» News and information helping NWT communities make choices to adapt and thrive in a changing climate

Climate Change and NWT Communities

December, 2012

» together we can make a difference

Arctic Sea Ice: lowest summer extent reached in 2012

This September, the National Snow and Ice Data Centre reported that Arctic sea ice covered the smallest area ever recorded (since 1979).

This year, the sea ice dropped to 3.41 million square kilometers. This is 760,000 square kilometers less than (or 18% below) the last low record set in 2007, and almost 50% below the average minimum from 1979 to 2000.

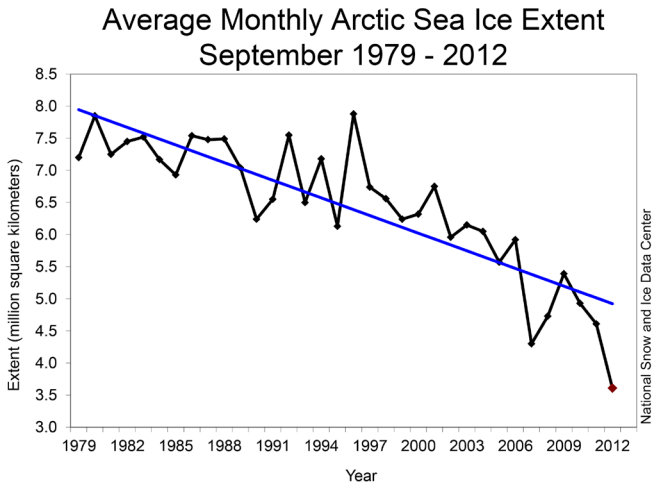
Northwest passage

The loss of summer sea ice means more people are talking about the Northwest shipping passage, which can cut up to 2 weeks off a shipping route from Asia to Europe.

When more areas of the Arctic ocean are ice-free longer, there could be increased demand for search and rescue, liability in case of accidents, increased tourism, and increased resource exploitation including oil and gas.

Positive feedback loop

Sea ice has a bright surface, reflecting 80% of the sunlight that hits it. The reflected sunlight cannot warm the surface. However, once the ice melts, the dark ocean surface absorbs 90% of the sunlight, heating the ocean. Because more heat is absorbed, more melting occurs, which leads to more warming. This "positive feedback loop" raises Arctic temperatures more quickly, speeds up global warming and changes global climate systems.



How do scientists make climate predictions?

Global climate models or GCMs are computer simulations of the global climate system. Research labs all around the world run global climate simulations to see how the future climate might change under different conditions.

For example, GCMs can assume high or low greenhouse gas emissions, and high or low global population growth. GCMs can be compared to historical records to see how accurate they are. Scientists often use sets of GCMs to see a range of different future climate projections. The simulations are usually averaged across 30 years. Common time periods for future projections are the 2020s, the 2050s, and the 2080s.

GCM projections tend to be more accurate for temperature than for precipitation, which is harder to model. For example, GCMs are under-predicting rainfall and snowfall in the NWT, compared to actual observations (see Library Corner and the DOT Highway 3 Vulnerability Assessment page 19).

Engineers use data from GCMs to help understand the future conditions that infrastructure will have to withstand.

Community adaptation planning can use climate projections from GCMs to help understand possible future climate conditions, while also making use of local knowledge about changes that people are already experiencing and how they are adapting.

Permafrost research

Warm and cold permafrost are affected differently by surface temperature changes. Surface temperatures can change when the land is disturbed due to forest / plant removal or climate change.

Warm permafrost is permafrost between -4°C and 0°C. In warm permafrost, extra surface heat melts the upper ice instead of increasing the temperature of the permafrost. This is because it takes a lot of heat to change ice to water, so the energy is going into the melting process, while the actual temperature of the ice stays the same.

This matters because changes in warm permafrost may be hard to measure. At the same time, the changes can be hazardous since they affect the strength of the ground. Even as the strength in the warm permafrost is going down because the ice is melting, the temperature of warm permafrost may not be changing much.

Frozen soils lose strength as they warm, and ice loses all its strength when it thaws.

For more information on permafrost and its responses to site disturbance and climate change, see the Library Corner resources, and S. Smit, *Trends in permafrost conditions and ecology in northern Canada*, 2010.

Glossary: The Mackenzie Valley Environmental Impact Review Board has provided translations of a number of key terms. Some of them are relevant to climate change adaptation planning.

Adaptive Management
Always looking for better ways to work

K'étl'a ts'ęn asıé k 'aneta edǫ́ nalyé dé xą
(Chipewyan)

Nıts'oo gwıtr'ıt gwaatsıı ejuk natr'ıgwą̀htsıh
(Fort Macpherson)

Ahsíı héghǫts'eda
(South Slavey)

Nààwo gèèhdza hagèèta
(Tlicho)

Gots'ę́ʔǫ́né gonezǫ asíı̨ goghálageda gha goka kenı̨wę (Délıne)
Gots'éhʔǫ́ne gonezǫ́ t'áhsı̨ goghálakeyúda gokakədáʔı̨
(Fort Good Hope)

Source: www.reviewboard.ca/reference_material/aboriginal_language_glossary.php

One of NWTAC's Smart Management Practices

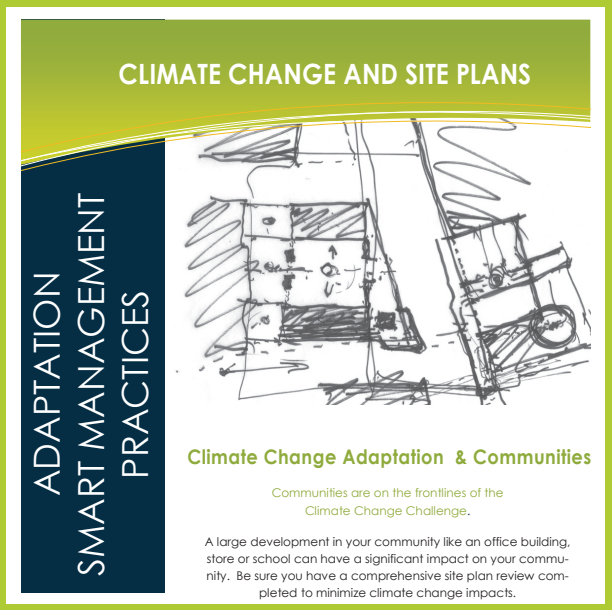
Climate Change and Site Plans

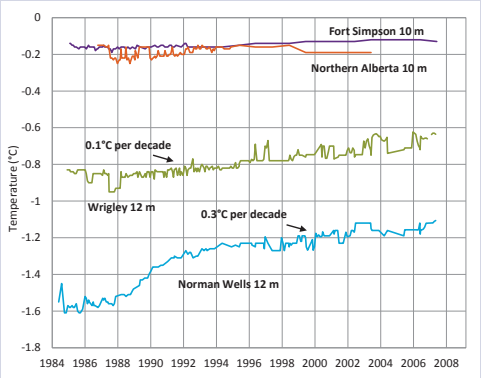
Do you do comprehensive site plan reviews for large building projects in your community, such as schools or stores? Large developments in your community can have significant impacts. Site characteristics such as vegetation, snow cover and drainage affect ground surface temperatures, which can affect permafrost.

Building and site plan designers should consider how the building and construction practices affect site drainage, snow storage, and grading. Site preparation and building siting and foundation type should consider potential impacts on permafrost, and climate change impacts.

The NWTAC has information to help you get started in their Climate Change and Site Plans Adaptation Smart Management Practices guide.

Contact Sara Brown, sara@nwtac.com, for more information.





The graph above shows temperature changes in permafrost between 1984 and 2007, at depths near 10 meters.

While the temperature has been warming at Wrigley (blue) and Norman Wells (green), it has stayed about the same at Fort Simpson (purple). This is probably because the surface heat is melting the permafrost, rather than raising the temperature.

From: S. Smit, *Trends in Permafrost Conditions*, 2010, 7.

IK-ADAPT: a new northern research project is launched

The Inuit Traditional Knowledge for Adapting to the Health Effects of Climate Change project (IK-ADAPT) was launched in May 2012 by researchers at McGill University, the University of Guelph, Trent University, Mount Allison University, and the Institute for Circumpolar Health.

This research project is working in partnership with six arctic communities, including Ulukhaktok in the NWT. Working closely with Inuit across Canada, the project wants to see how Inuit traditional knowledge can help communities adapt to the health effects of climate change.

Two researchers spent several weeks this summer in Ulukhaktok to set community research priorities and discuss how the research can benefit the community.

The work may use social media and video to communicate across generations and across communities. It is hoped that lessons learned about how to integrate traditional knowledge into adaptation planning can be shared with other communities to strengthen community adaptation across the north.

For more information, contact the coordinator Dr. Ashlee Cunsolo Willox, ashlee.cunsolo@mail.mcgill.ca or visit www.ikadapt.ca.

Photo 1-6. Elevated road surface on Highway 3. The tipped delineator (white and black marker) shows where the ground has moved and where the original surface was. Note that a 6:1 (less steep than shown here) side slope flattening close to water bodies is now recommended. NWT Department of Transportation, *Highway 3 - Climate Change Vulnerability Assessment Final Report, Appendix B, 2011.*

Library Corner: The latest in climate science and adaptation reports

NWTAC Permafrost video – a resource explaining permafrost zones in the NWT, potential climate change impacts, various building foundations and how to maintain them to protect the permafrost and prevent damage to buildings.

The Department of Transportation's Highway 3 - Climate Change Vulnerability Assessment (2011) has information on permafrost and climate change, particularly as it relates to road infrastructure. The report follows the climate change adaptation protocol developed by Engineers Canada.

The Canadian Standards Association has a guide to designing and building foundations. The Technical guide: Infrastructure in permafrost: A guideline for climate change adaptation is available for a fee - a draft is also online.

A new documentary on glaciers and northern ice loss, Chasing Ice, was released this fall. It follows National Geographic photographer James Balog in his quest to photograph changing ice conditions under climate change. The film has been nominated for an Oscar.

The Insurance Bureau of Canada has released Telling the Weather Story, a report about how weather patterns have changed in the past and how they are expected to change in the future. Wildfires in the NWT could increase by as much as 46% by the 2030's.