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Canada's North: On the Front Line of Climate Change

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**THE SENATE STANDING COMMITTEE ON ENERGY,
THE ENVIRONMENT AND NATURAL RESOURCES**

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Dr. Warwick Vincent is former
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City, where he is a Professor of Biology and
Canada Research Chair. Over the last three
decades, most of his research has been on lakes,
coastal seas, climate and permafrost issues in the
Canadian North. Dr. Vincent is the Canadian
delegate to the Terrestrial Working Group of the
International Arctic Science Committee (IASC);
Fellow of the Royal Society of Canada; and
recipient of the Polar Medal (Governor General
of Canada, 2016) for leadership in Arctic science.

Northern Canada is Hypersensitive to Global Climate Change for Two Reasons

1. Polar Amplification

Global models of climate change predict that the greatest rates of warming of our planet will be at the highest northern latitudes.

Why? This is because of a number of 'positive feed back' accelerator processes that affect climate, such as the 'shrinking mirror' effect.



Northern Canada is Hypersensitive to Global Climate Change for Two Reasons

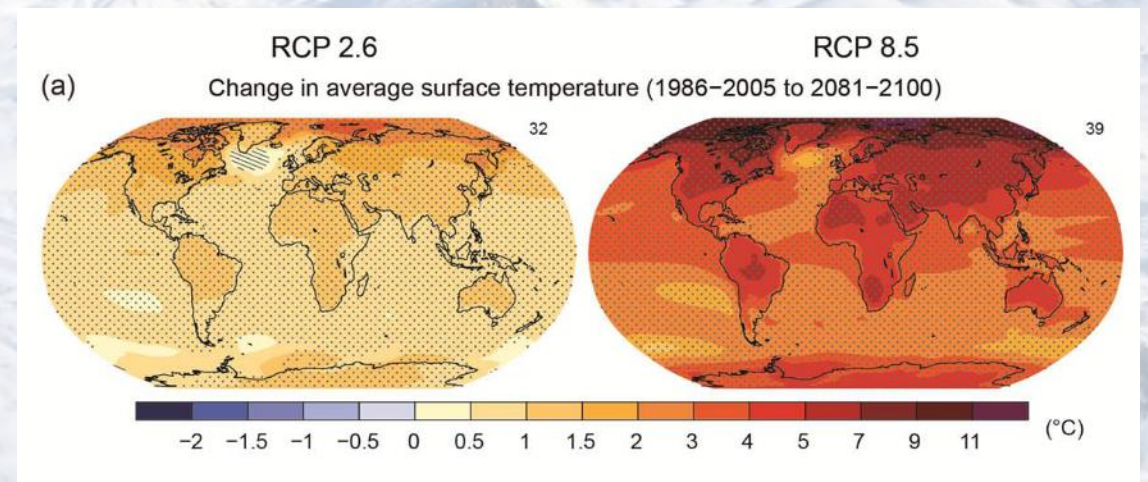
1. Polar amplification (cont.)

These models predict that small changes for planet Earth will translate into larger changes in the North:

+1.5°C (Paris) → 3-4°C warming in the North

"Business as usual" → Massive changes in the North

Projections pour 2100
Report IPCC 2013



Northern Canada is Hypersensitive to Global Climate Change for Two Reasons

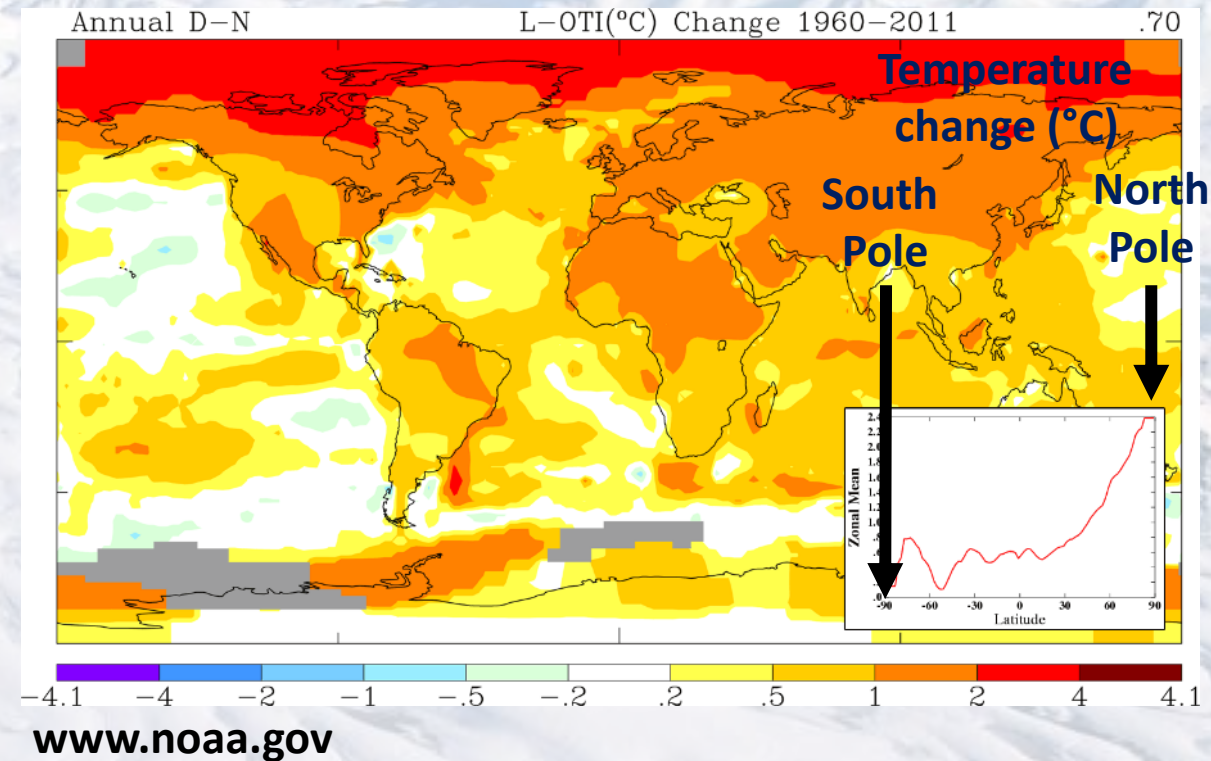
1. Polar Amplification (cont.)

Consistent with these model predictions:

the highest rates of measured climate warming across the world over the last few decades have been at the high northern latitudes:

the Subarctic and the Arctic.

Polar Amplification –1960 à 2011



Northern Canada is Hypersensitive to Global Climate Change for Two Reasons

2. Canadian Ice

- Snow, ice and permafrost underpin the Canadian North:
 - lands and seas
 - ecosystems
 - communities
 - industry
 - infrastructure

Canada : 50% of our land surface
contains permafrost



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2. Canadian Ice (cont.)

- It takes only small changes in temperature to melt the ice.
- The transition from solid ice to liquid water changes everything in the North, but especially **ecosystem services**, from ground stability to flood control and plant and animal ecology.

Sensitivity of northern landscapes to rapid thawing



Permafrost megaslump in northwestern Canada, J. Culp

We are now seeing these changes throughout the North

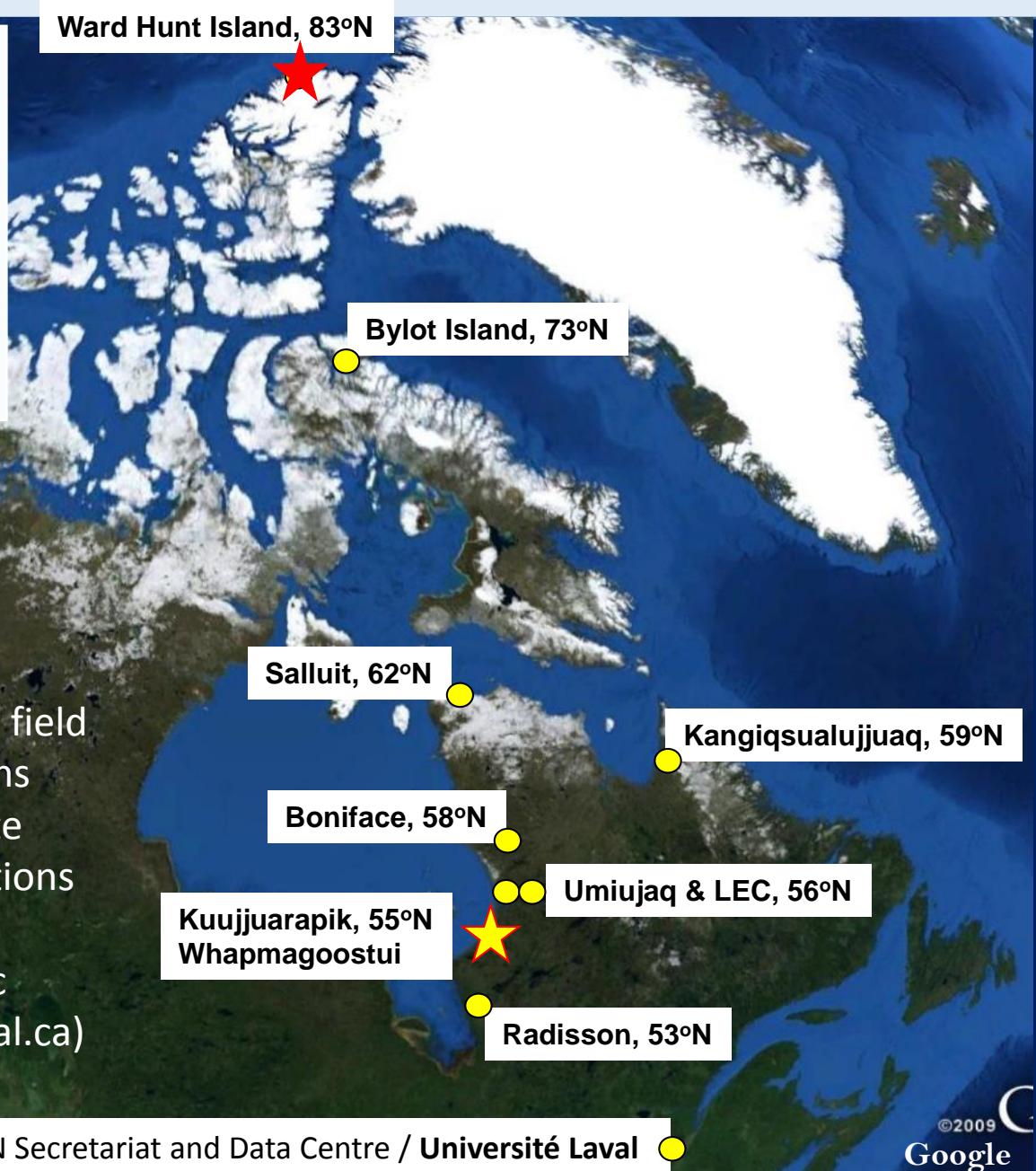
CEN's Mission



- To help the sustainable development of the North
- Network of stations
- Evidence of rapid change throughout the region

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CEN Centre for Northern Studies



CEN operates 9 field research stations and 100 climate monitoring stations in the eastern Canadian Arctic (www.cen.ulaval.ca)

Quebec City: CEN Secretariat and Data Centre / Université Laval



These changes are already affecting northern ice, landscapes ecosystems and infrastructure, with more serious impacts likely ahead



Collapse of ancient ice shelves (Nunavut)



Expansion & flooding of lakes (Nunavik)



Ecological impacts



“I feel the whole town should move”

(Nunatsiak News 2011)



“Thawing permafrost a growing problem for Iqaluit airport”

(CBC North 2013)



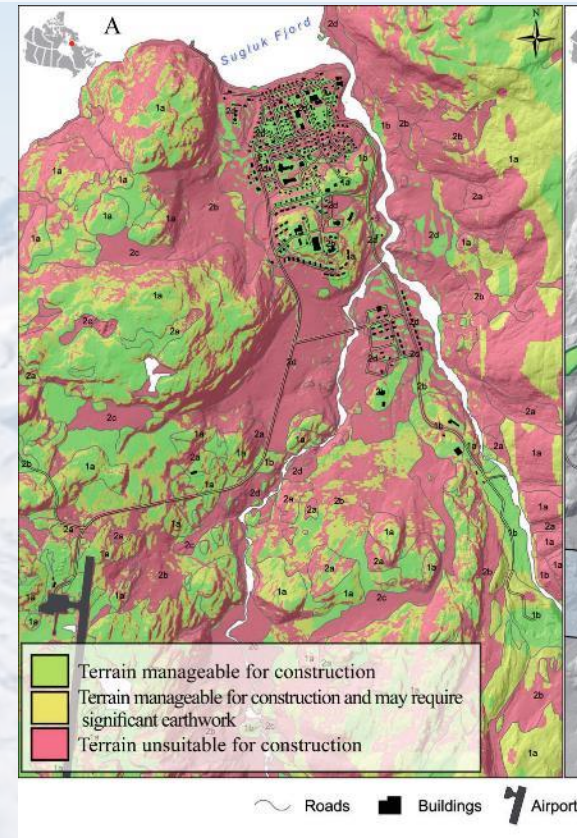
Impacts on mining

(CBC North 2017)

How can we cope with these changes?

ADAPTATION

- Monitoring and research
- Knowledge exchange
 - National
 - International
 - Indigenous
 - Transdisciplinary
- Integrative risk assessment
- Adaptive management for changing climate and extremes in weather



Permafrost risk map for land-use planning at Salluit (M. Allard)



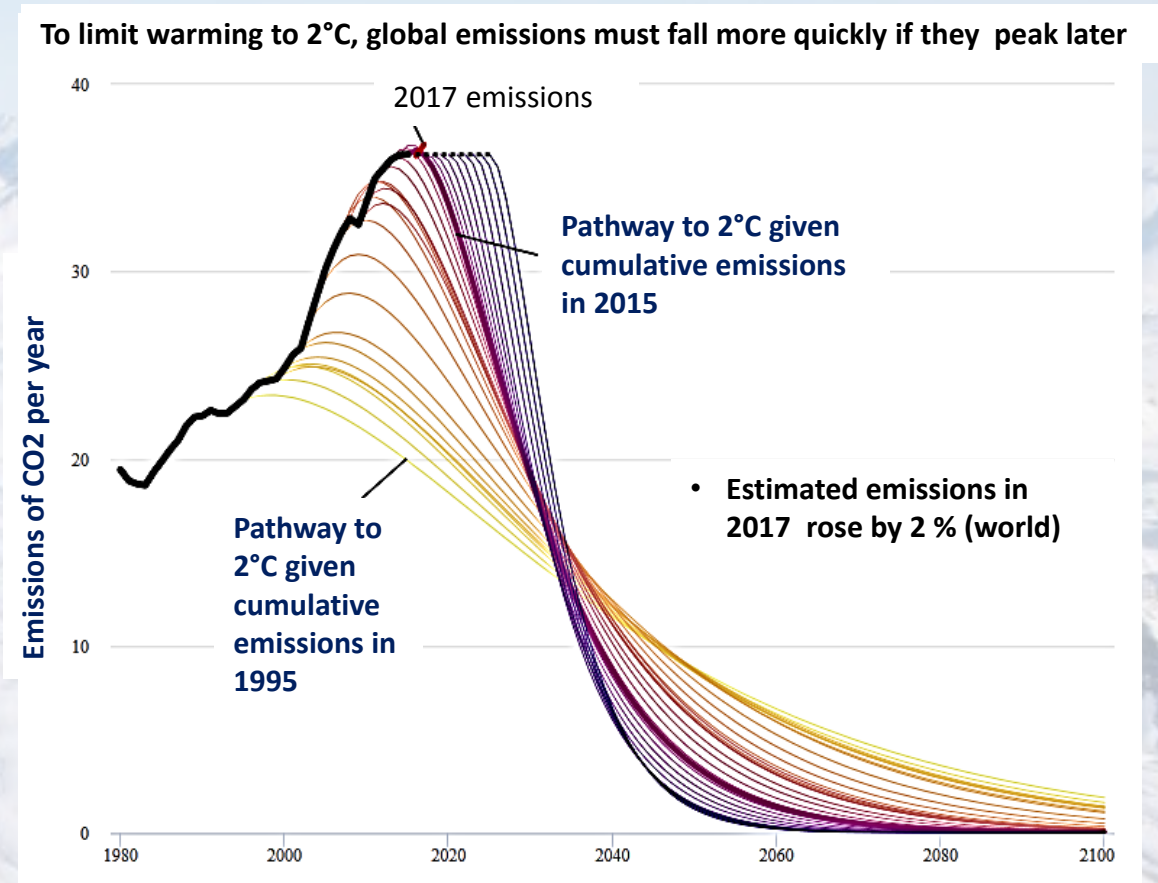
Canada's northernmost monitoring station at Ward Hunt Island (NU)

How can we cope with these changes?

MITIGATION

It is not too late to reduce CO₂ emissions in order to slow climate change, but it is urgent.

- **The earlier the reductions**, the less severe the transition to keep below 2°C
- Current changes in the North and its high sensitivity to warming underscore the urgent need for CO₂ reduction.
- Canada is on **the front line of climate impacts** and we have a major interest in being a leader in mitigation.



<https://www.carbonbrief.org/analysis-global-co2-emissions-set-to-rise-2-percent-in-2017-following-three-year-plateau>

Thank you very much.

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