Snow, Water, Ice and Permafrost in the Arctic, 2017

The Paris Agreement's Impact on Arctic Change

In December 2015, at the 21st Conference of Parties to the United Nations Framework Convention on Climate Change, 195 countries adopted the Paris Agreement. The Agreement commits parties to limit the increase in global average temperature this century to less than 2°C above pre-industrial levels. It also commits them to pursue efforts to reduce the temperature increase further, to 1.5°C.

SWIPA 2017 included an analysis to determine how the Arctic would be affected if the world were to come close to achieving the Paris Agreement's 2°C goal, using an existing scenario developed for the Intergovernmental Panel on Climate Change that results in a projected global average warming of 2.4°C by 2100, and comparing it with a business-as-usual scenario. Its key findings include:

1. Stabilizing the increase in global average temperature at around 2°C by 2100 would strongly reduce future changes in the Arctic compared with a business-as-usual scenario, but would still result in substantial changes to the Arctic environment and would not stabilize the loss of Arctic glaciers, ice sheets, and ice caps.

2. The changes in climate projected between now and mid-century are effectively locked into the climate system by the effects of past and current greenhouse gas emissions. The effects of emissions reductions would therefore not become apparent until after mid-century.

About SWIPA 2017

The Arctic Monitoring and Assessment Programme's Snow, Water, Ice and Permafrost in the Arctic (SWIPA) assessment focuses on changes to the Arctic cryosphere (the portion of the Arctic land and water that is seasonally or perennially frozen), and the implications of those changes. The second SWIPA assessment, which covers the period 2011–2015, with some updates to include observations from 2016 and early 2017, was published in 2017. This fact sheet reports on 2017's findings related to recent observed changes in the Arctic. For more information, see the chapters referenced in the fact sheet.

Photo credit: David Barber

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3. The changes in the Arctic projected over the course of this century, even assuming the Paris Agreement goal is reached, would have wide-ranging impacts outside the Arctic, including increases in sea level, and possibly changes in mid-latitude storm tracks and weather patterns, and increases in greenhouse gas emissions from stored carbon in permafrost soils.

A global average warming of 2°C by 2100 would translate to an increase in annual average temperature of 4°C for the Arctic, due to powerful feedback mechanisms in the Arctic environment. The increase is projected to be even higher (around 6°C) during the winter months, and could reach 4°C as early as mid-century. Because snow, ice, and permafrost are very sensitive to increases in temperature, a warming of this magnitude would have major consequences.

Implications for Policy and Scientific Research

Based on the key findings described above, there is a clear need for action in three areas:

Greenhouse Gas Mitigation

Aggressive reductions in net greenhouse gas emissions, much beyond those in current nationally determined contributions under the Paris Agreement, are needed to stabilize changes in the Arctic (and their associated global impacts) by the end of the century.

Adaptation to Climate Change

There is an urgent need for adaptation by communities in the Arctic and a longer-term need for adaptation by low-lying coastal communities worldwide. Arctic communities are already facing the need to adapt, and this need will only increase in the future.

A multipoint structural foundation used to maintain stability of buildings on thawing permafrost, Newtok, Alaska. Credit: Alaska Department of Military and Veterans' Affairs

Improving Scientific Understanding

While the findings reported in SWIPA 2017 reflect many advances in the understanding of climate change in the Arctic, important knowledge gaps remain. Filling these gaps will help inform adaptation efforts, and contribute to a better understanding of how changes in the Arctic affect climate and weather outside of the Arctic region.

Areas of focus for future research include:

- Determining which feedbacks involving the Arctic cryosphere contribute most to rapid Arctic warming.
- Improving the understanding of how different elements of the Arctic environment interact with each other.
- Improving Arctic climate observing systems and coordination among monitoring efforts.
- Improving the understanding of the connections between changes in the Arctic and changes in mid-latitude weather, changes in ocean circulation, and other impacts that reach beyond the Arctic region.

Photo credit: Søren Rysgaard