



Adapting to Climate Change in Kimberley, BC

**Executive Summary
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COLUMBIA BASIN TRUST
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Executive Summary

The City of Kimberley was selected by the Columbia Basin Trust (CBT) in April 2008 as one of two pilot communities¹ for its *Communities Adapting to Climate Change* initiative.² The purpose of CBT's initiative is helping Basin communities increase their resiliency to climate change through engaging in a process to address anticipated changes to climate at the local level by identifying the range of potential impacts, assessing local vulnerabilities and sensitivities, and developing adaptation strategies.

Kimberley's project was based on the three pillars of *Learn*, *Share* and *Plan*, which also defined the three stages of its process:

Learn – Gathering available scientific data on projected climate impacts to Kimberley and connecting this with local observations and concerns.

Share – Bringing the results of the data collection to the community, and providing opportunities to learn how the predicted impacts could affect Kimberley.

Plan – Synthesizing all the input that was received in the learning and sharing stages, and creating an action plan setting out both short-term and long-term adaptation measures.

A historical climate analysis and future climate projections were prepared by the Pacific Climate Impacts Consortium (PCIC) to inform local understanding of how Kimberley's climate has been changing and how it may continue to change in the future.³ In short, temperatures in this area have warmed about 1 degree Celsius over the last century, and are forecast by PCIC to warm by an additional 2 to 3 degrees by the 2050s.

Overall precipitation in the area has seen a slight increase over the last hundred years, with a clear trend to less precipitation in the form of snow. In the future, precipitation is expected to see a slight increase in winter and slight decrease in summer. Stream flows have also been changing, with peak spring flows shifting into April/May from May/June since the 1950s. Future projections for stream flows predict earlier spring freshets with lower peak volumes and a more sustained duration, and lower stream flows in late summer and early fall.

On the basis of current climate science, local observations and input received from five workshops and a community survey, three priority climate impact issue areas were identified for Kimberley:

1. Water and Forests (Natural Environment)
2. Municipal Infrastructure (Built Environment)
3. Tourism (Socio-Economic Environment)

Small working groups comprised of City staff and council representatives, local Steering Committee members and other interested local stakeholders were formed to further address the priority issues. Each of the working groups undertook a vulnerability assessment where they identified key

¹ The second community was the District of Elkford.

² For more information on CBT's initiative, see http://www.cbt.org/Initiatives/Climate_Change/?Adaptation

³ Arelia T. Werner, Brenna M. Paterson & Harpreet K. Jaswal, "Analytical Summary: Past Trends and Future Projections for the Kimberley and Elkford Region – DRAFT", Pacific Climate Impacts Consortium, October 2008. The analysis remains in draft form as of the preparation of this report, and is expected to be finalized later in 2009.

vulnerabilities associated with their priority issue (see Summary of Kimberley’s Vulnerabilities by Priority Issue Area below) and developed recommendations for adaptive actions. High priority actions for each vulnerability are summarized further below by priority issue area, and a complete list of recommended actions can be found in the appendices to this report.

Summary of Kimberley’s Vulnerabilities by Priority Issue Area

| Natural Environment: Water and Forests | Built Environment: Municipal Infrastructure | Socio-Economic Environment: Tourism |
|---|--|--|
| Municipal Water Supply | Urban Trees | Ski Tourism |
| Quality of Aquatic Environment | Drinking Water System | Golf Tourism |
| Risk of Flooding | Risk of Flooding | Trail-Based Tourism |
| Forest Health, Mountain Pine Beetle and Wildfire Risk | Flooding associated with Storm Water System | Water-Based Tourism |
| Wildfire Risk to the Built Environment | Wildfire and Protection of Municipal Infrastructure | Festival and Events Tourism |
| | Risk of Slope Failure | Other Local Attractions |
| | Future Proofing and Other Considerations | |

The project’s recommendations for adaptation range from simple, no regrets measures such as obtaining standing permission of the Mayor for City of Kimberley fire crews to fight fires in Kimberley’s watersheds to more complex investigations such as undertaking a comprehensive flood hazard study for Mark Creek. Many of the recommendations are intended to inform Kimberley’s upcoming OCP review and renewal process, and several extend to seek involvement of other local stakeholders in addressing local vulnerabilities, including Tourism Kimberley, Wildsight, Resorts of the Canadian Rockies, Kimberley Nature Park Society, service clubs, and local residents.

The hundred plus recommendations formed during the project will be received by the City of Kimberley in late June, 2009, after which the City will begin the process of determining which recommendations it can and will move forward with.

Overall, the project Steering Committee has concluded that the vast majority of Kimberley’s vulnerabilities to local climate impacts over the next decade or two can be managed through appropriate adaptive actions. For example, there is likely sufficient adaptive capacity in Kimberley’s water usage patterns to be able to make necessary reductions in the event of a significant drought year, though key questions still need to be explored in greater detail regarding reservoir management in drought years and balancing water needs for aquatic habitat with human needs.

Perhaps the most catastrophic vulnerability facing the community is wildfire, especially if it occurs in either of the watersheds that Kimberley relies upon for drinking water. Interface forest fuel management and reduction thus remains a high priority for the community, and will ideally be conducted in a manner that takes into account Kimberley’s status as a resort town and its tourism assets such as viewscapes, recreational trails and overall aesthetics of the community. Accordingly, navigating and balancing multiple interests and values will be a big component of moving forward with certain of the project’s recommendations, and measured tradeoffs between competing values will likely be required in some instances.

In addition to the recommendations arising from this project, the main “take-home” messages to the community are the importance of a) taking into account the possibility and implications of new

patterns of temperatures and precipitation when planning for Kimberley's future, and b) giving consideration to a wider range of climate futures than what may have been experienced here in the past.

CALP and Visualization of Climate Impacts

In fall 2008, the University of British Columbia's Collaborative for Advanced Landscape Planning (CALP) received funding to do a climate change visioning study as part of Kimberley's adaptation project. The purpose of the study was to develop digital visualization tools to help communicate climate change impacts and adaptation and mitigation scenarios to local residents and stakeholders. CALP worked with the project Steering Committee to localize two general scenarios:

- 1) "Kimberley Adapts" - adapting to climate impacts in a world where greenhouse gas emissions continue in a "business as usual" trajectory, and
- 2) "Low Carbon Kimberley" - engaging in both climate adaptation and mitigation strategies.

CALP synthesized considerable map-based (geo-spatial) information about Kimberley both now and in the future, creating an interactive tool in *GoogleEarth* that allows users to view different scenarios for the community using *GoogleEarth*'s capabilities to show landscapes in three dimensions. This work will be publicly available later in 2009.

The scenarios work with CALP revealed some underlying vulnerabilities that could be triggered by the advent of peak oil and sky-rocketing energy prices. These include the impacts of peak oil and/or carbon pricing on tourism, energy security and food security, especially in respect of Kimberley's dependence on outside sources for its energy (natural gas and petroleum), food, tourism and recreational property investment dollars. Accordingly, various recommendations emerged from the Scenarios Working Group around energy, food security, transportation, housing and land-use planning with a view to enhancing Kimberley's resilience.

Summary of Key Project Outcomes

As a result of the climate change adaptation project and the City's more recent efforts to address greenhouse gas emissions inventories and mitigation planning, a solid foundation has now been created for Kimberley to continue its efforts on both climate change adaptation and mitigation, with the overall goal of building a community that is more informed, responsive and resilient to future impacts, trends or events associated with climate change. A short list of project outcomes include:

- Increased local knowledge and capacity on climate change adaptation planning within City of Kimberley and community
- Partnerships and relationships with a wide network of climate change scientists, experts and planners in BC
- Collection of considerable amount of data, research and studies on different aspects of climate change impacts and adaptation that is applicable to this area
- Digitization of considerable spatial and technical data in GIS, which will support City of Kimberley in expanding its information and mapping systems to include GIS-based material
- Identification of three priority adaptation issues and 18 areas of vulnerability for the community.
- Approximately 100 recommendations for local climate adaptation planning
- Visioning material and scenarios to support conversations around Kimberley's future opportunities and challenges vis-à-vis climate change

- Tools and processes for continuing the work
- Interest among some of the project partners to undertake additional climate adaptation work in Kimberley

Summary of High Priority Actions

The priority issue tables below set out the high priority actions for addressing Kimberley’s vulnerabilities associated with each of its priority issues, adding up to fifteen high priority recommendations in total. For interested readers, over 80 moderate and lower priority recommendations can be found both in the body of the report and in greater detail in the appendices. The table immediately below illustrates the criteria used to assign level of priority to recommendations:

Definitions for Threat Reduction and Urgency of Action

| Rating | Threat Reduction | Urgency of Action |
|------------|--|---|
| High (H) | This action will help reduce the risk of damage to Kimberley homes, economic conditions and/or living conditions affecting more than 10% of Kimberley's population | Initiate action in 0-2 years, or between 2009-2011 |
| Medium (M) | This action will help reduce the risk of damage to Kimberley homes, economic conditions and/or living conditions affecting less than 10% of Kimberley's population | Initiate action in 3-10 years, or between 2012-2019 |
| Low (L) | This action will not reduce the risk of damage to Kimberley homes, economic conditions and/or living conditions, but may reduce the risk of impacts to other aspects of life | Initiate action in 10+ years |

WATER AND WATERSHEDS

Goal: Work towards a high degree of knowledge and understanding of Kimberley's water sources and system to ensure long-term sustainability and adaptation in a changing climate

| ID | Action | Threat Reduction | Urgency | Priority | Lead/Champion |
|--|--|------------------|---------|----------|---------------|
| <u>Vulnerability: Municipal Water Supply</u> | | | | | |
| <u>Objective: Kimberley is resilient to drought and seasonal low-water periods while maintaining adequate water for ecosystem needs</u> | | | | | |
| WF-1 | Determine the reasons Kimberley has more than double the BC average for water consumption | H | H | H+ | City |
| WF-2 | Determine the limits of current water supply for current demands and future growth, including estimates of drought flows incorporating future climate change scenarios and ecosystem needs | H | H | H+ | City |
| WF-10 | Develop a plan to address community water | H | H | H | City |

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| ID | Action | Threat Reduction | Urgency | Priority | Lead/Champion |
|---|---|------------------|---------|----------|---------------|
| | use and reservoir management during drought conditions | | | | |
| Vulnerability: Quality of Aquatic Environment | | | | | |
| Objective: Aquatic life and local fish populations are protected and maintained despite the stresses of a warming climate | | | | | |
| No High Priority Actions Identified | | | | | |
| Vulnerability: Risk of Flooding | | | | | |
| Objective: Flooding risks to Kimberley homes and infrastructure are minimized through upgrading flood hazard information to incorporate projected climate impacts and corresponding mitigative actions | | | | | |
| WF-20/ MI-24 | Undertake a comprehensive flood hazard study for Kimberley, including re-analysis of stream flow data for flood return frequency, digital elevation model, possible obstruction/blockage sites and weak/low points in the system. | M | H | M++ | City |

FORESTS AND FOREST ECOSYSTEMS

Goal: Minimize threats to forest health, watersheds, the local tourist economy and the built environment through adaptive management of the forests surrounding Kimberley.

| ID | Action | Threat Reduction | Urgency | Priority | Lead/Champion |
|--|---|------------------|---------|----------|-------------------|
| Vulnerability: Forest Health, Mountain Pine Beetle and Wildfire | | | | | |
| Objective: To minimize the risk of catastrophic wildfire in Kimberley's watersheds and ensure logging activity minimizes impact to water quality and volume in Mark, Matthew and Kimberley Creeks | | | | | |
| WF-28 | Contact Tembec to assist in defining spill response locations for Kimberley and Matthew Creek. Identify and map locations for pumping stations and clearly mark with signs on site. | H | H | H | City |
| WF-32 | Ensure Total Chance Access Planning is in place for all three watersheds (Mark, Kim, Matthew) and that regular refreshers (annual) occur for fire crew and contractors. | H | H | H | City – Fire Chief |
| WF-33 | Obtain standing permission from Mayor for wildfire response in the City's watersheds | H | H | H | City |
| WF-35 | Maintain and improve communications with the SE Fire Centre in Castlegar | H | H | H | City – Fire Chief |
| WF-36/ MI-8 | Ensure plan for alternative drinking water source for the community in the event of wildfire in Mark Creek watershed | H | H | H | City |

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| ID | Action | Threat Reduction | Urgency | Priority | Lead/Champion |
|--|--|------------------|---------|----------|-------------------|
| <u>Vulnerability: Wildfire & Risk to the Built Environment</u> <u>Objective: To protect life and property from the threat of wildfire</u> | | | | | |
| WF-37 | Continuation of current suite of interface fuel treatment activities, with addition of community education program to build and maintain support for interface fuel management | H | H | H | City – Fire Chief |
| WF-39 | Encourage community uptake of FireSmart building and landscaping guidelines | H | H | H | City |
| WF-40/ MI-16 | Review and update community emergency response plans for all emergencies (fire, flood, extreme storm events, etc), including emergency communication and evacuation plans | H | H | H | City – Fire Chief |

MUNICIPAL INFRASTRUCTURE

Goal: Kimberley's municipal infrastructure is resilient to the stresses of a changing climate.

| ID | Action | Threat Reduction | Urgency | Priority | Lead/Champion |
|---|--|------------------|---------|----------|---------------|
| <u>Vulnerability: Urban Trees</u> <u>Objective: Kimberley develops an urban forestry plan to ensure safe and healthy trees throughout the community</u> | | | | | |
| No High Priority Actions Identified | | | | | |
| <u>Vulnerability: Drinking Water System</u> <u>Objective: Kimberley's drinking water system minimizes water loss and provides high quality drinking water for the community</u> | | | | | |
| MI-8/ WF-36 | Undertake cost-benefit analysis for reciprocal back-up water system from Matthew Creek or St Mary's River if Mark Creek system goes down | H | H | H | City |
| MI-9 | Reduce risk to chlorination plants and associated infrastructure through appropriate firesmarting | H | H | H | City |
| <u>Vulnerability: Flooding Associated with Storm Water System</u> <u>Objective: Kimberley develops and adopts an integrated storm water management plan that reflects future climate projections</u> | | | | | |
| No High Priority Actions Identified | | | | | |
| <u>Vulnerability: Wildfire Protection and Municipal Infrastructure</u> <u>Objective: City of Kimberley takes appropriate measures to reduce wildfire risks to significant municipal infrastructure</u> | | | | | |

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| ID | Action | Threat Reduction | Urgency | Priority | Lead/Champion |
|--|--|------------------|---------|----------|-------------------|
| MI-9 | Reduce risk to chlorination plants and associated infrastructure through appropriate firesmarting | H | H | H | City – Fire Chief |
| MI-15/ WF-37 | Continuation of current suite of interface fuel treatment activities, with addition of community education program to build and maintain support for interface fuel management | H | H | H | City - Fire Chief |
| MI-16/ WF-40 | Review and update community emergency response plans for all emergencies (fire, flood, extreme storm events, etc) | H | H | H | City - Fire Chief |
| <u>Vulnerability: Risk of Slope Failures</u> | | | | | |
| Objective: At-risk slopes are identified and there is a clear plan to manage risk associated with them. | | | | | |
| No High Priority Actions Identified | | | | | |
| <u>Vulnerability: Future Proofing and Other Considerations</u> | | | | | |
| Objective: Kimberley’s built and human environment is resilient to climate change impacts | | | | | |
| MI-32 | Incorporation of climate impacts and adaptation measures into the City’s upcoming 10 year infrastructure plan | H | H | H | City |

TOURISM

Goal: To maintain and, where feasible, enhance Kimberley’s tourism assets through climate adaptation actions, and identify opportunities to attract visitors from areas that are experiencing more significant climate impacts.

| ID | Action | Threat Reduction | Urgency | Priority | Lead/Champion |
|--|--------|------------------|---------|----------|---------------|
| No High Priority Actions Identified for any of the Vulnerabilities Below | | | | | |
| <u>Vulnerability: Ski Tourism</u> | | | | | |
| Objective: To maintain a viable commercial ski hill operation for as long as possible without compromising municipal water supply and related water values. | | | | | |
| <u>Vulnerability: Golf Tourism</u> | | | | | |
| Objective: To maintain three commercially viable golf courses in Kimberley for as long as possible without compromising municipal water supply and related water values | | | | | |
| <u>Vulnerability: Trail Based Tourism</u> | | | | | |
| Objective: To enhance, protect and more effectively promote Kimberley’s trail systems as a valuable recreational and eco-tourism asset | | | | | |
| <u>Vulnerability: Water Based Tourism</u> | | | | | |
| Objective: Enhance awareness of our precious local rivers and lakes, and help ensure appropriate land/resource use decisions to manage and protect them in a changing climate | | | | | |

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| ID | Action | Threat Reduction | Urgency | Priority | Lead/Champion |
|--|--------|------------------|---------|----------|---------------|
| <p><u>Vulnerability:</u> Festival and Event Tourism <u>Objective:</u> Maximize opportunities for festivals afforded by a changing climate while ensuring health and safety of visitors</p> | | | | | |
| <p><u>Vulnerability:</u> Other Local Attractions <u>Objective:</u> Preserve the character of local tourist attractions and general mountain town feel in a changing climate</p> | | | | | |