A Stocktake of the Global Permafrost Region

PERMAFROST PATHWAYS

Indigenous-led adaptation to thawing ground

Today, communities across high-latitude and high-altitude regions are facing climate change-induced hazards due to thawing permafrost.

Thawing permafrost is a slow onset event that destabilises the ground, causing landslides, slumps or subsidence. Globally, up to 50% of critical high-latitude and high-altitude infrastructure will be at high risk due to permafrost thaw by 2050, with associated costs expected to reach tens of billions of US dollars. Permafrost thaw also imposes non-economic costs on communities, including disrupted freshwater access and reduced hunting and fishing access, with implications for community health and food security.

In the absence of national or international adaptation strategies or support to address permafrost thaw, local and Indigenous communities are identifying, leading, and seeking support for adaptation actions. Such actions are frequently underpinned by community and Indigenous-led monitoring and observation, which often also provides the only on-the-ground record of thaw impacts in remote communities.

Community and Indigenous-led monitoring and observation informs effective adaptation and should be supported within national adaptation planning.

Adaptation and loss and damage funds should provide direct access to Indigenous Peoples, in addition to national governments.

The expertise of local and Indigenous communities is a vital source of ‘best available science’, and must be afforded a strong voice in any GST outcome.

MONITORING PERMAFROST THAW IMPACTS ON WATER QUALITY

In 2022 the Alaska Native village of Nunapicuaq started a water sampling campaign to assess water quality that may be impacted by runoff from a garbage dump on land compromised by permafrost thaw.

Pictured: Sue Natali, Permafrost Pathways Project Lead, and Morris Alexie, Permafrost Pathways tribal liaison for Nunapicuaq, in Nunapicuaq, Alaska. Photo: Rachael Treharne.

MONITORING WARMING PERMAFROST

In 2022 the Alaska Native village of Kuigilnguq set up permafrost temperature monitoring.

Pictured: Boardwalk affected by permafrost thaw and subsidence in the Alaska Native village of Kuigilnguq. Photo: Sue Natali

Counting permafrost emissions

Permafrost thaw releases carbon dioxide and methane into the atmosphere. Between 24% and 69% (likely range) of near-surface permafrost is projected to thaw this century, adding as much as or more than 0.3°C to global mean temperature this century, and accelerating the impacts of climate change worldwide.

Despite scientific consensus that permafrost thaw will become a major emissions source over the next few decades, these emissions are incompletely or not all captured by global climate models, and are not currently reported in any National GHG Inventory.

This means that expected emissions from permafrost thaw are not factored into the information provided by global models - or by national inventories - to assess and benchmark collective progress towards the Paris Agreement goals. Failure to account for these emissions confounds efforts to accurately assess progress towards the mitigation goals of the Paris Agreement.

More ‘permafrost enabled’ climate models are needed. To provide the necessary infrastructure and support to modelling centres would require substantial funding in the order of millions of US dollars per climate model.

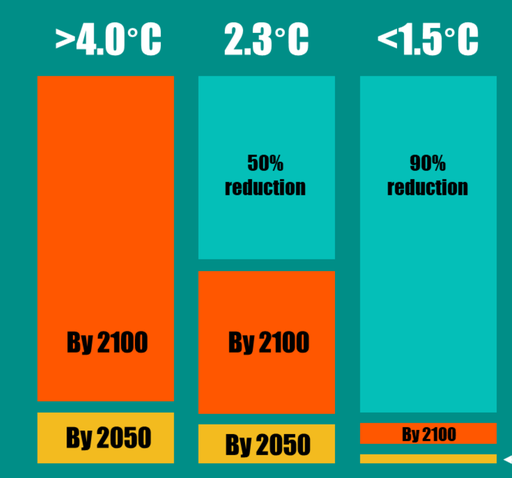
Improved ‘on the ground’ monitoring frameworks and enhanced support for community and Indigenous-led monitoring of permafrost thaw are needed to facilitate the inclusion of permafrost emissions in national GHG Inventories.

Avoiding permafrost emissions

GHG release following permafrost thaw is irreversible. However, the likely magnitude of those emissions can be substantially reduced through early, ambitious mitigation.

Keeping global average temperature increase within 1.5°C could avoid as much as 90% of the permafrost emissions expected by 2100 in a very high warming scenario – and could still avoid more than 85% of those expected in a 2.3°C world.

These potential avoided emissions are on the scale of a major global economy, and can only be avoided by limiting global mean temperature rise.



Conceptual figure guided by model output from OSCAR v.3 (Gasser et al., 2018) & from models reported in Turetsky et al., 2020

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GLOBAL PERMAFROST EXTENT

The shaded area shows the current extent of permafrost. Scan the QR code to see how much permafrost is expected to remain this century under different warming scenarios.