



What are Nature-based Solution (NbS) co-benefits and how do we define them?

For: Commission for Environmental Cooperation
Nature-based Solutions for Coastal Flooding Workshop Services

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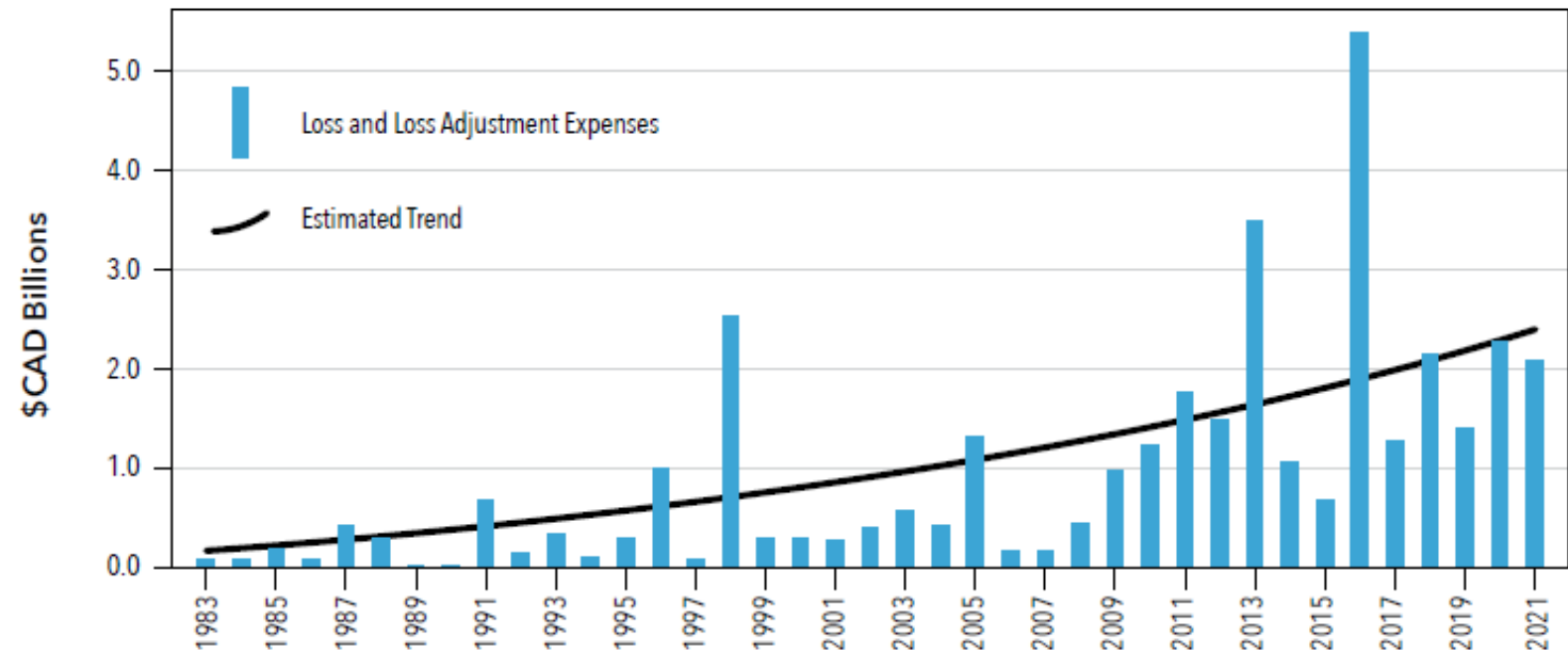
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NbS are not « just » to tackle an environmental issue....

- Per \$1 of insured loss, there are \$3-4 of uninsured losses incurred by government, businesses and individuals
- Degradation of natural infrastructure is a contributing factor reducing resilience to flooding.

Figure 1: Catastrophic Insurable Claims (\$ Can/billions) in Canada, 1983-2021. Blue bars represent loss + loss adjusted expenses. \$1 in insured loss reflects an “insurance gap” of \$3-4.



Source: IBC (2022) & CatIQ (2022)

Note: claims have been normalized for inflation (\$2021) and per capita wealth accumulation.

NbS are not « just » to tackle an environmental issue....

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World Economic Forum New Nature Economy Series 2020:

“\$44 trillion of economic value generation – over half the world’s total GDP – is moderately or highly dependent on nature”.

“Fighting climate change is critical – but not enough – to halt biodiversity loss and safeguard nature”.



“Our economies are embedded within Nature, not external to it”



Source: HM Treasury (2021) The Economics of Biodiversity: The Dasgupta Review
<https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review>

Source: World Economic Forum (2020) New Nature Economy Series 2020
<https://www.weforum.org/reports/new-nature-economy-report-series>

Broadening View of « Infrastructure » in Canada

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National Adaptation Strategy



1. Health and Wellbeing;
2. **Resilient Natural and Built Infrastructure;**
3. Thriving Natural Environment;
4. Strong and Resilient Economy; and,
5. Disaster Resilience and Security.

National Infrastructure Assessment



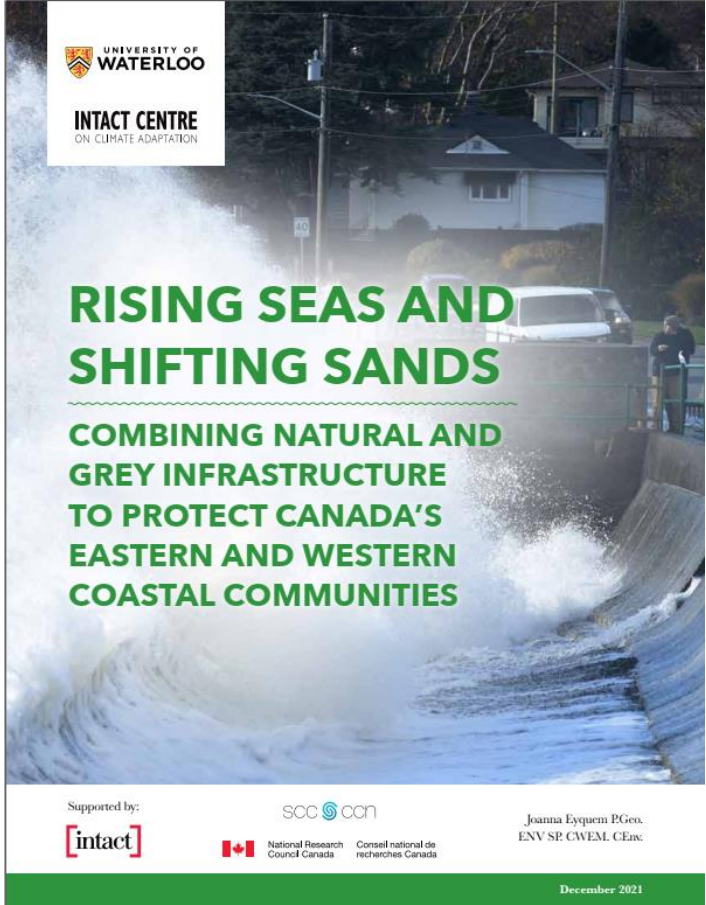
*....covering all sectors of economic, social, sustainable **and natural infrastructure.***

Budget 2021: Natural Infrastructure Fund

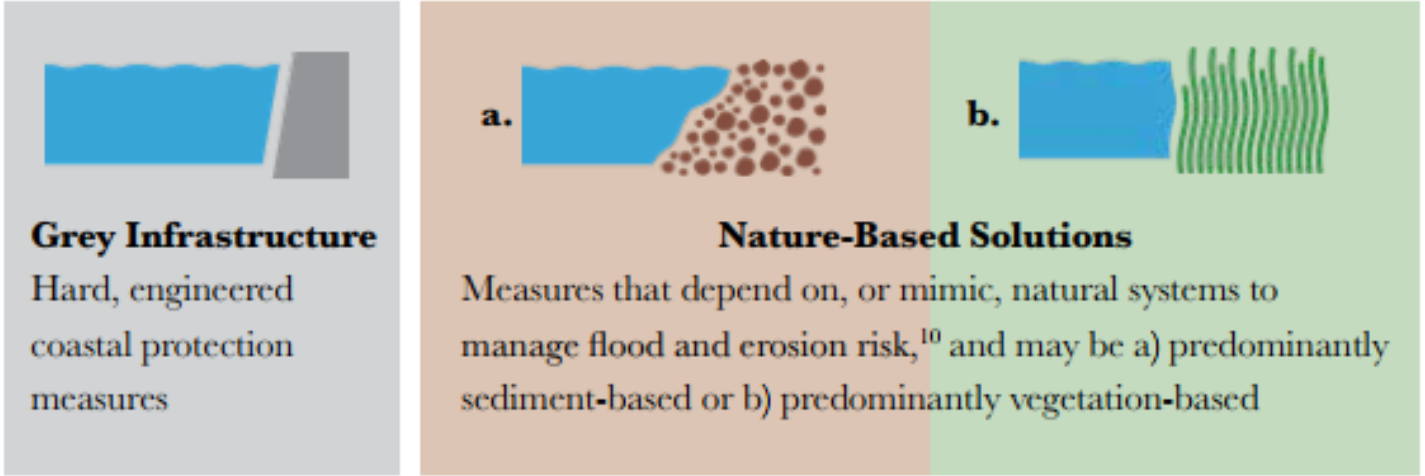


*....\$200 million over three years, starting in 2021-22, to **Infrastructure Canada to establish a Natural Infrastructure Fund.***

Recent National Guidance on Coastal Protection



- **Combining** grey infrastructure and nature-based solutions to achieve multiple benefits



- Actions to scale-up nature-based solutions
- Collaboration with over 65 subject matter experts
- **Focus on addressing NbS in options appraisal**

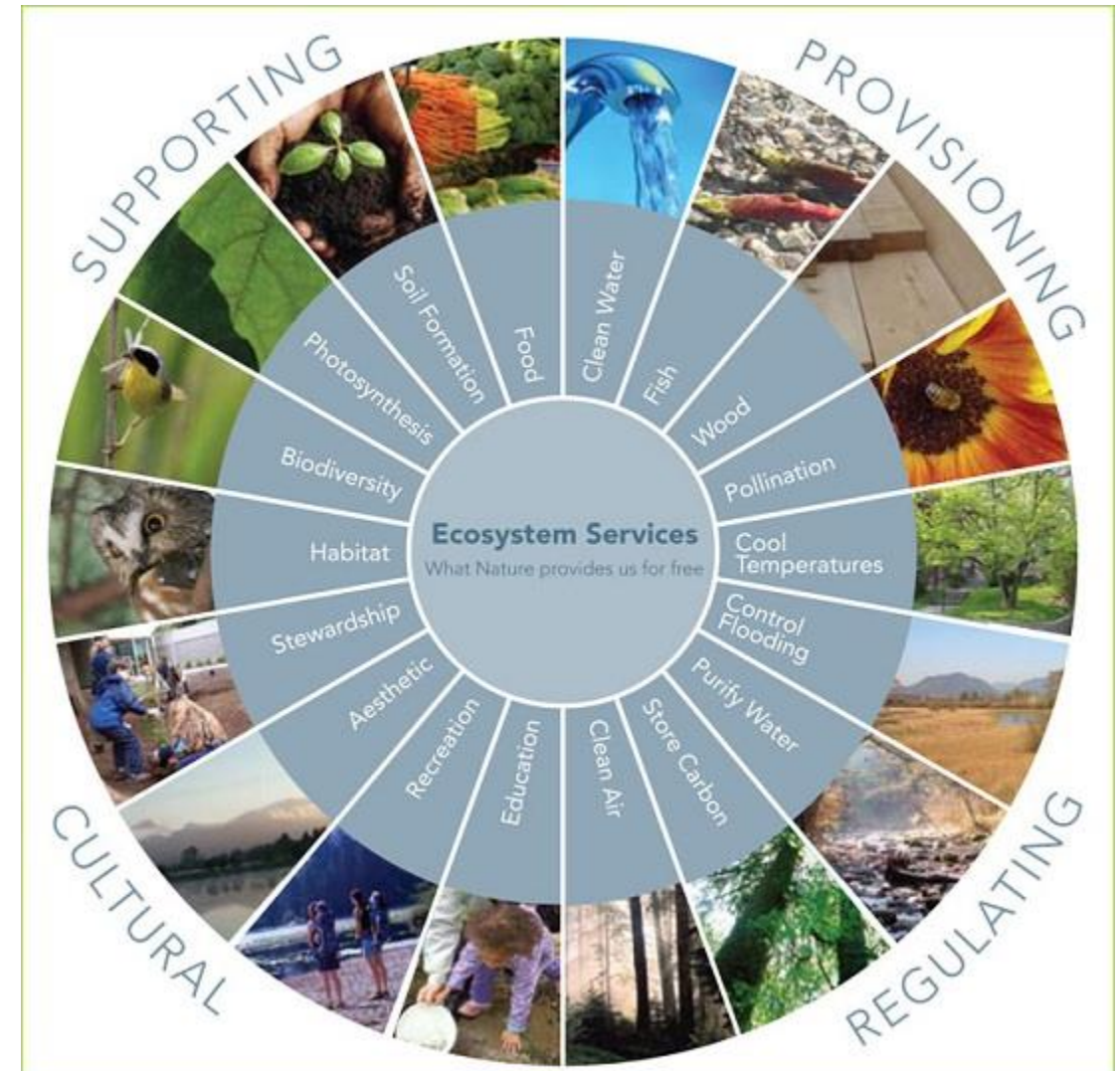
NbS Co-Benefits

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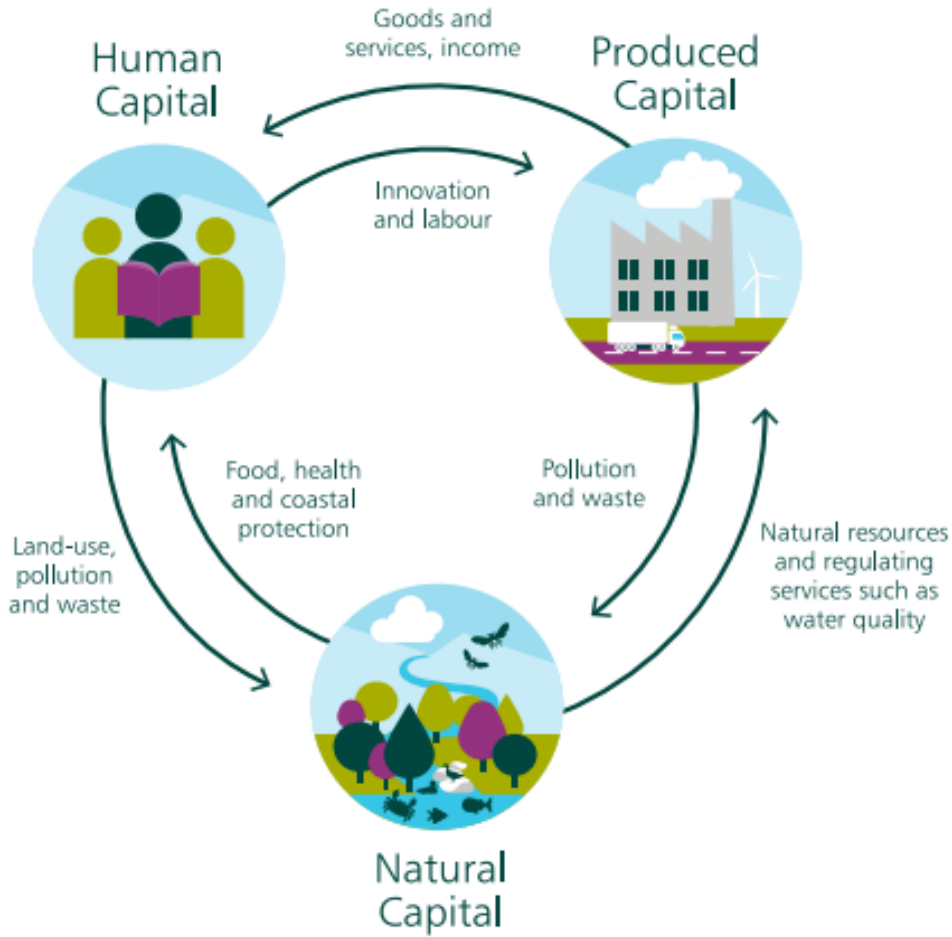
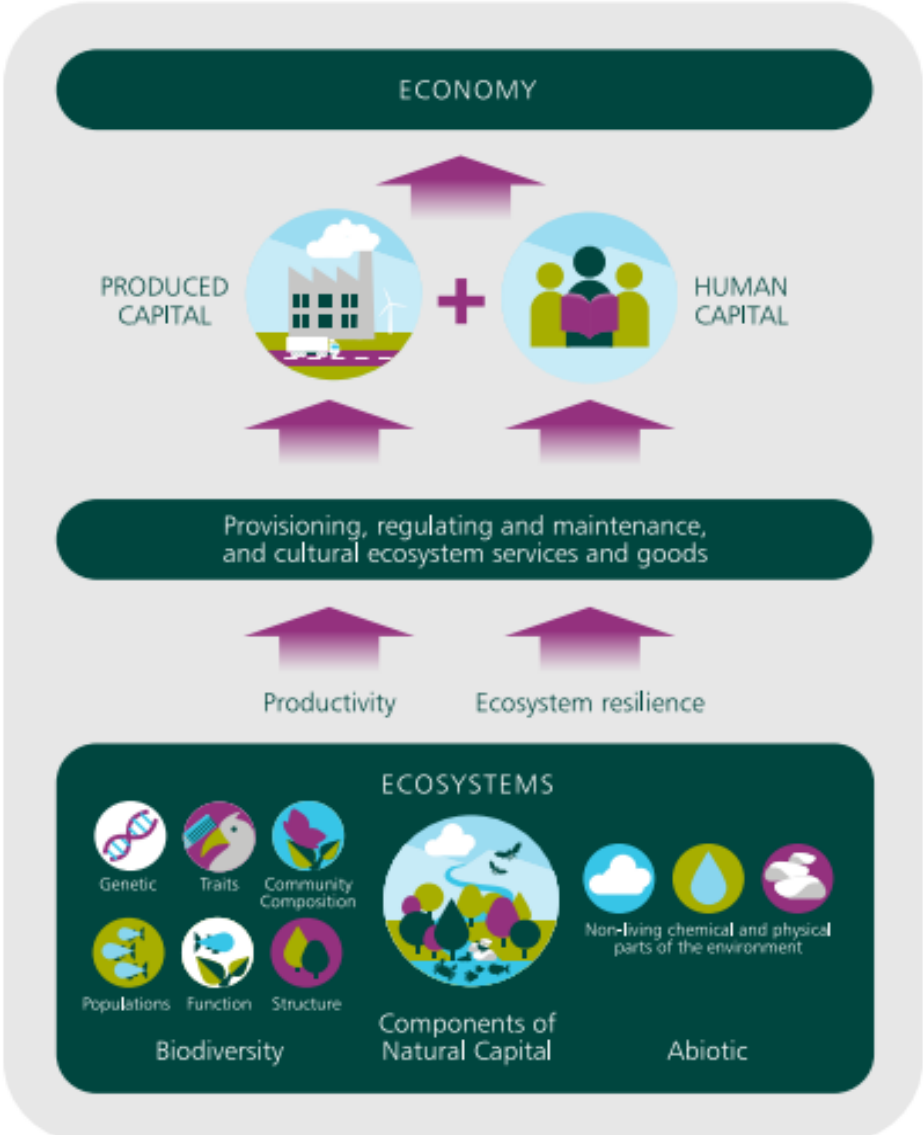
Nature-based Solutions provide
« **ecosystem goods and services** »

- **Provisioning**
 - Fish and shellfish
- **Regulation and support**
 - Flooding and erosion
 - Temperature control
 - Air and water quality
 - Carbon storage and sequestration
 - Biodiversity and habitats
- **Cultural**
 - Recreation opportunities
 - Aesthetic value

*These services are not offered by
« grey » infrastructure*


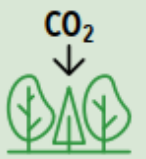



NbS Co-Benefits Support the Economy





Source: HM Treasury (2021) The Economics of Biodiversity: The Dasgupta Review <https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review>

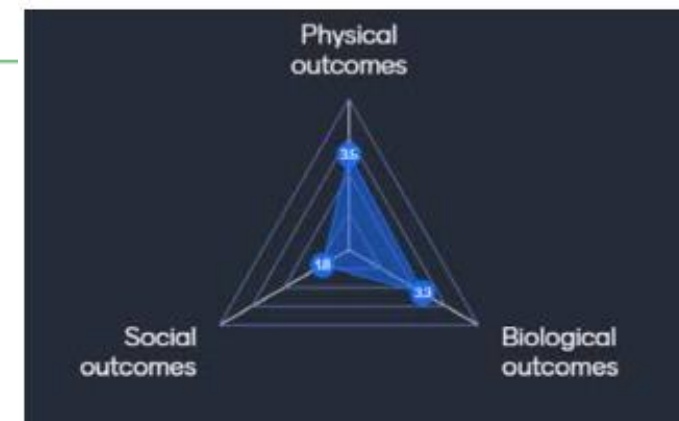
Defining NbS and their co-benefits in Options Appraisal

Impact	Methods, indicators and values used	Lessons Learnt
<p>Water quality</p> 	<ul style="list-style-type: none"> • Modeling using bespoke software (InVEST) • Predicted change in key water quality indicators (referencing established standards) • Predicted change in treatment costs • Visual indicators of water quality (turbidity, algal blooms) may be obtained using airborne sensors 	<ul style="list-style-type: none"> • Standard protocols are well established • Difficult to address variability over time and space
<p>Carbon sequestration and storage</p> 	<ul style="list-style-type: none"> • Modeling using bespoke software (InVEST) • Predicted change in vegetation and soils, and impact on carbon flux and storage • Calculation of embedded carbon in hard protection measures • Social value of carbon 	<ul style="list-style-type: none"> • No standardized method • Important to base calculations on local data • Need to account for time lag in carbon sequestration
<p>Biodiversity and habitats</p> 	<ul style="list-style-type: none"> • Modeling using bespoke software (InVEST, iTree) • Predicted change in land use area of different habitats (using GIS) • Predicted change in species diversity / species at risk / invasive species • Use of Traditional Ecological Knowledge / participative mapping to obtain baseline 	<ul style="list-style-type: none"> • Drones are useful to obtain high-resolution mapping • Difficult to adequately reflect the value of habitat connectivity • Different tools may be appropriate to different habitats

Defining NbS and their co-benefits in Options Appraisal

Impact	Methods, indicators and values used	Lessons Learnt
<p>Aesthetics</p> 	<ul style="list-style-type: none"> • Participatory mapping • Analysis of social media activity (Instagram, Flickr) • Indirect valuation (for example using the difference paid for a room with a seaview) • Public consultation on visuals of option alternatives 	<ul style="list-style-type: none"> • Difficult to quantify and avoid bias • Perceptions of aesthetics vary widely between people based on individual background and circumstance • Difficult to account for change over time
<p>Recreation</p> 	<ul style="list-style-type: none"> • Change in area/length of recreational facilities • Indirect measurements – number of visitors, frequency of site use, travel-cost, local tourism revenues • Averted health care costs (including mental health) for recreational activities linked to improved health 	<ul style="list-style-type: none"> • Opportunity to capture diverse perspectives • Often considered qualitatively, which may undervalue benefits

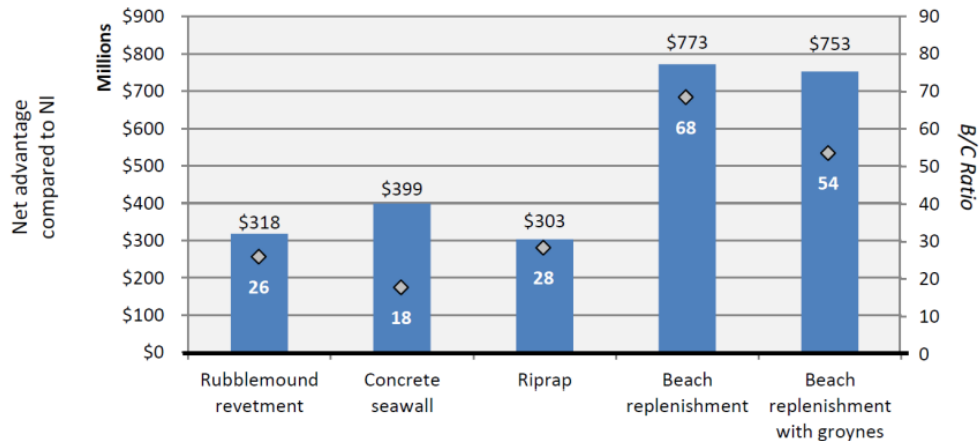
Question: How strong do you think we are at monitoring physical, biological and social outcomes. (respondents were asked to indicate their perception of strength in monitoring from 1 (weak) to 5 (strong) for each type of outcomes)



Worked Example: Percé, Quebec (Ouranos, 2016)

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Five alternatives assessed for Anse du Sud (heart of Percé):



CBA compared to non-intervention - Beach nourishment most beneficial option over 50-year period considered.

Benefit-cost ratio: 68:1

Large benefits from tourism industry

Source: Circé, M., et al. 2016, Ouranos

<https://www.ouranos.ca/wp-content/uploads/Synthesis-report-ACA-Quebec-final.pdf>

Type of Impact	Negative Impacts	Positive Impacts
Related to erosion	<ul style="list-style-type: none"> Loss of land Complete or partial loss of residential or commercial buildings Loss or damage to public infrastructure 	
Related to flooding	<ul style="list-style-type: none"> Damages to land Damages to residential or commercial buildings Damages to public infrastructure Emergency evacuation Debris clean-up Traffic congestion or detour 	
Economic	<ul style="list-style-type: none"> Reduced land value Loss of goods and commercial revenues Loss of tourism revenues 	<ul style="list-style-type: none"> Gain in tourism revenues
Environmental	<ul style="list-style-type: none"> Loss of natural habitats Loss of fishing spawning grounds 	<ul style="list-style-type: none"> Improvement in fish spawning grounds
Social	<ul style="list-style-type: none"> Loss of sea view Loss of sea access Decline in the coast's recreational use Reduced quality of life (anxiety, insecurity, etc.) Deterioration in the landscape Deterioration in historical and cultural heritage 	<ul style="list-style-type: none"> Improvement in the coast's recreational use Improvement in quality of life (security) Improvement in the landscape

Natural Asset Management by Canadian Municipalities

- Several municipal-scale initiatives to **inventory and value** natural infrastructure
- **Valuation** focused on municipal service provision
- **National Standard** of Canada in development for natural asset inventory.
- Interest among CFOs inability to reflect values in **financial statements**



- Town of Logy Bay-Middle Cove-Outer-Cove, NL*
- Town of Riverview, NB*
- Town of Florenceville-Bristol, NB*
- Village of Riverside-Albert, NB*
- Greater Montreal, QC*
- Greater Quebec City, QC*
- Rivière Chaudière, QC*
- Compton, QC*
- National Capital Region, ON/QC*
- City of Oshawa, ON*
- Region of Peel, ON*
- Town of Oakville, ON*
- City of London, ON*
- York Region, ON*
- City of Richmond Hill, ON*
- City of Calgary, AB*
- Town of Gibsons, BC*
- District of Sparwood, BC*
- City of Courtenay, BC*
- District of West Vancouver, BC*
- City of Grand Forks, BC*
- City of Nanaimo, BC*
- Regional District of Central Kootenay, BC*
- Regional District of East Kootenay, BC*
- Regional District of Kootenay Boundary, BC*
- City of Cranbrook, BC*
- Town of Golden, BC*
- City of Rossland, BC*



Conclusions

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- Definition and valuation of NbS co-benefits is rapidly evolving in Canada
- Municipalities are playing a key role in natural asset management, which includes NbS and co-benefits.
- Absence of « perfect » approaches should not get in the way of incorporating « good » practice.

<https://www.intactcentreclimateadaptation.ca>

