

BRITISH COLUMBIA'S FLOOD MANAGEMENT POLICY WINDOW – CAN WE TAKE ADVANTAGE?

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ABSTRACT: Over 300,000 people live on the Lower Fraser River floodplain in British Columbia, Canada. Many hundreds of thousands more would be affected if a large flood were to occur. The Lower Fraser Valley is the economic and transport centre for the province. The economic cost of a catastrophic flood to the region has not been recently calculated, but would be in the billions of dollars; the full social and environmental costs are incalculable. In June 2007, the Lower Fraser River threatened to spill over its banks, and potentially over the dikes. As a result of this scare, public awareness regarding flood potential, flood risk and flood damage increased dramatically. In addition, a report commissioned by the Fraser Basin Council and prepared by Northwest Hydraulic Consultants Ltd. in late 2006 showed a dramatic increase in the design flood profile, which triggered significant government concern. As a result of these two events, there was interest within the public and government to address the flood threat to the Fraser Valley. Government reacted to the threat, however for the most part the reactions have been focused on traditional structural solutions to flood management. There has been minimal progress towards creating a long-term integrated flood management solution for the Valley.

Key Words: Integrated Flood Management; Fraser River; Policy Window.

1. THE FRASER VALLEY – A FLOOD DISASTER WAITING TO HAPPEN?

The Fraser River, with a drainage of 233,000 km², is the largest river in British Columbia (BC), Canada, flowing from the Rocky Mountains down to the Pacific Ocean. At Hope, roughly 180 km from the ocean, the river exits from a confined canyon and flows across the Lower Fraser Valley. The Valley is largely developed, with over 300,000 people currently living on the floodplain. Many hundreds of thousands more living within the Metro Vancouver Regional District would be affected if a large flood were to occur. The economic cost of a catastrophic flood to the region has not recently been calculated, but would be in the billions of dollars; the full social and environmental costs would be even greater.

The Fraser River has a characteristic “nival” flow regime, with the highest runoff occurring during the spring snowmelt season. There have been two devastating floods in the valley since European settlement - in 1894 and 1948. The magnitude of the 1894 flood was greater than that of 1948. However, there was substantially less development on the floodplain in 1894 and damages were less extensive. The 1948 flood triggered a comprehensive flood control plan for the river basin (Fraser Basin Board 1963). Over time, the plan narrowed in focus and eventually considered only structural flood control and hydro power development in the basin to reduce peak flows. However, due to environmental concerns

and other factors, only some of the smaller developments on tributaries were implemented. Nevertheless, a major flood control program was carried out in the 1960's and 1970's to raise and strengthen the dikes in the Lower Fraser Valley. The height of the dikes was based mainly on the observed high water profiles from the 1894 and 1948 flood events. The potential effects of dike confinement on conveyance or flood attenuation do not appear to have been fully considered at that time. Also, the diking program was implemented with the anticipation that flow regulation by future upstream hydro developments would reduce the magnitude of the future flood threat. Sewell (1965) pointed out the limitations of narrowing the plan and potential implications on its effectiveness against future floods. There has not been a major flood event in the Lower Fraser Valley since 1948, although high water in 1972 caused flooding in other portions of the basin. Over the last 20 years, flood managers have provided warnings about the potential damages that could result if another major flood event occurred on the river (Peters 2000). However, until recently (UMA 2000, nhc 2006), no new investigations were carried out to quantify the flood hazard.

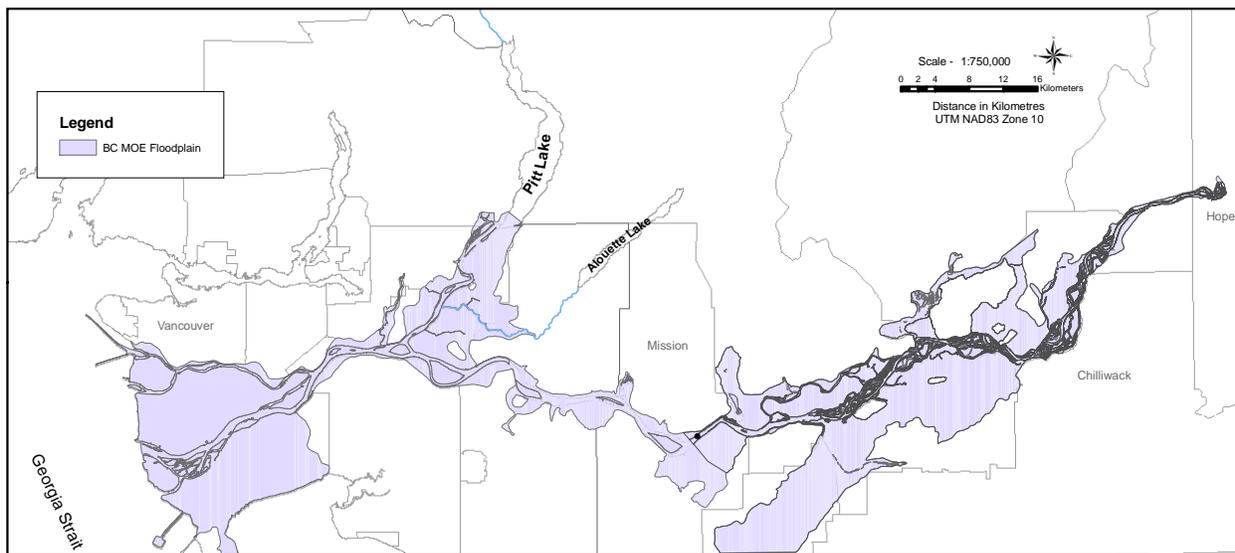


Figure 1: Lower Fraser Valley Floodplain

There is little doubt that a major flood will affect the Lower Fraser Valley in the future. The problem lies in accurately predicting the timing and severity of such an event. Passivity by all levels of government regarding floodplain management has created a risk for millions of British Columbians; risks related to flood damage and potential loss of life (Day 1999).

2. BC'S CURRENT FLOOD POLICY MODEL

2.1 Federal Government – Liable without Control

Canadian flood control policy since 1975 has fallen under the *Federal Flood Damage Reduction (FDR) Program* (Canada 1996) which was created under the *Canada Water Act* following extensive flood damage throughout the country in the early seventies. In 1987, a mapping program in BC was accelerated through the additional signing of the *Canada-BC Agreement Respecting Floodplain Mapping* (British Columbia 1998). The aim of the program was to discourage future flood vulnerable development through floodplain mapping programs which were carried out by individual provinces with funding assistance and monitoring by the Federal government. Although the agreement was strongly worded, there is little legislation to back it up. Watt (1995) noted that the *FDR Program* was successful at identifying areas at risk to flood damage, and at redirecting development from these areas. However, in the Lower Fraser Valley the majority of *Canada Water Act* funding supported structural projects;

comparatively little was spent on floodplain mapping (Booth and Quinn 1995). Hence, BC was unable to halt the rapid growth on the Fraser River floodplain from the 1970's to the present because data were not available to delineate areas at risk of flooding (Day 1999).

A further Federal policy that affects flood management is the *Federal-Provincial Disaster Financial Assistance* (DFA) arrangement. The DFA provides guidelines for the cost sharing of disaster payments between Federal and Provincial governments. Both governments contribute to the rebuilding of public and private properties after major floods, with the Federal government paying an increasingly larger share of the costs with escalating damage costs (Canada 1988). Private citizens, local level and Provincial governments rely upon post-disaster payments as an adjustment to flood risk. However, this adjustment burdens the nation's budget: every time a natural disaster occurs and damages ensue because of poor planning, all Canadian taxpayers are charged for the recovery costs, regardless of the level of personal risk each citizen may carry. Additionally, post-disaster payments are on the rise (Shrubsole 2000), and are unlikely to be reduced in the near future if current planning practices continue.

2.2 Provincial Government – Quiet Devolution of Power

Apart from the joint Federal-Provincial *FDR program*, there are limited provisions for flood management in BC's legislation. In 1986, the *Municipal Act* was passed. This *Act* provides Municipal government with the legal authority to adopt local floodplain by-laws (British Columbia 1986). The *Municipal Act* has since been replaced by the *Local Government Act* (British Columbia 2000), which has similar provisions to the *Municipal Act*. In 2003, the provincial government devolved some of its powers related to the development of provincially designated floodplains and for the construction and maintenance of dikes to individual municipalities through the promulgation of the *Flood Hazard Statutes Amendment Act* (British Columbia 2003a). This *Act* in effect allows municipalities greater freedom to permit development on provincially designated floodplains (British Columbia 2003b), although it also offers municipalities the opportunity to develop floodplain management plans – very few have done so.

2.3 Local Government – Control without Responsibility

Municipal and regional governments have a great ability to promote and establish bylaws and zoning regulations for flood management. In the Lower Fraser Valley each municipality has the authority, but not the obligation, to create its own floodplain management by-laws; thus policy varies widely along the Lower Fraser River. In 1966, the Official Regional Plan (ORP) for the Lower Mainland established floodplain boundaries in the Fraser Valley. No new urban developments were to be built in the floodplain. Areas that had been historically settled, "Urban Exempt Areas" (UEA) could continue to be developed. As a consequence the UEAs have experienced rapid growth and development since the 1970's (Peters 2000; Fraser Basin Management Board 1996). In 1986, the *Municipal Act* called for municipalities to create Official Community Plans (OCPs) in lieu of larger ORPs. The OCP allows, but does not obligate, a community to "designate areas for protection of development from hazardous conditions". Peters (2000) noted that "in general, OCPs do not appear to have been effective in directing development away from the floodplain". The *Local Government Act* gives authority to local government to make the decisions; however, the *Act* does not obligate local government in any way to designate floodplains or to zone the land appropriately. Thus, local governments have few incentives to make intelligent land use decisions that will reduce the long-term costs and damages associated with flooding.

3. 2007 – FEAR IN THE VALLEY

3.1 A New Flood Profile for the Fraser Valley

In 1999 the Fraser Basin Council along with other funding agencies initiated studies to update the flood profile along the Lower Fraser Valley. New surveys and hydraulic modelling were carried out in the reach between Hope and Mission by UMA Engineering in 2000. In 2006, Northwest Hydraulic Consultants Ltd

(nhc) developed a sophisticated unsteady hydraulic model (MIKE11) to predict flood levels along the river from Mission to the sea and then linked this model to the upper model to provide a comprehensive tool for estimating flood levels along the river. The results indicated that a reoccurrence of the 1894 'flood of record' or of the second largest flood in 1948 would cause widespread dike overtopping or failure, and catastrophic damage to the region. These results were shocking to many authorities and communities, and changed their perception about the river and the flood hazard.

The physical processes governing flood levels on the Fraser River are described in McLean, Mannerstrom and Lyle (2007). Briefly, the Fraser River channel and floodplain have undergone significant change over the last century due to the effects of diking, blockage of side channels and river training. During the 1894 flood event channel confinement was insignificant and considerable flow attenuation occurred due to flood storage and overbank spilling. Also, it appears the adopted profile from 1969 did not fully account for the confinement effects of the dikes. The new profile is in places a metre higher than the old design profile, clearly putting the communities behind the dikes at risk. The effect of dikes on raising flood levels has been observed on other large rivers such as the Mississippi and in Asia (Kuiper 1965). Consequent to the release of the report, there have been calls to increase the dike elevations to provide a true measure of protection to the floodplain. However, a dike raising program may be cost prohibitive, and in some instances technically impractical.

3.2 Snow, Snow, Snow

As the information on the flood hazard was being absorbed it also became apparent that the 2007 spring snowpack was going to be unusually high. The hypothetical flood conditions analysed in the NHC study suddenly became a very real potential scenario. These concerns triggered an emergency response by municipalities, provincial and federal agencies, as well as civil defence authorities to prepare for a potential flood throughout the valley. Media and public interest throughout the freshet risk period in May and June of 2007 were high. Stories in the national, provincial and local media were appearing daily, warning residents to be prepared for disaster. Municipal governments noted a significant increase in requests for information from concerned citizens. The threat resulted in the evacuation of some vulnerable livestock, and in generating an increased level of concern amongst floodplain dwellers. On June 11th, the river flow peaked well below the level of danger; a large rainstorm had turned at the last minute. Due to relatively gradual warming and limited precipitation during the spring, the peak flow had a return period of only 10 years and no major flooding occurred (NHC 2007).

3.3 A Policy Window Opens

Progress in flood hazard management has been very slow in Canada and in the future will occur in one of two ways: either through gradual, steady changes to policy resulting from enlightened governance, or through rapid change after a large flood event. For example, many changes to flood management in the Mississippi Valley resulted directly from the disastrous flood of 1993. Policy knowledge coincided with this large flood event and public support for change opened a brief policy window. Could the Lower Fraser Valley also be stimulated to change its approach to flood control through a similar event?

The recognition that the current infrastructure and planning is inadequate coinciding with the threat of a large flood certainly stirred up interest at grassroots and government levels. At the height of the threat work was focused on emergency planning; Federal and Provincial governments provided funding for emergency structural works, and the Canadian military moved in ready to help during the impending disaster. Meanwhile a wide media base picked up on the story and citizen interest in flood issues was high. All levels of government had no choice but to listen to their electorate - a policy window certainly opened a crack. The question then became - Would British Columbia's government react to the increased interest? And would the government create an environment that would allow for progressive flood hazard management as opposed to the status quo - a reactive and structural adjustment focused program?

4. REACTIONS TO DATE

Initial response to the spring 2007 threat was certainly reactive in terms of flood management. The provincial and federal governments both pledged significant monies to dike upgrade projects. The Prime Minister of Canada and the Premier of BC were both pictured standing on the banks of the rapidly rising Fraser River assessing potential dike projects. Over the brief two month period leading up to the peak river flow, higher level governments spent a total of \$33 million on infrastructure upgrades (Canada 2007). Significant additional government funds were also spent at the local level.

Once the initial threat had subsided, interest in flood issues generally remained high, and significant actions were observed at many levels of government and within the NGO community. However, the reactions to date have been focused on traditional solutions to flood hazard management with little discussion of large-scale planning or long-term thinking.

4.1 Municipal Government – Fear and Funding

Municipal governments certainly took the brunt of citizen fear during the spring 2007 flood threat. And as a result, the municipal level governments have been lobbying higher level governments hard for funding to pursue flood management in the Valley. Municipalities from all across the province submitted funding applications to the provincial government to complete flood protection works.

Unfortunately, there is generally a poor level of understanding around the complex processes that create flooding problems among municipal politicians. Municipalities are focused on obtaining funds in the short-term, primarily to construct traditional flood protection schemes such as dikes as these are the most understandable of flood protection, even if they are not the most efficient from either an economic or ecological perspective (Lyle 2001). Also, there is large variability in the ability of different municipalities to respond to flood threats – many smaller municipalities, some at great risk, do not have the resources or budgets to properly manage the risk.

4.2 Regional Government – Aware but Unresponsive

The Lower Fraser Valley incorporates two regional governments the Metro Vancouver Regional District that includes the generally urban and suburban cities to the west of the Valley, and the more rural Fraser Valley Regional District to the east. Both regional districts reacted to the information that became available in the spring of 2007. The Metro Vancouver's Regional Engineers Advisory Committee, which is formed of engineering officials from the member municipalities, asked the Metro Vancouver Board to pressure higher level governments to fund a long-term strategy for integrated flood management in the valley (GVRD 2007). However, no concrete actions were pursued, and no funding has been allocated to flood issues by the Metro Vancouver District. The Fraser Valley Regional District has actively pursued funding to improve flood infrastructure under their jurisdiction, which shows an awareness and understanding of the risk they are faced with.

4.3 Provincial Government – Long-term Funding, Short-term Planning

The main action at the provincial level was the announcement in September 2007 that the government would be providing \$100 million for flood infrastructure over a 10 year period (British Columbia 2007a). At the time they were hoping for federal matching funds, which have not yet arrived. The \$10 million a year is being managed by the newly created agency, Emergency Management BC (British Columbia 2006). The initial call for projects was aimed at the municipal and regional level governments, and focused on structural protection measures and bedload management (British Columbia 2007b). Gravel extraction, or bedload management, although not scientifically proven to significantly reduce flood levels along the Fraser River, has become a popular political solution to flood problems in the valley; 13% of this year's funds have been spent on gravel extraction. Of the remaining funds, all but \$350k have been allocated to flood infrastructure – dikes, rip-rap armouring, pump installation and upgrades and culvert replacements

(British Columbia 2008). Two engineering studies were funded to evaluate existing infrastructure and to make recommendations with regards to flood hazard management – these are the only non-physical, non-structural projects funded out of the program. The focus of the program at this time is on the construction of structural flood control. Hopefully, the program will eventually look towards funding longer term flood management plans to include options for pursuing non-structural flood adjustments.

4.4 Federal Government – Silent Player

Federal reaction to the policy window has been particularly muted; no substantive announcements have been made. The Provincial government is continuing to lobby the Federal government for matching funds for their *British Columbia Flood Protection Program*. They hope to secure funds from the federal *Building Canada* infrastructure program; a funding body that would certainly be focused on structural flood control as opposed to long-term planning and non-structural flood control measures.

4.5 Non-Governmental Organisations

The major facilitator and coordinator for flood issues in the region is the Fraser Basin Council (FBC), a not-for-profit organization that aims to advance long-term social, economic and environmental well-being in the Fraser Basin. In January 2008, the FBC hosted a very well attended, diverse forum that focused on flood issues. At the forum they also launched a survey focusing on Flood Hazard Area Land Use Management, which was sent to every First Nation, Municipal and Regional government in the province as well as to select Provincial and Federal officials and to some engineering consultants (FBC 2008). Detailed summaries and results from the forum and survey are not yet available; however preliminary comments on the success of the ventures can be made.

The Flood Forum was attended by approximately 150 delegates from a diverse stakeholder base that include elected officials from all levels of government and First Nations, Municipal, Provincial and Federal government staff, academics, and engineering consultants. The major message from the forum was that there is a certain level of concern particularly amongst lower level governments, and that this has resulted in significant interest in flood issues. Lower level governments are keen to get funding from higher levels, and they want to see action-oriented projects as opposed to planning and engineering studies.

Similar observations can be made from the preliminary results of the Fraser Basin Council survey. The survey was sent out to over 100 approving officers in British Columbia municipalities. A large majority of respondents claimed that flood hazard management is a major issue in their jurisdiction, and most noted that they had local legislation in place to aid in land use management of flood hazard areas. However, many noted that the tools available from the provincial government, particularly since the 2003 change in legislation that downloaded responsibility to local level government, could be improved (Litke 2008). In general, it is clear that there is an increased awareness of flood risk in the province; however, there is no clear direction from higher level government with regards to comprehensive long-term planning. Flood hazard planning at the municipal level is variable, dependent on the resources available to individual communities.

5. FUTURE DIRECTION

A significant policy window certainly has been opened in British Columbia with regards to flood hazard management. Unfortunately, the window appears to be partly screened – with the actions and reactions to the window being generally minor and uninspired.

There has been no move to long-term large-scale planning for the region. Senior level governments need to aid in the co-ordination of flood management through the creation and funding of watershed institutions, which is key to decreasing flood losses in the long-term. Co-ordination and co-operation

amongst different issue groups will provide impetus to initiate publicly supported, multi-purpose projects, which can provide an array of flood control benefits (Lyle and Day 2003).

Significant downloading of responsibility to municipal level governments has occurred recently. However, it is clear that not all municipal governments have the resources and tools to take on this new responsibility. There is a clear need for higher level government to provide resources in the form of guidelines, tools and communication forums to local governments if the new legislation is to be effective.

At present, the province lacks leadership and commitment to flood management issues; decisions tend to be temporary, reactive, and most often are taken in the face of potentially large floods – such as in the spring of 2007. A comprehensive, long-term planning approach to flood damage reduction needs to take centre stage in flood management policy in British Columbia if the province is to avoid exponential costs in the future. Forward thinking politicians and policymakers must begin to make changes immediately to floodplain management in BC to achieve this goal. The 2007 policy window was an excellent opportunity for enlightened governance to promote new approaches to floodplain management. Unfortunately, the window was primarily used to secure funding for traditional flood management solutions. There is however still time to capitalise on this opening and to redirect resources towards comprehensive solutions to flood management in the Fraser Valley.

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