

A blue hatchback car is shown driving through deep floodwaters. The water is murky and reflects the sky. The car is positioned in the lower-left quadrant of the image, moving towards the right. The background shows a blurred view of trees and a building, suggesting an urban or suburban setting.

Planning to avoid DISASTER:

The state and fate of flood mapping in BC

By Anna Warwick Sears, Ph.D., Executive Director, Okanagan Basin Water Board;
and David Sellars, Civil Engineer and Hydrologist

In 2005, Hurricane Katrina rocked North America with footage of flooded neighbourhoods and people waving for rescue from their roofs. In 2011, Lake Manitoba had a one-in-2000-year flood event, with high waters displacing 7,100 people from their homes across the province. Hurricane Sandy, in 2012, reminded the world that even the centres of western civilization are not invulnerable to flooding. Insurance companies are rushing to reconfigure their policies and financial models, as water damage is the fastest growing source of insurance claims.

Far from being immune ourselves, British Columbia has fallen behind on basic risk assessments, while the risks themselves are increasing. Storm water and wastewater systems are particularly susceptible to flooding, whether the high waters come from sea level rise, intense storm cells, or over-bank flow from rivers and streams. The full impact of floods can range from water quality to economic stability, and threaten to bring the effects of climate change directly into our homes and basements.

A recent report on sea level rise from the BC Ministry of Environment put a \$9.5-billion price tag on dike raising and reconstruction for

coastal areas, reinforcing the urgency to re-map floodplains. It's not just municipalities and the water sector that are concerned. On March 8, 2013, a floodplain-mapping workshop, convened by the BC Real Estate Association, drew nearly 70 people from the BC government, local governments, academic institutions, the business community, and First Nations.

Humans have a long history of settling in floodplains. Early BC settlers made an obvious choice to site farms and villages on flat-bottom lands instead of on mountainsides. The soil is rich, waterfront homes are highly sought after, and level ground near waterways is prized for roads, rail lines, mills, and shipping terminals. Bottom lands are also a favourite location for wastewater treatment plants, with low pumping costs. Collectively, this puts some of our most expensive infrastructure in the path of flood waters.

Climate change only increases the need for rigorous risk assessments. In an uncertain future, as weather patterns shift, many parts of BC could experience storms that occur with greater intensity, frequency and duration. With bigger storms, changes in precipitation, and higher tides from sea-level rise, the best way to avoid flood damage is to estimate where it may happen and

make plans to reduce impacts or move critical infrastructure out of the way.

Floodplain maps are the first step for understanding flood risks. Typically, BC maps show areas that can be expected to flood every 200 years – a somewhat misleading statistic, which actually means there is a 0.5% chance of a flood in any given year. Over the life of a 30-year mortgage, a house in a floodplain has a 15% risk of getting wet (although levels and damage will vary). Floodplain maps can also show the normal location of watercourses, surrounding land elevations, and the total geographic area within the floodplain zone. The extent of actual damage depends on what structures or land uses are flood-prone, whether areas have been protected with dikes or other measures, what bylaws or other development regulations are in place, and the length, violence and magnitude of the flood.

Like most maps, designated floodplains are essentially snapshots of existing conditions. Climate change, alteration in forest cover, watershed hydrology and riverbed geomorphology, alter the probability of flooding over time, and best engineering practices recommend that floodplain maps be updated every 10 years. Yet, of the 87 floodplain maps

currently on the website of the BC Ministry of Forests, Lands, and Natural Resource Operations, 69% are at least 20 years old.

So, why are so many of BC's floodplain maps decades out of date? While everyone agrees that floods are potentially devastating for a wide variety of reasons, there are persistent disincentives, a lack of education and dysfunctional policies that slow progress. It's an old problem, made worse by jurisdictional struggles and uncertainty about where liabilities lie.

The first major provincial floodplain-mapping program began in 1974, and accelerated with the 1987 *Canada-BC Floodplain Mapping Agreement*, which ended in 2003. In 2004, the responsibility for floodplain mapping was transferred to local governments. Only a handful of communities have mapped flood-prone areas since that time. Without new maps, local governments – that have the authority for land use and development decisions – continue to allow construction according to old flood zoning, and, in some cases, in low-lying areas with no flood zoning at all.

From the perspective of local governments, flooding is a chronic disaster that crosses jurisdictional boundaries and is exacerbated by factors outside of their control (sea level rise is an extreme example). Mapping is expensive (one estimate puts a \$5-million price tag on floodplain-mapping for BC's coastal communities), and elected leaders may be reluctant to inform property owners that their property values may decrease. There are also presumed concerns that official designation of floodplains could increase local government liability, if they are unable to follow provincial guidelines for floodplain management.

From the perspective of provincial and federal governments, mapping floodplains is of little use unless there is follow-through by local governments to control floodplain development and reduce potential flood damages. A 1995 paper by David Sellars, written for the Canadian Water Resources Association, speaks of a "sense of frustration among provincial and federal government staff," because mapping efforts didn't translate to changes on the ground. Given this history, it's not surprising that responsibility for mapping was eventually transferred to the local level.

Another problem is that (with the exception of a few flood protection programs) senior government financial assistance is often only available after a disaster has taken place. The Director of the *Flood Protection Program* for Emergency Management BC, speaking at a BC Real Estate Association (BCREA) workshop

on March 8, 2013, stated that for every dollar spent on floodplain mapping, there is a \$30 savings in avoided damages. However, workshop participants raised the issue that the mapping dollar is paid by local governments, and much of the savings is made by senior government. This arrangement reduces the incentive of local jurisdictions to fund flood mapping – despite being on the front lines for responding to the full economic, environmental and social consequences of a flood.

The good news is that there is broad support for change – across government, civil society and the water sector – and many new tools available.

Recoiling from the \$9.5-billion price tag for dike building and reinforcement, \$5 million for mapping coastal floodplains sounds like good value, especially if costs are shared across many communities. Knowing more precisely where flood hazards are highest could greatly refine plans for protective dikes and highlight alternative lower-cost solutions. These could include engineered flood-storage (where certain areas are allowed to flood to protect homes and infrastructure), new setbacks, building codes, and in some cases, relocating structures in vulnerable areas – what is called a 'flood-resilience' approach.

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We have become much more sophisticated in designing stormwater systems, back-flow preventions and green-infrastructure for intercepting and rechanneling water where it falls on the landscape. Mapping tools have also improved dramatically. High-resolution LIDAR can provide precise digital elevation contours, and powerful computers drive new hydraulic models that can much better predict the distribution of flood flows in complex floodplains. The problems now are less likely to be related to scientific limitations, but rather to tangles in policy and finance.

In the end, changes will come from the ground up. As the public becomes more aware of the potential impacts of climate change, it will provide political support to move forward. There are a number of local governments that are leading by example with steady progress in redesigning their community, accepting and anticipating that – if flooding is inevitable – they will act now to reduce future flood damage.

The Association of Professional Engineers and Geoscientists of BC has recognized the need for raising the profile of flood issues and recently published its *Professional Practice Guidelines for Legislated Flood Assessments in BC*. The BCREA workshop generated an action plan to update BC floodplain maps, and BC Water & Waste Association (BCWWA) hosted a workshop on flood risk assessment as part of the 2013 Annual Conference.

It is clear that everyone needs new floodplain maps and these are best done at a regional scale. The water sector needs maps to protect water delivery, treatment and drainage systems. Local governments need them to prepare land use plans and regulate floodplain development. Senior governments need the maps to reduce the costs of emergency programs and compensation for damages. And the public needs assurance that homes and businesses are safe from chronic flood hazards, to make investment decisions – and to avoid loss of homes and livelihoods.

Nonetheless, getting beyond our current inertia will take coordination, communication and action by all levels of government, with broad-based support from the professional community, industry associations and civil society.

This article was made possible through collaboration with the BC Real Estate Association – drawing on the materials generated by the March 8, 2013 workshop: *Planning to Avoid Disaster*. The resulting action plan is available at www.bcrea.bc.ca.

For more information on how utilities and municipalities can manage the risk of uncertain events, such as flooding, consider attending an upcoming BCWWA event:

Got Risk? New tools for communicating about water, climate and the future

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See page 14 or visit our events calendar at www.bcwwa.org/events for more information. 💧

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