Reaching global warming targets under ice-free Arctic summers requires zero emissions by 2045

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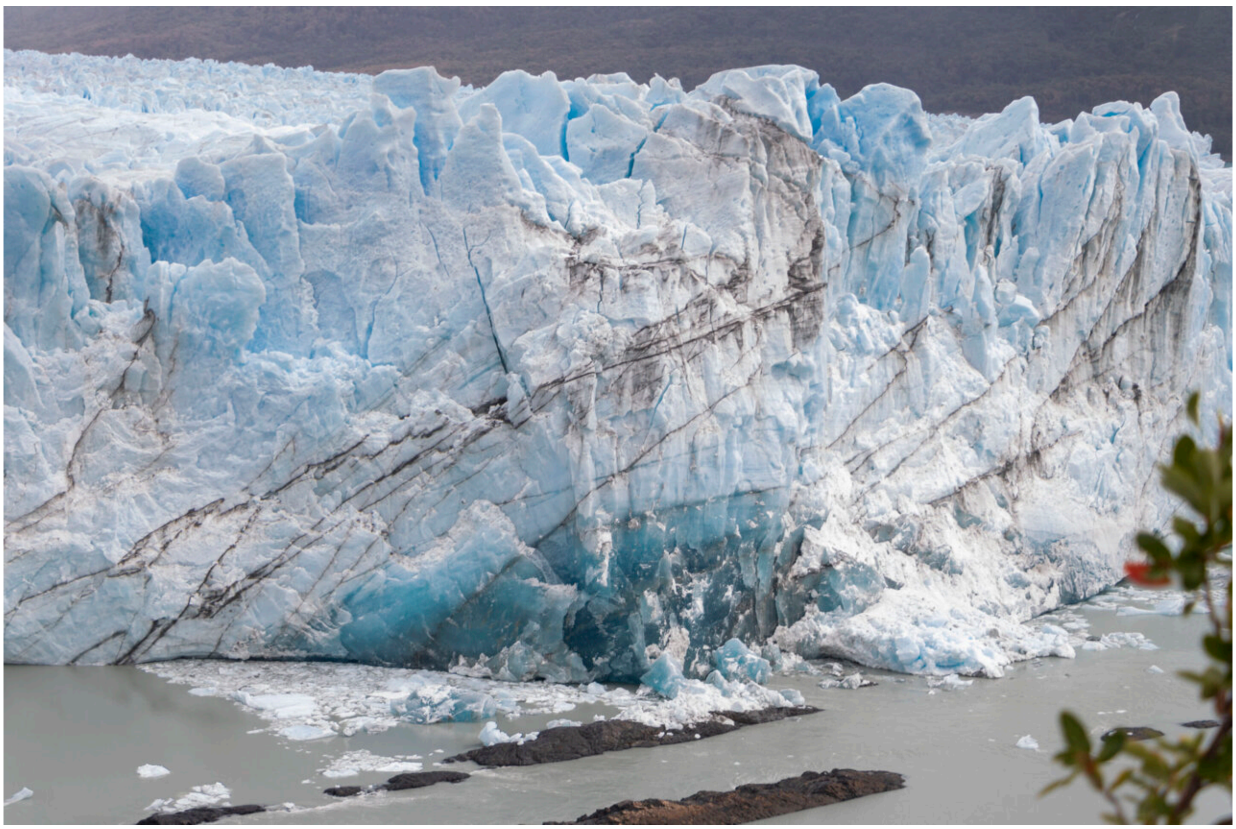

Credit: Bren Pintelos from Pexels

Ice-albedo feedback as a result of sea-ice melting, notably in the Arctic, is known to reinforce global warming. What is less known, however, is the impact of a no-summer ice scenario on the world's ambition to maintain global warming below 2°C by 2100. A study conducted under the TRANSRISK project paints a rather dark picture, highlighting the need to better understand the impact of rapid climate change in the region.

'More stringent mitigation efforts globally.' This is what researchers of the Basque Centre for Climate Change (BC3) have come to recommend after studying the potential consequences of an Arctic ice-free month of September 2050 - something doomed to happen according to the IPCC's Fifth Assessment Report.

Whilst in line with the growing number of pessimistic studies on the pace and impact of climate change, the new study takes a new approach, highlighting the remaining gap in our understanding of the Arctic's role in the regulation of Earth's temperature. It considers the implications of climate change mitigation to below-2°C levels in the presence of the SIAF - a process that sees sea-ice melting, resulting in more open water being exposed to solar radiation, absorbing more energy and generating a self-reinforcing warming mechanism.

Although important, this feedback process is currently not incorporated into integrated assessment models. This led the TRANSRISK team to study the consequences of a sea-ice-free month of September 2050 and, in light of the current debate about a potential recovery of Arctic sea ice in a low-carbon scenario, they decided to consider three potential trajectories following this no-ice scenario: partial recovery, stabilization, and continued loss of sea ice.

'The sooner the sea-ice-free condition occurs, the more difficult it will be to control climate change, especially if sea-ice recovery does not occur,' the study reads. 'Emissions reductions should increase significantly compared to current mitigation scenarios that do not include Arctic sea-ice loss.'

The team highlights measures that should be taken, notably a quicker replacement of existing energy infrastructures and earlier adoption of policy instruments that could make such improvements feasible. All in all, the studied scenario shows that the only way to achieve the 1.5°C target in the presence of SIAF would be through negative emissions, which means that the implications of considering Arctic sea-ice-free conditions for the transformation of the global energy system are 'severe.'

'We find that global CO2 emissions would need to reach zero levels 5–15 years earlier and that the carbon budget would need to be reduced by 20%–51% to offset this additional source of warming,' the study concludes. 'The extra mitigation effort would imply an 18%–59% higher mitigation cost to society. Our results also show that to achieve the 1.5°C target in the presence of ice-free summers negative emissions would be needed.'

The team also insists that future research should focus on more precise scenarios of sea-ice loss derived directly from physical models. Indeed, SIAF is not the only feedback process that had yet to be considered.

More information: Project website: transrisk-project.eu/

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