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# EXECUTIVE SUMMARY

## Unlocking private investment in Canadian flood resilient home retrofits:

### *A return on investment research summary*

#### AN EXECUTIVE SUMMARY OF THE 2025 REPORT

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**Climate Ready Together**  
*Fostering collaboration to strengthen resilience*



National Research  
Council Canada

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recherches Canada

# FLOOD DAMAGE IS ON THE RISE IN CANADA

## Floods cost Canadians billions each year

Each year governments, businesses, and residents collectively **spend an average of \$2.9 billion repairing homes damaged** by pluvial (intense rainfall), fluvial (riverine), and coastal flooding.



## The distribution of losses is concentrated



**Damage is concentrated in locations exposed to the highest levels of flood hazard:**

- The top 1% of homes (approximately 109,000) experience 34.1% of average annual losses.
- The top 10% of homes (approximately 1.5 million) experience 89.3% of average annual losses.<sup>1</sup>

## Reduce risks today to avoid future damages

Without implementing voluntary and regulatory measures to reduce risk for existing structures and new builds annual home **flood damages may triple by 2030.**<sup>2</sup>



# FLOODING DISPROPORTIONATELY IMPACTS LOWER INCOME RESIDENTS

## High risk ≠ insurance coverage

**High flood hazard homes are not eligible for overland flood insurance coverages,** limiting the capacity of those with little access to loans or savings to repair structures and replace belongings.<sup>3</sup>



## Renters are highly vulnerable

**Rental housing takes longer to repair and is more likely to be bulldozed,** disproportionately impacting lower income residents by limiting supply of rental properties and driving up prices.<sup>4</sup>



*“The most affordable home is the one you don’t have to rebuild.”<sup>5</sup>*

# APPROACHES FOR REDUCING VULNERABILITY TO FLOOD DAMAGES<sup>6</sup>



## PROTECT



Block water entry into structures using home (**dry flood proofing**) and/or community scale flood defenses (**barriers**)



Backwater valves, sump pumps (**dry flood proofing**), temporary flood barriers, berms, dikes, floodways (**barriers**)



Permit water to flow in, out or through buildings to limit structural damage (**wet flood proofing**)



Flood vents, elevating homes on piers (**wet flood proofing**)



## ACCOMMODATE



Remove structures from high-risk zones (**demolition**) or relocate them to lower risk zones (**relocation**)



Use expropriations and buyouts to remove homes (**demolition**); house moving services (**relocation**)



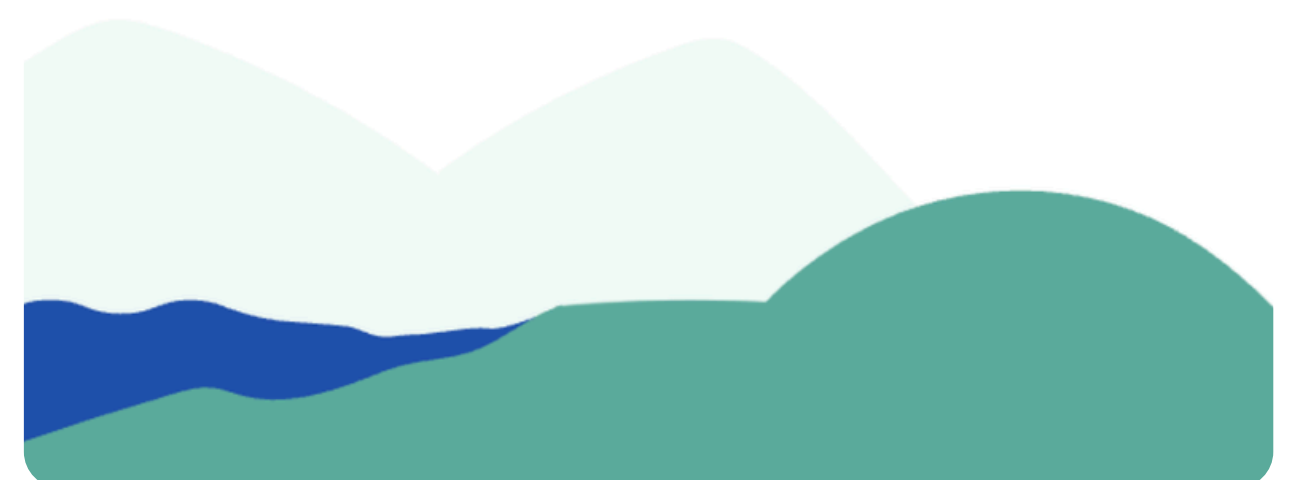
## RETREAT



Prevent development in the highest risk areas



Use legislation, planning, and development policies to restrict home building in highest risk areas



## AVOID

# CALCULATING THE BENEFITS OF FLOOD RESILIENCE<sup>7</sup>

Researchers use 3 main ways to calculate benefits associated with strengthening flood resilience:

Return on Investment (ROI) and Relative Cost (RC) consider only economic benefits whereas Benefit Cost Ratio (BCR) considers physical, social, environmental, and economic benefits to the whole of society.

## Return on Investment (ROI)

ROI compares losses avoided to installation and maintenance costs over a specific period of time. ROI is expressed as a percentage.

- E.g. 78% ROI over 10 years



## Relative Cost (RC)

Relative cost compares the costs of 2 or more items and ranks them from lowest to highest.

- E.g., lowest, low, medium, high, highest



## Benefit Cost Ratio (BCR)

BCR compares total expected benefits to society for the life of a building to total installation and maintenance costs.





- E.g. \$15 benefit for every \$1 spent or 15:1

**Life of a building:** 75 years for new builds | 50 years for retrofits

**Benefits to society** consider avoided damage and disruption. Factors vary widely and may include property damages, additional living expenses, indirect economic losses, insurance costs, deaths, injuries, instances of post-traumatic stress disorder (PTSD), and environmental damage.



# CALCULATED FLOOD RESILIENCE BENEFITS RESEARCH EXAMPLES

| Approach  | Return on Investment (ROI)   | Relative Cost (RC) <sup>10</sup><br>*Riverine & Coastal Flooding               | Benefit Cost Ratio (BCR)   |
|---|--|--|--|
|  <p><b>Protect (New Builds)</b></p>    | N/A  | N/A  | <b>11:1</b> flood resilient home <sup>11</sup>   |
|  <p><b>Protect (Retrofit)</b></p>    | Red River Valley Floodway, Manitoba:<br><b>+400% ROI over 60 years<sup>8</sup></b>                       | Dry Flood Proofing:<br><b>Low</b><br><br>Barrier Systems:<br><b>Low-Medium</b> | <b>6:1</b> flood resilient home retrofits <sup>12</sup>  |
|  <p><b>Accomodate (Retrofit)</b></p> | Home elevation 1' above 100-year floodplain, New Orleans:<br><b>68% to 179% over 7 years<sup>9</sup></b> | Wet Flood Proofing:<br><b>Lowest</b><br><br>Elevation:<br><b>Medium-High</b>   | <b>6:1</b> for 30cm elevation above the 100-year floodplain <sup>13</sup><br><br><b>5:1</b> for 150cm elevation over 100-year floodplain <sup>14</sup> |
|  <p><b>Retreat (Retrofit)</b></p>    | N/A  | Relocation:<br><b>Medium-High</b><br><br>Demolition:<br><b>Lowest-Highest</b>  | <b>6:1</b> over 20 years for buyouts and demolition <sup>15</sup><br><br><b>6:1</b> over 30 years for buyouts and demolition <sup>16</sup>             |
|  <p><b>Avoid</b></p>                 | N/A  | N/A  | Methods developed but no results reported <sup>17</sup>  |

**FOOTNOTES:** [8] Kovacs & Sandink (2013). [9] Bordeau (2015). [10] Federal Emergency Management Agency (2014). [11] Porter & Scawthorn (2020). [12] Porter et al. (2019). [13] American Flood Coalition (2022). [14] American Flood Coalition (2022). [15] Porter et al. (2019). [16] Nelson & Camp (2020). [17] Mechler et al. (2014); De Risi et al. (2018).

# UNLOCKING PRIVATE SIDE INVESTMENT IN FLOOD RESILIENT HOME RETROFITS AND NEW CONSTRUCTION

## BARRIERS



### LACK OF PUBLIC AWARENESS

Low public awareness of flood risks; lack of knowledge about cost-effective retrofit options to reduce flood risk<sup>18</sup>



### LACK OF MOTIVATION

High costs, low priority for owners; low/no insurance or mortgage discounts<sup>19</sup>



### GENERIC GUIDANCE

Flood resilience guidance primarily for homeowners<sup>20</sup>



### INADEQUATE BUILDING CODES

National, provincial and territorial (NPT) building codes provide inadequate guidance to reduce flood risk<sup>21</sup>



### PERVERSE DEVELOPMENT AND LAND USE POLICIES

Perverse development and land use policies encourage construction of flood vulnerable homes in high-risk zones<sup>22</sup>



### BEST PRACTICE RESEARCH GAPS

Flood resilience best practice guidance has limited applicability to rural, remote and Indigenous communities<sup>23</sup>



### CALCULATED FLOOD RESILIENCE BENEFITS RESEARCH GAP

Limited research available to support data-informed decision-making for owners, renters, governments, banks, realtors, insurers, developers, builders<sup>24</sup>

## ENABLERS



### STRENGTHEN PUBLIC AWARENESS

Publicly available flood risk maps; flood risk and resilience awareness campaigns by governments, banks, realtors, insurers, developers, builders<sup>25</sup>



### INCREASE MOTIVATION

Low interest loans, subsidies, grants; insurance and mortgage discounts<sup>26</sup>



### TARGETED GUIDANCE

Adapt guidance for tenants and landlords<sup>27</sup>



### UPDATE BUILDING CODES

Update NPT building codes to limit flood vulnerable development in high-risk zones<sup>28</sup>



### UPDATE DEVELOPMENT AND LAND USE POLICIES

Update development and land use policies to prohibit construction of flood vulnerable homes in high-risk zones<sup>29</sup>



### CO-CREATE BEST PRACTICE RESEARCH

Co-create flood resilience best practice guidance with and for rural, remote and Indigenous communities<sup>30</sup>



### CO-CREATE CALCULATED FLOOD RESILIENCE RESEARCH

Co-create flood resilience benefits research with and for owners, renters, governments, banks, realtors, insurers, developers, builders<sup>31</sup>

**FOOTNOTES:** [18] Zirolecki et al. (2020). [19] Porter & Yuan (2020); Porter et al. (2023). [20] Giannitsos (2023); Krueger (2022); Minano & Peddle (2018). [21] Porter & Scawthorn (2020). [22] Ibid. [23] National Research Council Canada [NRC] (2019); Porter & Scawthorn (2020). [24] American Flood Coalition (2022). [25] Zirolecki et al. (2020). [26] Porter & Yuan (2020); [26] Porter & Yuan (2020); Porter et al. (2023). [27] Porter & Scawthorn (2020). [28] Ibid. [29] Ibid. [30] NRC (2019); Porter & Scawthorn (2020). [31] American Flood Coalition (2022).



# Climate Ready Together

Fostering collaboration to strengthen resilience

## Read the full report:

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