

# A Stocktake of the Global Permafrost Region

# PERMAFROST PATHWAYS

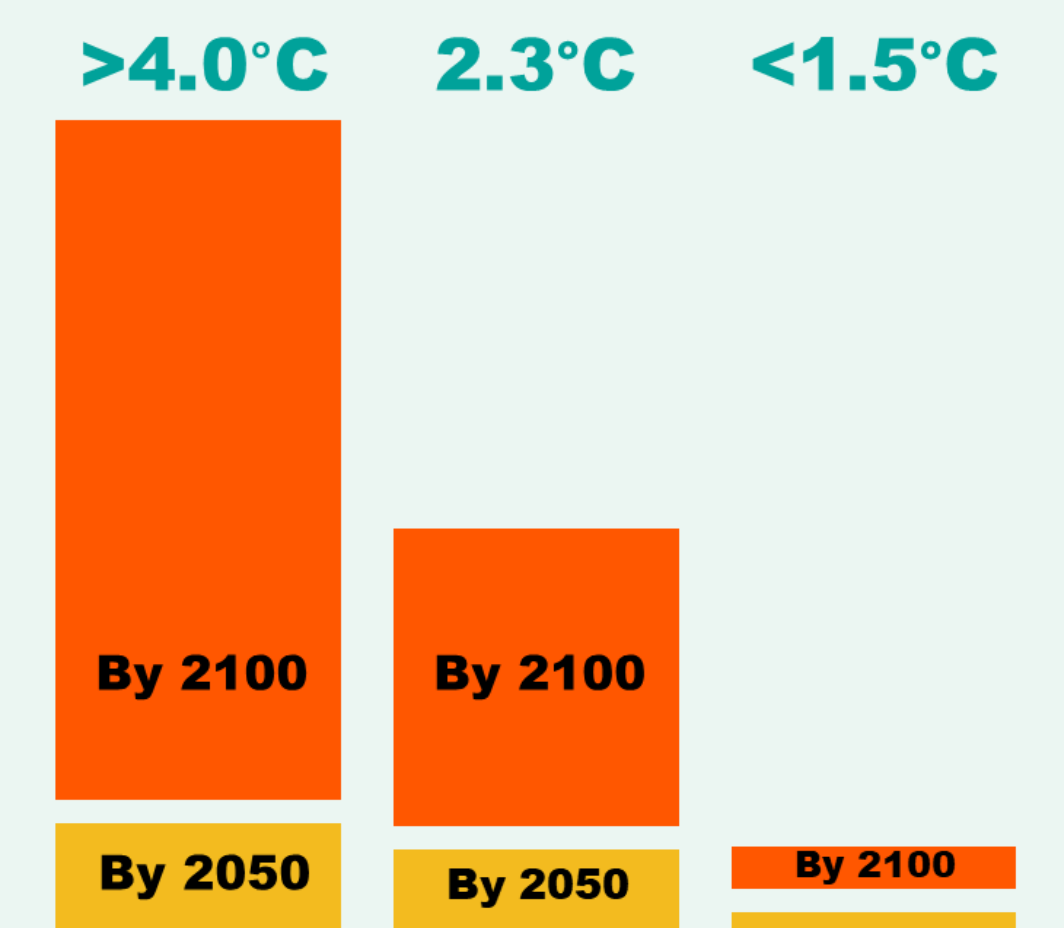
## A GHG emissions accounting gap:

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.

Future permafrost emissions depend on mitigation effort



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

## Closing the gap:

Ensuring permafrost emissions are accounted for in assessments of collective progress towards the Paris Agreement goals requires increased capacity for monitoring of permafrost thaw and the resulting emissions, and for the development of global-scale models.



### Community-led monitoring

In remote permafrost regions, community and Indigenous-led monitoring and observation often provides the only on-the-ground record of thaw impacts.

Enhanced support for community and Indigenous-led monitoring of permafrost thaw would help facilitate accurate reporting of permafrost emissions. Community and Indigenous-led monitoring is also critical to informing effective adaptation to thawing ground (see below), and should be supported through national adaptation planning.



### 'Permafrost enabled' climate models

Global-scale models provide the future climate projections against which mitigation progress is benchmarked – but few include permafrost carbon.

In addition to further development of existing climate models that have permafrost carbon enabled, we need more climate models that include processes relevant for permafrost carbon cycling.

Providing the necessary infrastructure and support to modelling centres would require substantial funding in the order of millions of US dollars per climate model.



#### MONITORING PERMAFROST THAW IMPACTS ON WATER QUALITY

In 2019 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.

## Why is the permafrost region important to the Global Stocktake?

Ambitious, near-term mitigation can substantially reduce the magnitude of permafrost emissions over the next few decades – adding weight to the central importance of the 1.5°C goal, and to the need for a course-correction in global mitigation effort. At the same time, communities across high-latitude and high-altitude regions are already facing climate change-induced hazards due to thawing permafrost.

Permafrost thaw 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. The GST should afford a strong voice to these communities, and highlight the need for national support.

#### MONITORING CHANGE ON UNSTABLE GROUND

Boardwalk affected by permafrost thaw and subsidence in the Alaska Native village of Kuigilnguq.

In 2022 Kuigilnguq set up permafrost temperature monitoring to track the rate of change.

Photo: Sue Natali



#### 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.



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