IEAGHG Information Paper 2016-IP49; Artic Warming Predicted to Have Catastrophic Consequences Around the Globe

A new report by scientists from Stockholm Environment Institute and Stockholm Resilience Centre for the Artic Council[1] has just been released. The Arctic Resilience Report (see https://www.sei-international.org/publications?pid=3047) has found that the effects of Arctic warming could be felt as far away as the Indian Ocean, and warns that the changes in the region could cause uncontrollable climate change at a global level.

Temperatures in the Arctic are currently about 20^0C above what would be expected for the time of year, referred to as "off the charts". Also that sea ice is at the lowest extent ever recorded for the time of year.

One concern highlighted by the report is that the developments above make the potential for triggering "tipping points" and "feedback loops" much larger."

Climate tipping points occur when a natural system, such as the polar ice cap, undergoes sudden or overwhelming change that has a profound effect on surrounding ecosystems, these changes the report says are often irreversible.

In the Arctic, the tipping points identified in the report include:

- growth in vegetation on tundra, which replaces reflective snow and ice with darker vegetation, thus absorbing more heat;
- higher releases of methane, from the tundra as it warms;
- shifts in snow distribution that warm the ocean, resulting in altered climate patterns as far away as Asia, where the monsoon could be effected;
- and the collapse of some key Arctic fisheries, with knock-on effects on ocean ecosystems around the globe.

Scientists, it seems, have speculated for some years that so-called feedback mechanisms – by which the warming of one area or type of landscape has knock-on effects for whole ecosystems – could suddenly take hold and change the dynamics of Arctic ice melting from a relatively slow to a fast-moving phenomenon with unpredictable and potentially irreversible consequences for global warming. For instance, when sea ice shrinks it leaves areas of dark ocean that absorb more heat than the reflective ice, which in turn causes further shrinkage, and so on in a spiral.

The Arctic ice cap helps to cool sea and air temperatures, by reflecting much of the sun's radiation back into space, and acting as a global cooler when winds and ocean currents swirl over and under it. It has long been known to play a key part of the global climate system, but the difficulty and expense of close monitoring have meant that scientists have only in recent years been able to make detailed assessments.

[1] The Arctic Council is the leading intergovernmental forum promoting cooperation, coordination and interaction among the Arctic States, Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, on issues of sustainable development and environmental protection in the Arctic. See: http://www.arctic-council.org/index.php/en/about-us

The authors claim that:

"*The potential effects of Arctic regime shifts [or tipping points] on the rest of the world are substantial, yet poorly understood. Human-driven climate change greatly increases the risk of Arctic regime shifts, so reducing global greenhouse gas emissions is crucial to reducing this risk.*"

They also warn that that people living in and near the Arctic would be badly affected, and called for communities to be provided with equipment and skills to survive. They took evidence from a variety of settlements in the region, finding many signs of stark changes already under way.

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