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Is the World in a State of Climate Change Planetary Emergency?

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Leading climate change experts have made public statements that the world is beyond dangerous interference with the climate system (John Holdren 2006), committed to a warming of 3-5ºC (Robert Watson 2012), facing a risk of global climate catastrophe (John Holdren 2006), and in a state of planetary emergency (James Hansen 2008, 2012), but these conclusions are not informing climate change policy.

The evidence for these statements is examined and presented in this paper. The main parameters considered are world food security and Arctic carbon feedback "runaway" or rapid global warming. These are both theoretical causes of a planetary climate change emergency that have not received the attention of the loss of planetary land ice sheets and sea level rise.

The overriding reason for the emergency presented here is global climate change commitment – at today’s warming of 0.8C we are committed to more than double today’s warming in the future (more warming is ‘in the pipe’ as James Hansen has been warning for many years.

2012 was a record year for Arctic albedo loss, which amplifies Arctic warming and drives Arctic methane feedback emissions. Since 2007, atmospheric methane is on a renewed, sustained increase- due to planetary feedback source emissions. All potentially large positive (i.e. amplifying) Arctic feedbacks are operant.

These include albedo loss from disappearing snow and summer sea ice; methane released from peat rich wetlands, thawing permafrost and sea floor methane hydrates; and also carbon dioxide and nitrous oxide from thawing permafrost.

Increasing extreme weather events have caused regional crop productivity losses on many continents since 2000, and has been linked to global warming.

The loss of Arctic albedo might be driving extreme heat and drought in the northern hemisphere.

Using a novel policy relevant summation approach of all minimum unavoidable sources of warming due to climate system science, it is estimated the committed unavoidable warming is more than 3ºC by 2100.

However commitments due to economic, energy and climate policy and agreements are far higher than the climate science commitments.

What are the implications of these future commitments for world food security and the risk of runaway climate change?

The paper considers how these commitments and the policy-relevant research findings can inform policy making with respect to an appropriate science-based mitigation response.

**Climate change commitments due to policy**

The International Energy Agency has been warning since 2008 that the current global energy mix and economy is on track for a warming of 6°C by 2100. That is an eventual equilibrium commitment of more than 11°C.

Today the formal national pledges for emissions reductions filed with the UN, combined, commit humanity to a warming of 4.4°C (Climate Interactive) by 2100, which is a full equilibrium warming commitment of more than 8°C eventually after 2100, and there are no plans or initiatives to change this.

**The minimum unavoidable global warming sources additional to today’s global average warming from preindustrial of 0.8°C.**

**1. Ocean heat lag climate system inertia**

This about doubles the realized or transient warming (at the time of atmospheric GHG stabilization making another 0.8°C

**2. Fastest time to stabilize atmospheric greenhouse gases**

The fastest time contemplated is 20 years while the best case IPCC scenario RCP-3 PD is 50 years, so we allow an optimistic 0.4°C (excluding CO2 drawdown).

**3. Aerosol (fossil fuel air pollution) deferred warming – unmasking.**

This may be 0.8°C (IPCC AR4) but we use the IPCC’s 0.4°C.

**4. Carbon feedbacks**

 A warming of 2.4°C (summation of above) from the IPCC AR$ WG1 fig 10.20 (excludes Arctic carbon) leads to a feedback warming of 0.8°C

**Simple summation of commitment is 3.2°C.**

**The implications of committed warming to climate feedbacks**

Right now at 0.8°C all sources of Arctic albedo cooling (Far North snow, Greenland ice sheet surface and Arctic sea ice extent) are rapidly losing albedo due to snow and ice melting caused by rapid Arctic warming ( three times global average). Loss of Arctic albedo is a very large positive feedback.

Only terrestrial carbon feedbacks are included in model projections of warming (not the large feedbacks from peatlands or the Arctic.

All sources of Arctic methane are emitting more methane, and in addition methane is being emitted from new thermokarst lakes, from cracks in the sea ice, the open ocean and thinning edges of glaciers and permafrost. Carbon dioxide is being emitted from collapsing coastal permafrost. Nitrous oxide is being emitted from cryoperturbed permafrost.

According to IPCC models terrestrial carbon sink switches from sink to source at about 2.6°C.

The Arctic switches from sink to source by the 2020’s.

Huge Siberian permafrost is extensively thawed by 1.5°C or less. Arctic permafrost holds double all atmospheric carbon.

Sub sea floor Arctic methane hydrate according to models are destabilized at 1.5°C, but may be doing so now (East Siberian Arctic shelf and west of Svalbard Island). Arctic methane hydrate may hold more than all atmospheric carbon.

Atmospheric methane, having increased two and half times with industrialization, since 2007 (the first big drop in Arctic summer sea ice) methane has been a renewed sustained increase, but this is due to planetary feedback source methane emissions.

Clearly as in the 2009 UNEP Year Book "The potential for runaway greenhouse warming is real and has never been more clear".

**Committed warming and Arctic methane is a planetary emergency**

**Northern hemisphere food productivity.**

The Northern hemisphere (NH) is the location of the world best food producing regions. Any compromise to NH food productivity would be a global emergency.

Scientists call the arctic summer sea ice the ‘air-conditioner’ for the entire northern hemisphere. It is actually the spring to summertime arctic albedo cooling effect that is the air-conditioner for the entire Northern hemisphere. The cooling albedo comes from Far North snow cover, the Greenland ice sheet surface and the extent of the arctic summer sea ice. This is a vast region of white albedo. The area of the Arctic circle covers 15,000,000 or 40,000,000 sq km and 8% of Earth’s surface. In Spring to early summer the Arctic albedo area, with the extent of N hemisphere snow, is considerably larger.

Global warming, not surprisingly, is predicted to increase global and northern hemisphere extreme heat events increase global and NH regional drought. There has been an increase in drought that occurred late 1990s and early 2000s and another increase starting just a few years ago.

The loss of snow and ice Arctic cooling albedo can only increase the direct global warming caused NH heat and drought increase. Current research on the Arctic albedo loss and altered jet stream indicates this one way happening now.

Committed warming and Arctic albedo loss is a NH and world food productivity emergency