

Executive Summary:

Implementing Climate Change Adaptation in Prince George, BC

Volume 4: Flooding

Climate change is affecting the number and severity of flooding events that are occurring, and that are expected to occur in the future. Communities need to adapt to climate change by preparing for anticipated changes in flooding to avoid significant social, environmental and economic consequences. Many actions can be taken to help to avoid future flooding and/or to be more prepared for a flooding event should one occur.

As Prince George lies at the confluence of the Fraser and the Nechako Rivers, it is very susceptible to flooding. The Fraser River is vulnerable to springtime freshet flooding events, while the Nechako River is more prone to experiencing ice-jam floods. In 2007-2008 Prince George experienced flooding conditions three times; including a winter ice jam in the Nechako which pushed waters above the 200 year flood plain and caused significant damage (see Figure 1). These events made flood mitigation an urgent priority, and not surprisingly flooding was selected as the second highest priority for climate change adaptation in Prince George. Therefore ongoing local adaptation work, supported through the federally funded Regional Adaptation Collaborative (RAC) program, focused on flooding for the Prince George case study.



Figure 1. The Nechako River during the ice jam event in January 2008.

Flooding is closely related to many other impacts of climate change, and many strategies can address multiple impacts. Some of these related impacts include:

- **Storm-water:** many storm-water management facilities remove run-off from a site as quickly as possible which increases flood risk, and natural storm-water retention areas can store run-off and mitigate flood risk
- **Transportation infrastructure:** roads are often susceptible to flooding, they are needed to respond to flooding emergencies and they can be designed to act as dikes to mitigate risk
- **Transportation and building infrastructure:** human structures can be damaged by flooding and are typically impervious; thus precipitation does not enter the ground and water flows directly back into waterways
- **Forests:** forests are an important part of the hydrological cycle and the mountain pine beetle (MPB) has had a huge effect on the hydrology of northern BC, resulting in an increased flood risk.

In 2008 the City began a major project with many consultants to assess the local flooding risk, develop and prioritize flood relief options, suggest practical solutions to manage the risk, and update the existing floodplain maps. The assessment resulted in a risk analysis report, and two documents evaluating the risk and proposing flood control strategies. After an extensive process involving public consultation, the second phase of the project was completed. In this phase, potential flood control options in Prince George were each evaluated in 14 identified high-risk areas. Factors such as cost and environmental impact were considered, and recommendations were made for each area. To address all areas will cost an estimated \$35 million.

Because Prince George has identified flooding as a major local adaptation priority, and was examining past and future climate change in partnerships with the Pacific Climate Impacts Consortium (PCIC), they decide to incorporate climate change into the flood risk assessment. The flooding consultants worked with PCIC to utilize climate change projection information in the analysis. The report found that the current effects of climate change do not appear to be having a significant impact on flooding in Prince George. Using projected climate changes for the 2050s, the report states that climate change will result in an overall increase in spring flows. Climate change may result in flow conditions conducive to ice-jam events, but this might be offset by warming winter temperatures. Therefore the relationship between climate change and ice-jam flooding is still not well understood. The consultants ultimately called for a freeboard allowance (i.e. the vertical distance added to the flood plain as a safety factor) of 1.0 metres to account for the potential impacts of climate change and the mountain pine beetle. The common practice in BC is to use a 0.6 m freeboard allowance.

In addition to the flood risk analysis, Prince George is taking many actions to minimize flood risk. These include a new emergency response bylaw, a new flood plain bylaw, and the inclusions of actions to mitigate flooding in the *myPG* plan. Additional future initiatives can help to further prepare Prince George to the potential impacts of increased flooding. Some of these adaptation actions include:

- Buying and rezoning land to uses that will help mitigate flooding risk, and encouraging land use (such as parkland and agriculture) in vulnerable areas that will result in less damage if a flood occurs
- Improving local capacity to effectively respond to floods and other extreme events
- Educating homeowners and residents to minimize risks of personal injury and property damage
- Encourage forestry practices that minimize negative hydrological effects
- Designing storm-water infrastructure to retain run-off and mitigate flooding risk
- Design infrastructure to minimize potential negative impacts on flooding, and also to be resilient to a potential increase in flooding