Disasters
Storage
and
Nature Based Solutions

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2 | CONCLUSIONS

- Understand global change and its cconsequences
- Focus on storage
- Use systems approach:
  - One of the primary challenges we face is that failure to plan storage as a system often results in overreliance on built storage and overlooking the value of *natural storage*
- Natural infrastructure alone can't always address a community's challenges, but it can also complement built infrastructure.
- *"Ultimately, we must work with nature to prevent and adapt to problems such as flooding, water scarcity, wildfires and climate disruption. When we work against nature, we work against ourselves". David Suzuki*

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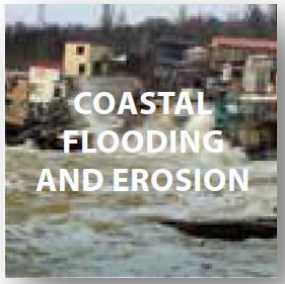
3 | OUTLINE
Presentation

- Water-related disasters
  - Global change
  - Water storage
- Nature-based solutions
  - Canada exposure
  - Benefits
  - Examples
  - Future
- Conclusions

4 | WATER-RELATED DISASTERS
Global change

- Global change
  - Population growth and migrations
  - Land use change (urbanization)
  - Climate change
- Consequences
  - Extreme weather (intensity and frequency)
  - Additional load for infrastructure (hard and soft)
  - Need for mitigation and adaptation



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5 | WATER-RELATED DISASTERS
Water storage

- Floods and droughts around the world – greatest risks facing modern societies
- **Water storage** for millennia helped us cope with the natural extremes by redistributing water in time and space:
  - Household wells - Mountain glaciers
  - Reservoirs - Coastal floodplains
  - Dams - Wetlands
  - Tanks - Aquifers
  - Built storage - Natural storage
- We are at the crossroads
  - Population doubled in the last 50 years (and demand for water)
  - Volume of fresh water declined by around 27,000 billion m^3
- In short we are facing **a global WATER STORAGE gap**

World Bank (2023) What Future Has in Store – A New Paradigm for Water Storage, International Bank for Reconstruction and Development / The World Bank, 1818 H Street NW, Washington, DC 20433, USA

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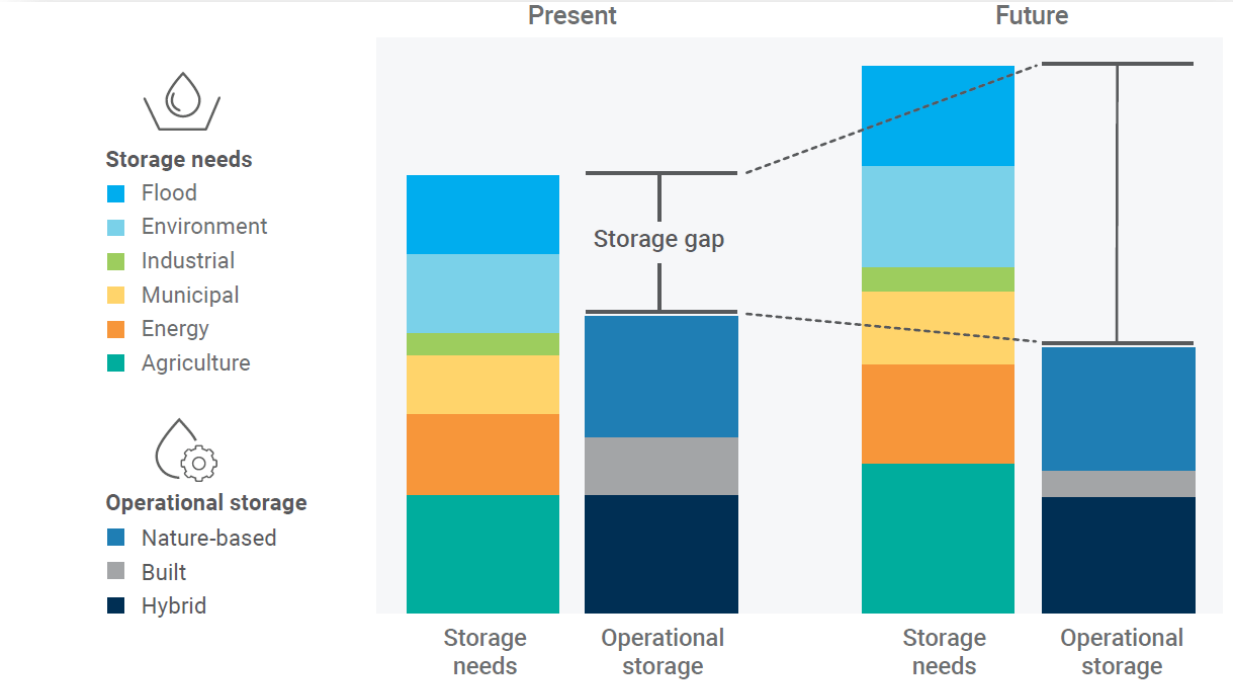
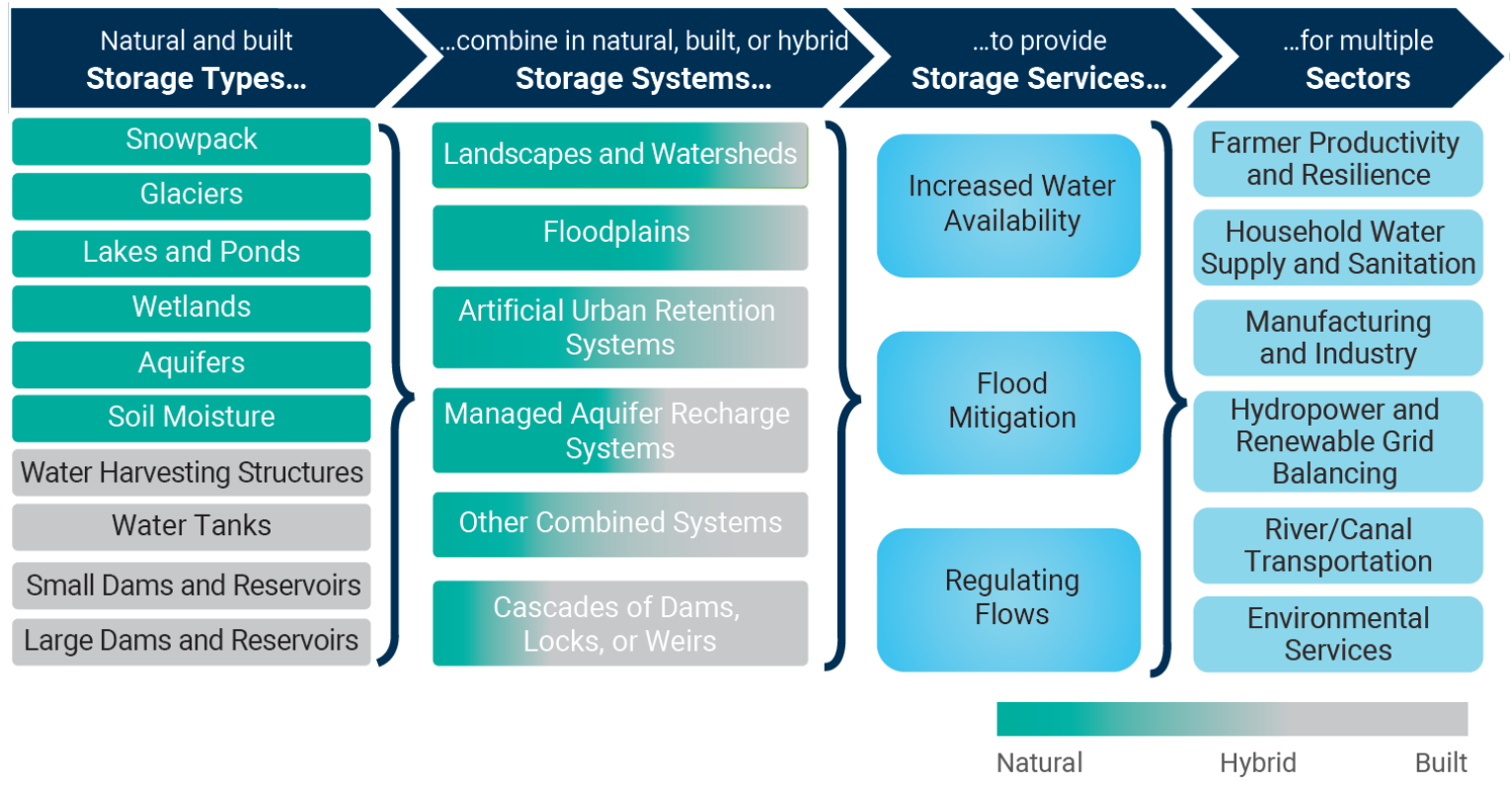
6 | WATER-RELATED DISASTERS
Water storage

The growing storage gap



Source: Adapted from GWP and IWMI 2021.

7 | WATER-RELATED DISASTERS
Water storage



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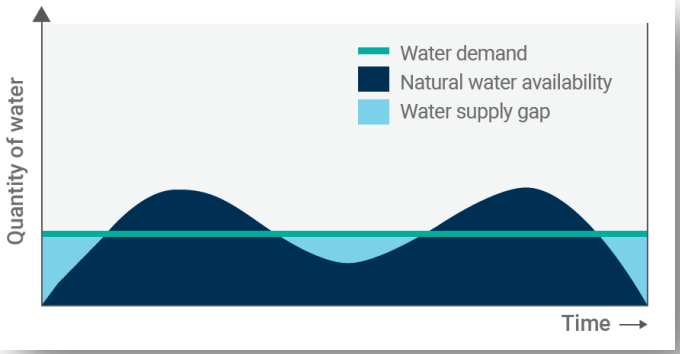
WATER-RELATED DISASTERS

Water storage



- Water storage gap is growing and expected to widen
- Current approaches to freshwater storage development and management are inadequate
- Water storage is a dense web of interdependent natural, built and hybrid solutions
- **Water storage is not planned and managed as a system**
- Future:
  - Think differently
  - Plan inclusively
  - Act systematically
  - Follow principles of Integrated Water Resources Management

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WATER-RELATED DISASTERS

One possible answer – nature-based solutions

- One of the primary challenges we face is that failure to plan storage as a system often results in overreliance on built storage and overlooking the value of ***natural*** storage
- Challenges
  - Understanding nature-based solutions
  - Plan using systems approach
  - Secure participation of all stakeholders
  - Identify all costs and benefits
  - Implement “best” solutions

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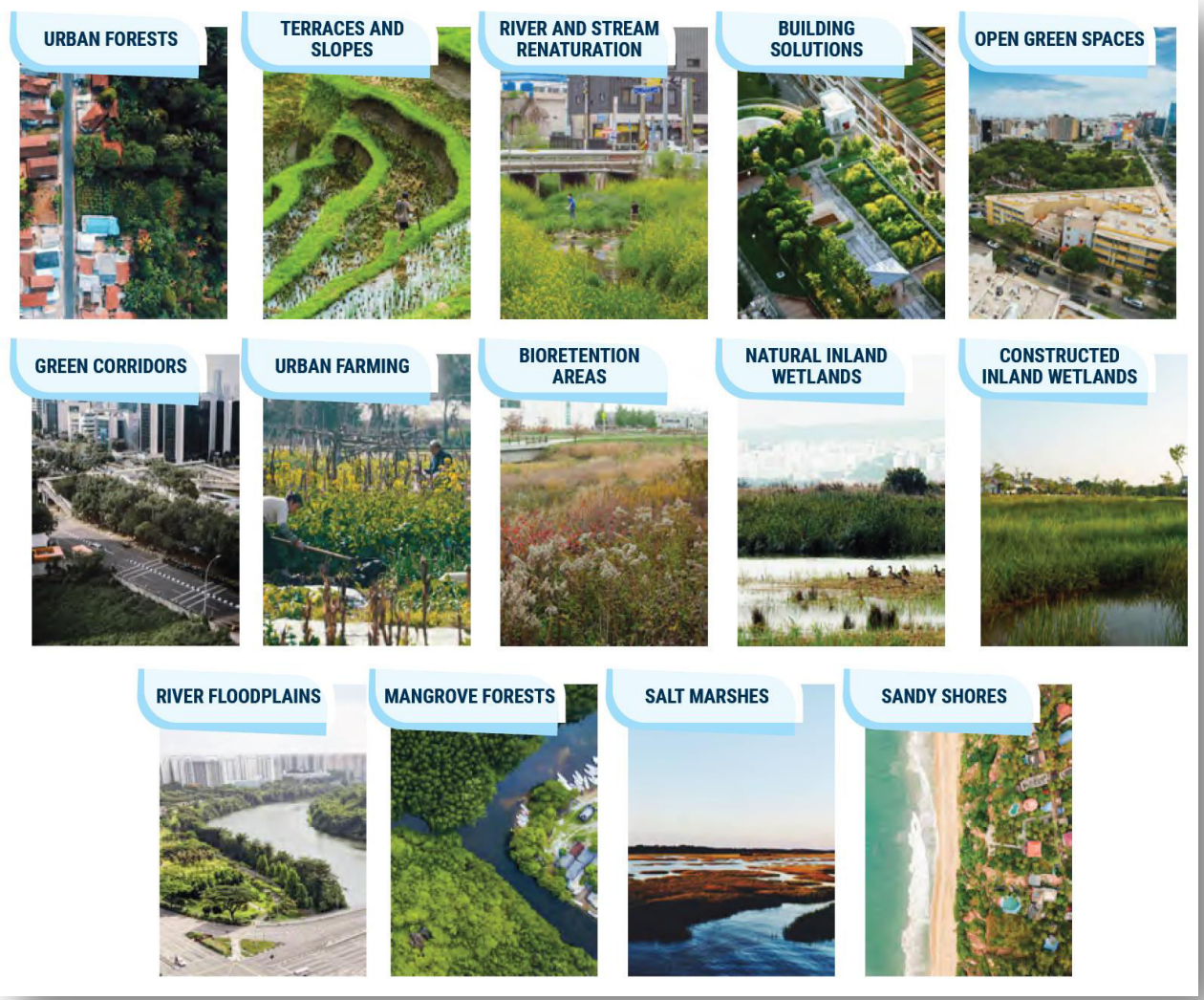
10 | NATURE-BASED SOLUTIONS
Options



11 | NATURE-BASED SOLUTIONS
Deeper look

- Services provided by nature
  - Provisioning (from food, water,…, up to ornamental resources)
  - Regulating (cleaning air, buffering extreme events,…)
  - Habitat (living spaces for plants and animals, increasing resilience to adverse effect of climate change and disasters)
  - Cultural and amenity (esthetic, emotional,…)
- Nature is the most vital infrastructure asset
  - Natural assets deliver essential services
  - Traditional infrastructure planning does not account for services provided by nature and DM can't properly value them

12 | NATURE-BASED SOLUTIONS
Canada exposure

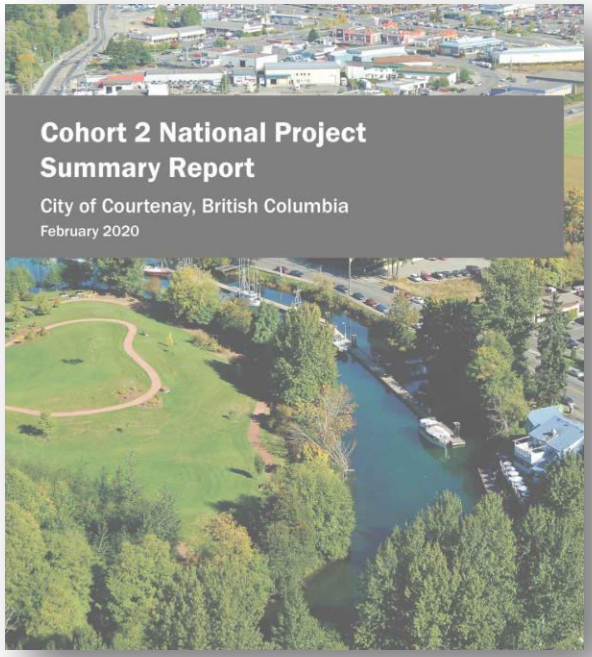
- Why Canada needs natural infrastructure?
  - 1 in 5 people in Canada faces some level of flood risk (1.8M are at high risk)
  - Examples:
    - Alberta flood of 2013 cost more than $6 B;
    - Annual urban flood damage is $1.2 B
    - Only 2023 wildfires (6,018) burned about 4% of the entire forest area of Canada (over 150,000 km^2
    - …..

NATURE-BASED SOLUTIONS

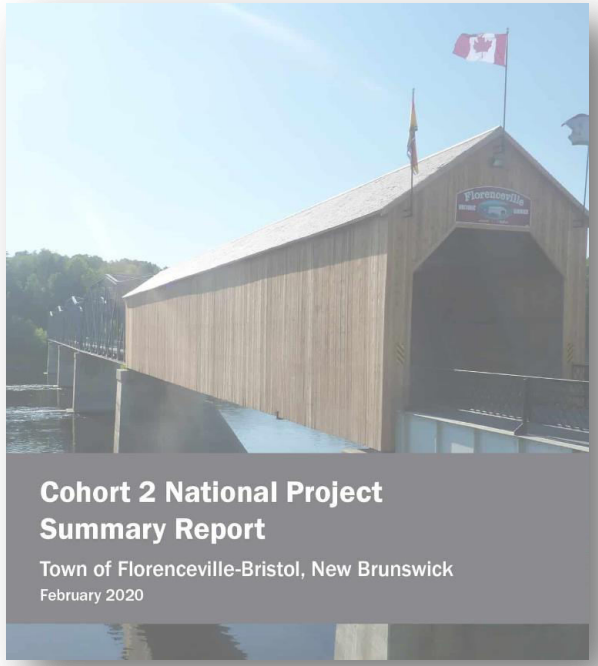
Canada benefits

- The benefits of natural assets
  - Lower community infrastructure costs (wetlands, forests and grasslands reduce flood risk and manage drinking water)
  - Natural infrastructure is multifunctional (built infrastructure has a single function)
  - Green and blue infrastructure increases in value over time, unlike grey which depreciate
  - More resilient and adaptable to global change (especially climate change)

15 | NATURE-BASED SOLUTIONS
Canada examples



Widening and naturalizing 1.3 km of river
Provides $2.4 M flood damage reduction downstream



Protecting 182 ha of forested area along St. John River is providing Stormwater management services worth $4.0 M.

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16 | NATURE-BASED SOLUTIONS
Canada plans and programs

- Harnessing benefits from nature-based solutions
  - Move from risk to resilience
  - Effectiveness
  - Adaptation
  - Mitigation
- Canada is committed to protecting 30 % of its lands and 30 % of its oceans by 2030, using nature-based solutions to fight climate change, and reaching net-zero greenhouse gas emissions by 2050
  - Nature Smart Climate Solutions Fund
  - Indigenous-led Natural Climate Solutions
  - Towards local action on Nature-based Climate Solutions - Toolkit
  - 2 Billion Trees Program
  - Agricultural Climate Solutions
  - Environment Portal
  - www.naturecanada.ca

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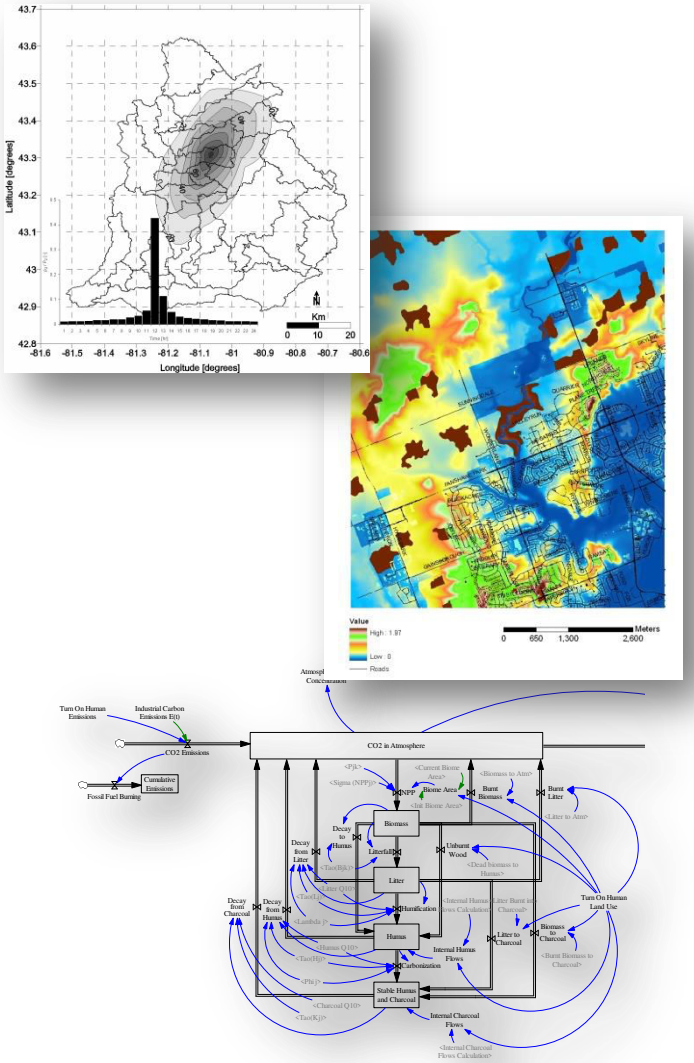
Research

- Research:
  - *Subject Matter* - Systems modeling; Risk and reliability; Water resources and environmental systems analysis; Computer-based decision support systems development.
  - *Topical Area* - Reservoirs; Flood control; Hydropower energy; Operational hydrology; Climatic Change; Integrated water resources management.
- 75 research projects
- 12 visiting fellows
- 21 PosDoc
- 24 PhD and
- 45 MESc



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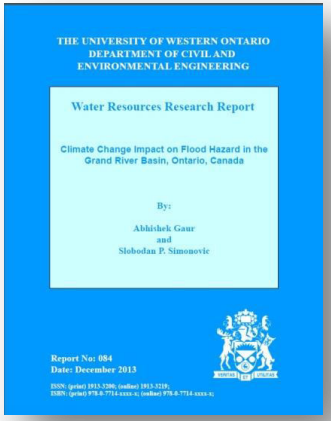
19 | Slobodan P. Simonović
Publications

- ~ 620 professional publications
- 272 in peer reviewed journals
- 3 major textbooks

- Water Resources Research Reports 117 volumes – https://ir.lib.uwo.ca/wrrr/
- > 115,000 from 189 countries downloads since 2011



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