

Submission to the First Input Phase of the Global Stocktake Permafrost Pathways at Woodwell Climate Research Center March 2023

Permafrost Pathways¹ continues to recognize the importance of the Global Stocktake (GST) as a pivotal process for critically assessing implementation of the Paris Agreement. As the only accountability mechanism of the Paris Agreement, the GST presents an unparalleled opportunity to ensure meaningful consideration of the “best available science” as well as the knowledge experiences of those living on the front lines of the climate crisis, particularly Indigenous Peoples and local communities of the circumpolar Arctic. Previous submissions by Woodwell Climate Research Center to the GST highlighted the need to include estimated permafrost emissions as part of the GST process,² and conveyed the devastating cultural, social and economic consequences of permafrost thaw and other adverse effects of climate change in the Arctic.³ The present submission continues on this theme of leveraging the GST as a vehicle for identifying (and ultimately addressing) implementation gaps of the Paris Agreement.

Assessing collective progress towards the Paris Agreement mitigation goals requires consideration of the permafrost carbon feedback.

Robust quantification of net global greenhouse gas (GHG) emissions is needed to assess progress towards the mitigation goals of the Paris Agreement. Likewise, robust estimates of the remaining carbon budgets associated with those goals are needed in order to benchmark that progress.

Permafrost and wildfire in National GHG Inventories.

IPCC guidelines allow nations to report as anthropogenic all carbon fluxes from land designated as ‘managed’, whether those carbon fluxes are a direct or indirect result of human activity, or of a natural process. This focus on “managed lands” appropriately reflects the importance of accounting for, and ultimately mitigating, anthropogenic sources of emissions and recognizes that national policy measures are well-positioned to regulate and reduce such sources. However, current National Greenhouse Gas Inventories (NGHGs) reveal a risk of this “managed” land delineation: current reporting is underrepresenting or entirely excluding important land-based processes that contribute

¹Permafrost Pathways is a collaborative effort from Woodwell Climate Research Center, the Arctic Initiative at Harvard Kennedy School, the Alaska Institute for Justice, and the Alaska Native Science Commission that is intended to inform and develop adaptation and mitigation strategies to address permafrost thaw. The project aims to engage a diverse and extensive network of scientists, Indigenous knowledge holders, policymakers and practitioners with combined expertise in climate science, policy action, and environmental justice to advance equitable adaptation plans that respect and protect the health, well-being, and human rights of Arctic residents. PERMAFROST PATHWAYS, <https://permafrost.woodwellclimate.org/> (last updated February 2023).

² See February 2022 Submission from Stockholm University, Sweden, entitled “Global Stocktake Submission: ‘Country’ of Permafrost” supported by Woodwell Climate Research Center, the International Cryosphere Climate Initiative, the Bolin Centre for Climate Research, and the Permafrost Carbon Network.

³ See August 2022 Submission from Permafrost Pathways.

to GHG emissions, such as permafrost thaw, and the interaction of permafrost thaw with wildfire at high latitudes.

- Emissions resulting from permafrost thaw are not reported in any NGHGI, either on managed or unmanaged land. While at a global level current emissions from permafrost are likely to be comparatively small, there is scientific consensus that permafrost thaw will become a major emissions source rivaling a medium-to-large developed economy over the next few decades.
- Where wildfire emissions are reported, this occurs only where wildfire burns on land designated as “managed.” Further, reported wildfire emissions may omit CO₂, and/or emissions from the combustion of below-ground material, which at high latitudes often accounts for a majority of total emissions. Emissions associated with longer-term consequences of wildfire, such as enhanced heterotrophic respiration in burned areas, are also not reported.

The significance of these processes to the rate of future climate change is noted in the Special Report on the Ocean and Cryosphere in a Changing Climate.⁴ Failure to accurately quantify these emissions confounds efforts to accurately assess progress towards the mitigation goals of the Paris Agreement.

Permafrost and wildfire in global climate models.

Global models provide mitigation pathways and carbon budgets against which the efficacy of mitigation action can be assessed. However, only a small percentage of global models include permafrost carbon dynamics. Those that do account for such dynamics, only include gradual permafrost thaw, thereby excluding critically important processes such as abrupt thaw and wildfire-permafrost interactions.

In the IPCC 6th Assessment Report², a simplified, post hoc approach was used to account for some permafrost emissions in the reported remaining carbon budgets. While this is a useful step forward, this approach—and its assumption of a linear relationship between global average temperature increase and gradual permafrost thaw emissions—may be too conservative and does not account for other processes such as abrupt thaw.

The outcome of the GST should recognise the ongoing need for investment in global modeling frameworks, including with the aim of comprehensively integrating the permafrost thaw feedback. It should also encourage Parties to improve upon IPCC guidance regarding their mitigation responsibilities, in recognition of the clear scientific consensus regarding the direction of this and other feedbacks that are omitted or not completely represented in global models.

⁴ Meredith, M., M. Sommerkorn, S. Cassotta, C. Derksen, A. Ekaykin, A. Hollowed, G. Kofinas, A. Mackintosh, J. Melbourne-Thomas, M.M.C. Muelbert, G. Ottersen, H. Pritchard, and E.A.G. Schuur, 2019: *Polar Regions. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegria, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 203–320. <https://doi.org/10.1017/9781009157964.005>.

Permafrost thaw and wildfire are examples of ‘second order’ emissions sources - *i.e.*, emissions that result from cumulative anthropogenic climate change, rather than from direct human activity.

Climate change has already substantially altered the functioning of natural and semi-natural (nominally unmanaged) ecosystems worldwide. In many cases this altered functioning is driving emissions well beyond those associated with historical disturbance regimes. As climate change progresses, “second order” emissions will have an increasingly significant impact on future climate and on the efficacy of mitigation efforts and contribute to a widening gap between emissions that are reported, and those that are actually released.

Unlike emissions that are directly attributed to discrete human activities, second-order emissions are not easily traced back to a particular jurisdiction, so defining parameters for reporting on these emissions requires careful consideration.

In the immediate, Parties should recognize the need to define and account for second order emissions as part of accelerated mitigation efforts. Looking forward, Parties should establish effective and transparent means of more completely and accurately tracking and reporting emissions from permafrost thaw, wildfire, and other second order processes.

Recommendations:

Given the issues set forth above, the outcome of the GST should:

- Acknowledge the limitations in current reporting of emissions from permafrost and wildfire (as communicated through NGHGs) and the implications for accurately measuring and benchmarking progress towards the Paris Agreement goals.
- Support Parties’ efforts to improve upon IPCC guidance regarding required mitigation efforts, in recognition of the clear scientific consensus that certain carbon feedbacks are omitted or not completely represented in global models.
- Recognize the importance of accounting for second order emissions sources, including permafrost thaw and wildfire, that are omitted or incompletely reported in NGHGs, and indicate how systematic earth observations and other data products made available to the GST could be used to better quantify these emissions as part of future assessments.
- In recognition of the gaps in existing earth system monitoring and modeling frameworks, encourage Parties to leverage funding mechanisms to respond to the need for long-term ‘on the ground’ and satellite remote sensing monitoring and for ongoing model development.
- Consider approaches for addressing responsibility for second-order emissions within the context of historic contributions.