by 2017 to assist DUC in identifying key maintenance concerns on water control structures.”</p> <p>“Progress of the plan’s implementation will be evaluated annually by Kelsey Conservation District”</p> <p>“[A] new plan will be completed in 10 years”</p>
Identifies financial resources for planned adaptation actions	Yes: The plan’s implementation will be “integrated into the district’s budget and conservation programming”
Mentions other relevant climate change adaptation plans or initiatives	Yes: The plan offers 10 recommendations for local development plans to support the watershed plan. This includes development plans from Mosakahiken Cree Nation, Opaskwayak Cree Nation, Moose Lake, the RM of Kelsey, the Town of The Pas, and the Province of Manitoba regarding Crown land.



A1.3.3 La Salle River Integrated Watershed Management Plan

Organization	La Salle River Watershed Planning Authority
Year completed	2010
Description	Completed in partnership with La Salle Redboine Conservation District, the province and six RMs. The plan's vision is "To have clean, safe and abundant water that sustains our vibrant local communities and a system of coordinated surface water management that respects current water users, agriculture, downstream residents and aquatic ecosystems."
Source	https://www.gov.mb.ca/sd/waterstewardship/iwmp/la_salle_river/la_salle_river.html

Criteria	Assessment
Climate change is recognized as a risk	Yes, but only in that "ecological goods and services" includes "climate stabilization" and "carbon storage." Only identifies climate change mitigation and not adaptation.
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan identifies flooding as a major impact to which communities in the watershed are vulnerable: <ul style="list-style-type: none"> • "residential development in flood-prone areas or riparian zones along the La Salle River" • "fallen trees in rivers that are restricting and blocking flow, causing further flooding and negative impacts on water quality"
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but Goal 1 is to "improve the state of surface water management in terms of alleviating downstream flooding and ensuring sufficient water is available during dry periods" through the following objectives: <ol style="list-style-type: none"> Coordinate properly designed drainage works and activities by developing a surface water management plan and policies for the watershed Improve the provincial waterways infrastructure maintenance schedule Improve the drainage licensing process Develop water control and flood protection projects The plan lists actions connected to each of these objectives. For example, one of the actions connective to objective 1d is to "develop digital maps of flood-prone and spring/summer flooding areas in the watershed."
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but areas such as "residential development in flood-prone areas or riparian zones along the La Salle River" are identified as vulnerable to flooding in general.
Identifies specific timelines for adaptation actions	No
Identifies financial resources for planned adaptation actions	No



Criteria	Assessment
Mentions other relevant climate change adaptation plans or initiatives	No, but the plan notes that its implementation will involve coordinated efforts by many stakeholders including local municipalities.

A1.3.4 East Souris River Integrated Watershed Management Plan

Organization	Turtle Mountain Conservation District
Year completed	2006
Description	This plan identifies priority actions for surface water management, water quality, water supply, ecosystems, soils, and education and communications.
Source	https://www.gov.mb.ca/sd/waterstewardship/iwmp/east_souris/documentation/east_souris_river_iwmp.pdf

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No, nothing specific to climate change, but the plan does summarize local climate data for the recent past.
Identifies specific biophysical risks due to a changing climate	No, but the plan identifies that the watershed is “generally considered ‘water deficient’” and that “the southwest corner is normally the driest corner of the province.”
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but the plan identifies that the Deloraine Reservoir provides water during droughts. This could be considered an asset for climate change resilience. The plan also identifies chronic flooding, erosion and water quality problems as requiring attention.
Establishes specific adaptation-related actions to address the identified vulnerabilities	No, but a variety of actions are listed, including the development of a surface water management plan, workshops on maintaining wetland and riparian health, and more.
Identifies specific vulnerable sectors/areas on which to focus planned actions	No
Identifies specific timelines for adaptation actions	No, not for climate change adaptation, but the plan outlines a timeline for its actions in general, such as developing a surface water management plan.
Identifies financial resources for planned adaptation actions	No, not for adaptation explicitly, but the plan provides a breakdown of current income. It estimates that \$6 million is required over five years to fund the plan and projects where new funding partnerships can be formed to reach this target.
Mentions other relevant climate change adaptation plans or initiatives	No, but the plan notes that its information will be used by local planning districts in their development plans.



A1.3.5 Little Saskatchewan River Integrated Watershed Management Plan

Organization	Little Saskatchewan River Conservation District
Year completed	2011
Description	<p>This plan sets five goals for the watershed: reduce nutrient levels in local lakes, protect drinking water, develop a surface water management plan, protect the quality and quantity of groundwater, and conserve and improve natural areas.</p> <p>Little Saskatchewan River was home to the first Alternative Land Use Services pilot project from 2006 to 2009.</p>
Source	https://www.gov.mb.ca/sd/waterstewardship/iwmp/little_sask_river/little_sask_river.html

Criteria	Assessment
Climate change is recognized as a risk	No
Mentions specific climate-related trends and data	No
Identifies specific biophysical risks due to a changing climate	No
Identifies specific socioeconomic or ecological vulnerabilities/impacts due to a changing climate	No, but drought-prone areas are identified on a map of the watershed, for example.
Establishes specific adaptation-related actions to address the identified vulnerabilities	<p>No, but many of the 47 actions are relevant to climate change adaptation. For example:</p> <ul style="list-style-type: none"> • “Establish objective criteria to evaluate drainage applications” • “Increase water storage for drought sensitive areas” • “Protect wetlands through conservation agreements”
Identifies specific vulnerable sectors/areas on which to focus planned actions	No, but each action has a geographic target area associated with it.
Identifies specific timelines for adaptation actions	No, but the plan states that “in addition to bi-annual updates this watershed management plan will undergo a full, comprehensive review in 2016.” The surface water management strategy was to be developed by 2013. Each action has a timeframe associated with it.
Identifies financial resources for planned adaptation actions	No
Mentions other relevant climate change adaptation plans or initiatives	Yes, the plan makes reference to development plans. In addition, the plan’s 47 actions are categorized by organization responsible, including the conservation district, provincial government, municipalities and more.

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Published by the International Institute for Sustainable Development.

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