

Economic Assessments and Decision-Making for Community-Led Managed Retreat in B.C.

Background

Compounding climate and societal factors are driving a need for innovative flood risk reduction approaches in many British Columbia communities. These factors include:

- Increasing hazard, climate variability, and uncertainty due to climate change
- Decreasing societal acceptance of risk, disruption, and loss from natural hazards
- Increasing losses from disasters due to economic growth and development
- Increasing recognition of inequities in the distribution of flood risk, flood impacts, and the impacts of traditional flood risk reduction measures
- Greater concern for the environmental and social impacts of the structural flood risk reduction measures that have traditionally been favored

Flood risk can be reduced using various approaches, including protection, accommodation, retreat, and avoidance. Each approach can take many forms and be used individually or in combination.

Community-led Managed Retreat (CLMR), which involves the strategic relocation of people and structures out of harm's way, often accompanied by ecological restoration and a permanent change in land use, has received increasing attention in recent years. It is seen as a potential option for the highest risk areas where more traditional approaches are no longer viable.

However, CLMR presents unique challenges. It can be difficult to decide when and where it should occur and how it should be implemented to minimize negative impacts on households and the community while maximizing its potential to address inequalities and provide ecosystem and other co-benefits.



What We Heard

Engagement feedback¹ in developing the B.C. Flood Strategy identified that participants:

- Felt that CLMR is not currently well supported in B.C.
- Communicated that due to some peoples' connection to land and traumatic history with relocation, CLMR can be a sensitive topic to discuss
- Felt that regulations have not kept up with people living in high-risk areas and CLMR be considered for some areas
- Described that CLMR may be a complicated option for communities facing flood risk. While some areas may be designated for safe flooding, where people have settled on floodplains, relocating people out of their homes would likely require compensation and is further complicated by peoples' connection to their homes and the land
- Felt that CLMR required increased education and awareness

Purpose of Engagement

The [B.C. Flood Strategy](#) was released March 2024. We are now entering the fourth phase of engagement, focusing on advancing early flood policy work to support communities in improving their flood resilience.

The Ministry is working to introduce and provide preliminary guidance and assessment tools on CLMR. This will include detailing the analysis, processes, benefits, and strategic importance of relocating people and structures out of harm's way to reduce natural hazard risk and adapt to climate change.

Target Audience

First Nations, local governments, community leaders, residents in flood hazard-prone areas, policymakers, and other stakeholders involved in disaster risk reduction and climate adaptation planning.

¹ Alderhill. What We Heard Report 2022: Summary of First Nations and Local Government Engagements on the B.C. Flood Strategy Intentions Paper (Fall 2022). Available at: [Alderhill WWHR FINAL Mar-2023.pdf \(gov.bc.ca\)](#).



Next Steps

The [Pacific Institute for Climate Solutions](#) conducted foundational research on this topic over the past year and will publish their reports in the near future. Results from this engagement session will help the Province develop guidance and communications to support communities, which will be part of the implementation planning for the B.C. Flood Strategy.

Community-Led Managed Retreat: Assessment and Decision-Making

What is Community-Led Managed Retreat (CLMR)?

CLMR is the strategic relocation of people and structures out of harm's way to reduce natural hazard risk and adapt to climate change. Community support is the most important factor for achieving positive outcomes for both the affected households and the broader community when implementing Managed Retreat.

BC Flood Strategy Intentions Paper Action 4.4: Enhance Investments in Community-Led Retreat

"Critically, affected communities must support such measures and be involved in leading change to enable success."

Why Consider Community-Led Managed Retreat?

- CLMR fully eliminates flood risk, unlike flood protection which can overtop or fail
- Lower maintenance costs than building hard infrastructure
- Land after retreat can provide environmental, social, cultural, and flood protection benefits for the wider community
- After retreat, the available land can provide environmental, social, cultural, and flood protection benefits for the wider community
- Although most commonly used to move homes out of floodplains, CLMR can be used for many different natural hazards (e.g., flood, landslides, forest fires) and types of values (e.g., infrastructure, culturally significant sites)

Supporting Managed Retreat Decision-Making

Reducing natural hazard risks, such as coastal and inland flooding, can be done using various approaches, including protection, accommodation, retreat, and avoidance, each of which can take many forms and be used individually or in combination. Communities considering CLMR must assess its complex trade-offs, cost, and benefits to inform collective decision-making. This summary introduces two of the most common tools used to help make transparent and defensible decisions based on community values: Cost-Benefit Analysis and Multi-Criteria Decision Analysis.

Cost-Benefit Analysis (CBA)

Cost-Benefit Analysis (CBA) compares all of the costs and benefits of each available option that can be measured in dollars, with the aim of identifying which one produces the greatest net benefit to society (i.e., where benefits outweigh the costs by the greatest amount). CBA results are often expressed as a ratio of benefits to costs (e.g., 7:1, meaning the expected benefits are 7 times greater than the costs), or as a Return on Investment (ROI), which is a simplified form of CBA focused on the financial mitigation costs and estimated reductions in future flood damage.

CBA's are a relatively thorough, transparent, and accepted way to compare alternatives and demonstrate efficient use of public funds, however it is difficult or impossible to monetize some environmental, social, and cultural costs and benefits. This is important for CLMR, which can have large intangible costs (e.g., losing connections to place/community) and benefits (e.g., improved feeling of safety and connection to nature). Most CBA's also discount the future compared to today, meaning that present day impacts are valued more highly than future ones. This adjustment may not make sense for important 'timeless' values like public safety, sense of community, spiritual ties to land, and a healthy environment.

Multi-Criteria Decision Analysis (MCDA)

CBA's provide valuable information but are best used as part of a more holistic decision-making process. One such approach is Multi-Criteria Decision Analysis (MCDA), which compares proposed options across a range of quantitative and qualitative factors. MCDA and CBA work well together, using a CBA to measure financial impacts and MCDA to add non-monetary factors.

MCDA's can provide more holistic comparisons, build understanding of trade-offs, and encourage discussion. MCDA comes in many forms to accommodate different types of decisions, values, levels of community participation, and resources available. MCDA is most effective when built on a collaborative, inclusive process where the community helps to decide which values are important, how to measure those values, and how to weigh them against each other.

However, MCDA's collaborative process can be time consuming and expensive, choosing the best form of MCDA can be difficult (e.g., should a high scoring area offset a low scoring one, or is moderate performance in all areas preferred?), assigning values and weights is open to bias and manipulation by influential people and groups, and it may still not capture values that cannot be scored or where information cannot be publicly released.

Multiple Accounts Analysis (MAA)

MAA is a form of MCDA that has been used in B.C. for various natural resource management issues. MAA uses four 'Accounts' to divide the values under consideration (Technical, Economic, Environmental, and Socio-Economic) and uses a relatively easy to implement scoring system.

Examples of CBA and MCDA for Managed Retreat

Grand Forks, BC <i>CBA/ROI</i>	A buyout of residents in the highest risk areas of Grand Forks was conducted as part of a wider flood mitigation plan following a major flood event in 2018. A simplified CBA was conducted to fulfill the ROI calculation requirement when applying for support from the Federal Disaster Mitigation and Adaptation Fund (DMAF). The study found the return on investment (ROI) was 3.4 for the Grand Forks flood mitigation plan (i.e., the benefits were 3.4x the costs).
Calgary, AB <i>MCDA & CBA</i>	Calgary used both MCDA and CBA to select mitigation projects following flooding in 2013. <u>MCDA ("Triple Bottom Line")</u> was used to compare 13 mitigation options, including Managed Retreat. A detailed CBA was then used to choose between the top two options.
Merritt, BC <i>MCDA & CBA/ROI</i>	City of Merritt used MCDA to select a preferred mitigation strategy post-flooding in 2021, and a CBA/ROI to support the implementation and funding of this plan. <u>MCDA</u> was used to score and rank seven mitigation options, including Full Floodplain Retreat, which was not selected as the preferred option. CBA and ROI were then used to analyze the preferred diking option and to support a DMAF funding application. The study found an ROI of 7.1 for the plan as a whole.
Canadian National Research Council (NRC) <i>CBA, MCDA, CEA</i>	The NRC report ' <u>Guidelines on undertaking a comprehensive analysis of benefits, costs and uncertainties of storm drainage and flood control infrastructure in a changing climate</u> ' provides detailed, flexible guidance for communities assessing flood mitigation options. CBA, MCDA and Cost-Effectiveness Analysis (CEA) are each discussed and compared, and guidance is given on when each is most appropriate to use.
US Federal Emergency Management Agency (FEMA) <i>CBA</i>	In the USA, community and state-led mitigation projects, including Managed Retreat, qualify for FEMA funding, which requires a CBA to demonstrate cost effectiveness. FEMA provides useful <u>guidance and tools</u> to help communities complete CBAs. These tools and guidelines help complete the CBAs required to access funding, but can limit program flexibility.

Other Managed Retreat Examples

Gatineau, QC: More than 250 homes were purchased and demolished following flooding in 2017 and 2019. This program is notable for its cap on compensation set at \$250,000 per property.

High River, AB: A series of buyouts over several years occurred in High River following flooding in 2013.

New York, NY: Following Hurricane Sandy in 2012, NY purchased 723 properties for demolition and an additional 566 for more resilient re-development.

Christchurch, NZ: 8,000+ properties were acquired and demolished following earthquakes in 2010 & 2011.

New Orleans, LA: Buyouts were one of many tools used by FEMA as part of the Hurricane Katrina recovery program in 2005.

Lessons and Good Practices for Managed Retreat Decision-Making

Importance of Community: Community collaboration should be part of all stages of the decision-making process, including designing the process itself.

Decision Aid: CBA results are not being used in isolation to select the preferred option. Instead, CBA is being used in combination with MCDA and other decision-making processes that consider wider values and community support/input.

Maturing Practice: Methods for estimating flood damage prevented by Managed Retreat and other mitigation works are well developed, with many good examples (see Grand Forks, Merritt, Calgary, NRC)

Clarity of Purpose: Explicit and clear communication of the assessment's purpose and limitations (e.g., Grand Forks and Merritt ROI calculations for DMAF funding)

Multi-criteria: Good attempts are being made to consider broader, non-financial impacts of flood mitigation (e.g., Calgary's 'Triple Bottom Line', Merritt's quality of life, school disruption, etc.)

Flexibility: Municipalities and academics are exploring different variations and combination of CBA and MCDA tools to create place- and context-specific processes.

Challenges For Future Projects & Assessments

Reactive assessment: Mitigation projects and assessments are usually done post-disaster, rather than proactively.

Funding Constraints: Funding availability and assessment guidelines limit mitigation options and constrain assessments to more standard financial impacts (e.g., DMAF, FEMA).

Trade-offs: Difficult balance between providing guidance and fast implementation versus allowing flexibility and time for community involvement at the local level (e.g., DMAF, FEMA, NRC).

Non-Financial Impacts: Many important, non-financial impacts (e.g., environmental, psychological, cultural impacts) are left out of formal decision-making processes. Instead, they are omitted or considered informally and without transparency.

Limited Options: Assessments are typically done on a limited range of options, instead of exploring creative solutions.

Equity: Exposure to natural hazards, and the impacts of risk reduction projects, often disproportionately affect lower income and equity-seeking populations. Capturing and addressing these inequities in CLMR planning and decision-making will be an ongoing challenge for all parties involved.