

Planning for the future:

Local-level adaptation to climate change



Graduate Seminar Series

April 19, 2023

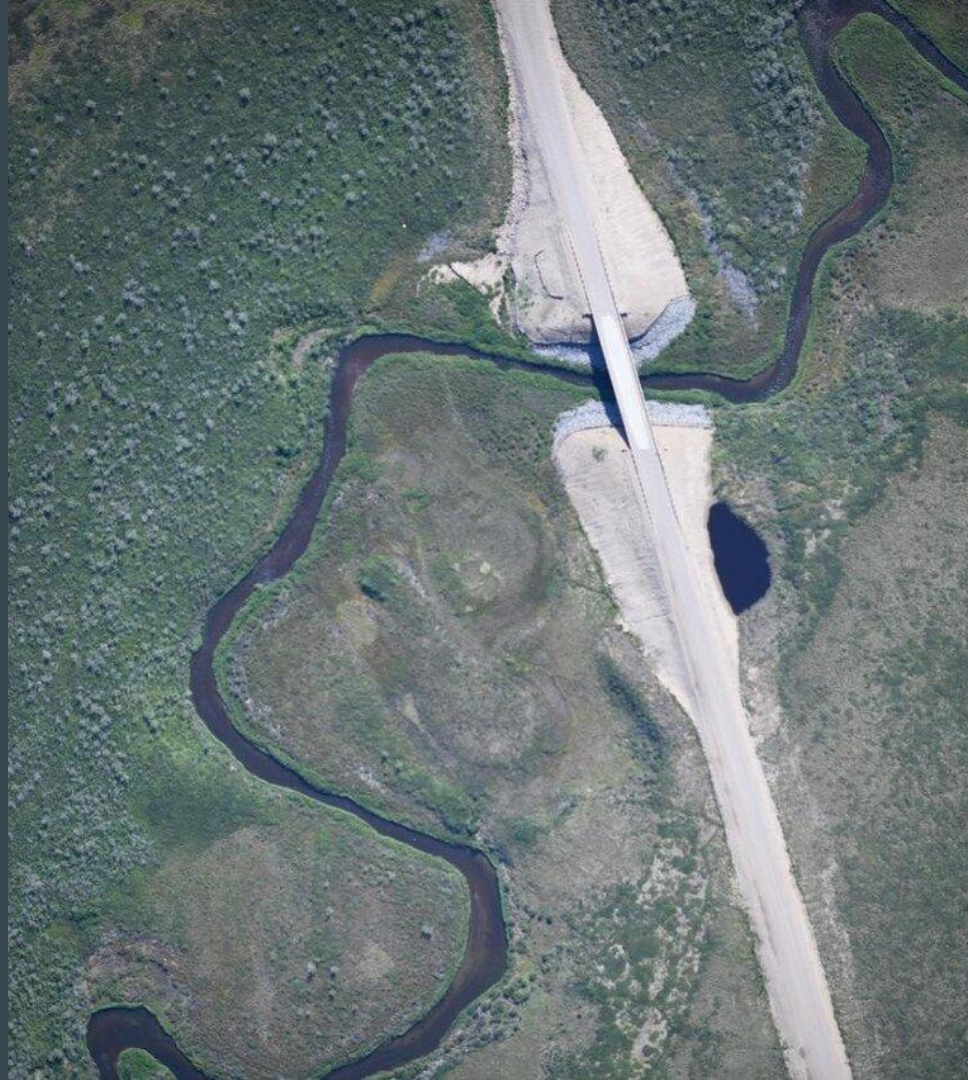
UArctic Thematic Network on Local-scale Planning, Climate Change and Resilience

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Outline

1. Adaptation **Planning**
2. **Benefits & Risks** of Adaptation
3. Making **Adaptation** Work



An aerial photograph showing a multi-lane concrete bridge that has collapsed into a river. The river is filled with white water rapids and carries a large amount of sediment and rocks. The bridge spans across the river, with one section having fallen into the water, leaving a gap. The surrounding area is a dense forest of evergreen trees. In the background, a road and some buildings are visible on a hillside. The overall scene depicts a significant infrastructure failure in a natural setting.

Climate change has increased disaster risk

(IPCC, 2022)



Climate impacts are costly.

Projected Canadian yearly losses:

2025: \$25B

2100: \$100B

1. Adaptation Planning

Planning, disaster risk and adaptation



What is Planning?

Planning guides local-level decision making on future land use, development and infrastructure.

Planning makes recommendations specific to the local context through:

- *Technical data*
- *Public engagement*

**Adaptation
Planning for
Risk Reduction**
Every \$1 now can save
\$15 in the future



Hard Adaptation

Structural measures & infrastructure updates



Soft Adaptation

Non-structural & ecosystem-based measures



A solid yellow vertical bar is positioned on the left side of the slide, extending from the top to the bottom.

Simple, right?

... not quite.

2. Benefits & Risks

Costs, uncertainty and maladaptation

Why is Adaptation Important?

- Reduces Risk
- Mitigates Cost





What are the BENEFITS?

**Low-risk and high-benefit
adaptation policy prepares
communities for uncertainty and
builds capacity.**



There are risks & limits to adaptation.

Unmitigated warming is already outpacing our capacity to adapt.

Maladaptation:

when adaptation measures result in unintended negative consequences that further increase risk and vulnerability



3. Making Adaptation Work

Addressing Vulnerability, Place-based Approaches & Adaptive
Capacity



What Enables Adaptation?

1. Addressing the right thing
2. Using the right approach
3. Having enough of the right stuff



**Why does
vulnerability
exist?**

Physical Vulnerability

Exposure to hazards and physical risk



Social Vulnerability

Social stressors & environmental injustice





Vulnerability is unique to each community, requiring a Place-Based Approach



Place-based approach:

Coordinating long-term risk reduction
through collaboration with communities



An aerial photograph of a dense forest. A bright orange and yellow fire line is visible, cutting through the trees from the bottom right towards the center. Thick white smoke is rising from the fire, partially obscuring the forest canopy. The overall scene is dramatic and highlights the impact of fire on a natural ecosystem.

**Communities must have
Adaptive Capacity**



Adaptive Capacity

(Cinner et al. 2018)

1. **Assets**

- Financial, technical and public resources

2. **Flexibility**

- Diversity of options and strategies

3. **Social Organization**

- Cooperation, collective action and knowledge sharing

4. **Learning**

- Living and managing uncertainty

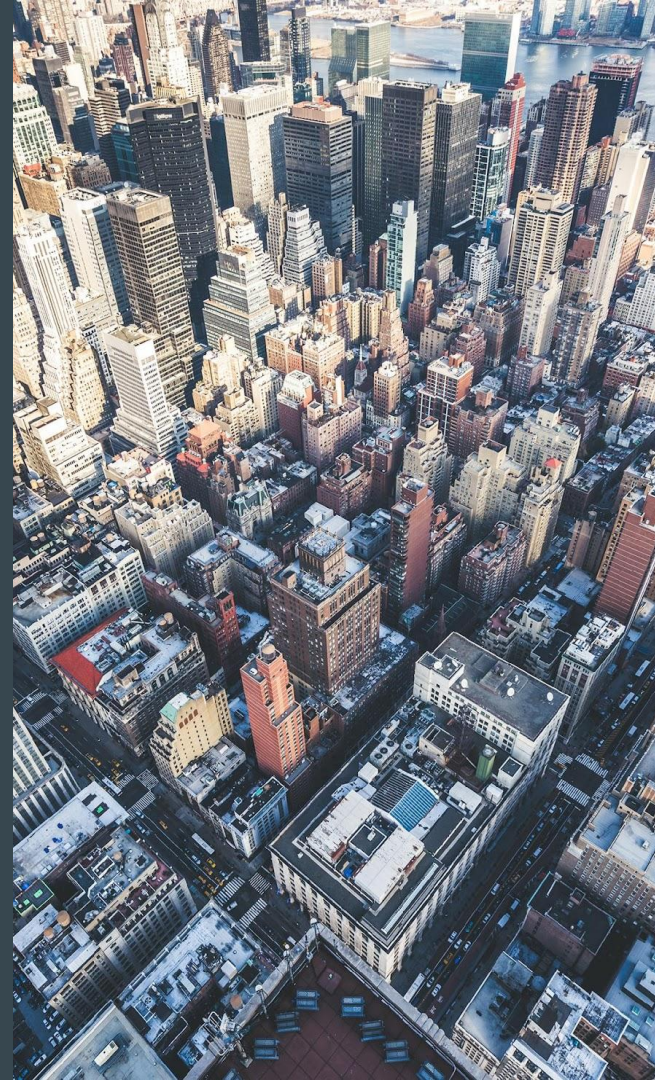
5. **Agency**

- Power and freedom to shape their future

4. Conclusion

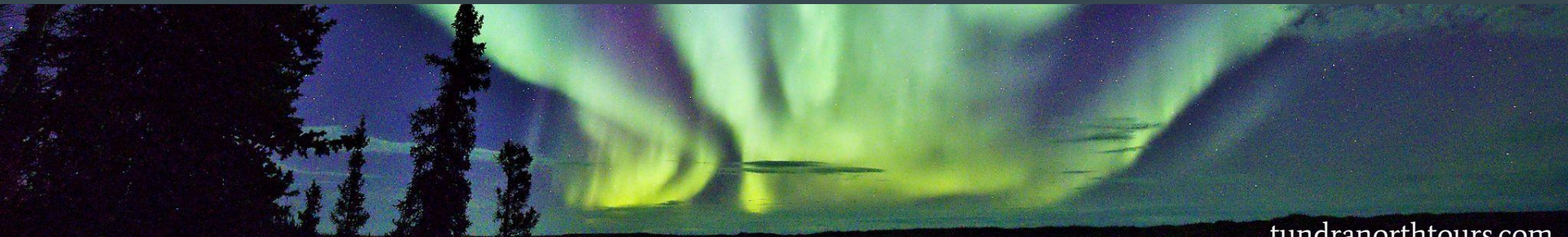
Key Takeaways

- **Adaptation planning** plays a big role in disaster risk reduction
- Adaptation has **benefits & risks**
- **Effective adaptation** requires:
 - Addressing **vulnerability**
 - Using **place-based approaches**
 - Requires **capacity** to implement measures





“The cumulative scientific evidence is unequivocal: Climate change is a threat to human well-being and planetary health. Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and rapidly closing window of opportunity to secure a liveable and sustainable future for all.” (p.35, IPCC, 2022)



Thank you



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Bibliography

- Adger, W. N., & Barnett, J. (2009). Four Reasons for Concern about Adaptation to Climate Change. *Environment and Planning A*, 41(12), 2800–2805.
- Andrew, B. (2008). Market failure, government failure and externalities in climate change mitigation: The case for a carbon tax. *Public Administration & Development*, 28(5), 393–401.
- Benevolenza, M. A., & DeRigne, L. (2018). The impact of climate change and natural disasters on vulnerable populations: A systematic review of literature. *Journal of Human Behavior in the Social Environment*, 29(2), 266–281.
- Birchall, S. J., & Bonnett, N. (2020). Thinning sea ice and thawing permafrost: Climate change adaptation planning in Nome, Alaska. *Environmental Hazards*, 19(2), 152–170.
- Birchall, S. J., MacDonald, S., & Slater, T. (2021). Anticipatory planning: Finding balance in climate change adaptation governance. *URBAN CLIMATE*, 37, 100859.
- Cinner, J. E., Adger, W. N., Allison, E. H., Barnes, M. L., Brown, K., Cohen, P. J., Gelcich, S., Hicks, C. C., Hughes, T. P., Lau, J., Marshall, N. A., & Morrison, T. H. (2018). Building adaptive capacity to climate change in tropical coastal communities. *Nature Climate Change*, 8(2), 117–123. <https://doi.org/10.1038/s41558-017-0065-x>
- Canada & Public Safety Canada. (2019). Emergency management strategy for Canada: Toward a resilient 2030.
- Davoudi, S., Brooks, E., & Mehmood, A. (2013). Evolutionary Resilience and Strategies for Climate Adaptation. *Planning Practice & Research*, 28(3), 307–322.
- Environment and Climate Change Canada. (2019). *Canada's changing climate report*.
- Eriksen, S., Schipper, E. L. F., Scoville-Simonds, M., Vincent, K., Adam, H. N., Brooks, N., Harding, B., Khatri, D., Lenaerts, L., Liverman, D., Mills-Novoa, M., Mosberg, M., Movik, S., Muok, B., Nightingale, A., Ojha, H., Sygna, L., Taylor, M., Vogel, C., & West, J. J. (2021). Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance? *World Development*, 141, 105383.
- Field, C. B. (2018). Smart adaptation in an era of rising climate risks. *Bulletin of the Atomic Scientists*, 74(2), 73–80
- Fitton, J. M., Addo, K. A., Jayson-Quashigah, P.-N., Nagy, G. J., Gutiérrez, O., Panario, D., Carro, I., Seijo, L., Segura, C., Verocai, J. E., Luoma, S., Klein, J., Zhang, T.-T., Birchall, J., & Stempel, P. (2021). Challenges to climate change adaptation in coastal small towns: Examples from Ghana, Uruguay, Finland, Denmark, and Alaska. *Ocean & Coastal Management*, 212, 105787.
- Ford, J., & King, D. (2013). A framework for examining adaptation readiness. *Mitigation and Adaptation Strategies for Global Change*, 20(4), 505–526.
- IPCC. (2014). *Climate change 2014—Impacts, adaptation and vulnerability: Regional aspects*. Cambridge University Press
- IPCC (2022) Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press
- Kehler, S., & Birchall, S. J. (2021). Social vulnerability and climate change adaptation: The critical importance of moving beyond technocratic policy approaches. *Environmental Science & Policy*, 124, 471–477.
- Naylor, A., Ford, J., Pearce, T., & Van Alstine, J. (2020). Conceptualizing Climate Vulnerability in Complex Adaptive Systems. *One Earth*, 2(5), 444–454.
- Osborne, N. (2013). Intersectionality and kyriarchy: A framework for approaching power and social justice in planning and climate change adaptation. *Planning Theory, Journal Article*.
- Sawyer, D. (2022). Damage Control: Reducing the costs of climate impacts in Canada. 86.
- Siders, A. R. (2019). Adaptive capacity to climate change: A synthesis of concepts, methods, and findings in a fragmented field. *Wiley Interdisciplinary Reviews: Climate Change*, 3.
- Suter, I., Streletskiy, D., & Shiklomanov, N. (2019). Assessment of the cost of climate change impacts on critical infrastructure in the circumpolar Arctic. *Polar Geography*, 42(4), 267–286