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# Assessing ‘‘Dangerous Climate Change’’: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature

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***Abstract:***

Abstract: We assess climate impacts of global warming using ongoing observations and paleoclimate data. We use Earth’s measured energy imbalance, paleoclimate data, and simple representations of the global carbon cycle and temperature to define emission reductions needed to stabilize climate and avoid potentially disastrous impacts on today’s young people, future generations, and nature. A cumulative industrial-era limit of ,500 GtC [*Giga ton of carbon]* fossil fuel emissions and 100 GtC storage in the biosphere and soil would keep climate close to the Holocene range to which humanity and other species are adapted. Cumulative emissions of ,1000 GtC, sometimes associated with $2^{o}$ C global warming, would spur ‘‘slow’’ feedbacks and eventual warming of 3–$4^{o}$ C with disastrous consequences. **Rapid emissions reduction is required to restore Earth’s energy balance and avoid ocean heat uptake that would practically guarantee irreversible effects. Continuation of high fossil fuel emissions, given current knowledge of the consequences, would be an act of extraordinary witting intergenerational injustice.** Responsible policymaking requires a rising price on carbon emissions that would preclude emissions from most remaining coal and unconventional fossil fuels and phase down emissions from conventional fossil fuels.

***Introduction (excerpt):***

Humans are now the main cause of changes of Earth's atmospheric composition and thus the drive for future climate change [1]. The principal climate forcing, defined as an imposed change of planetary energy balance [1–2], is increasing carbon dioxide (CO2) from fossil fuel emissions, much of which will remain in the atmosphere for millennia [1,3]. The climate response to this forcing and society's response to climate change are complicated by the system's inertia, mainly due to the ocean and the ice sheets on Greenland and Antarctica together with the long residence time of fossil fuel carbon in the climate system. The inertia causes climate to appear to respond slowly to this human made forcing, but further long-lasting responses can be locked in.

***Human caused atmospheric changes (excerpt):***

Today, however, CO2 is under the control of humans as fossil fuel emissions overwhelm natural changes. Atmospheric CO2 has increased rapidly to a level not seen for at least 3 million years [56,63]. Global warming induced by increasing CO2 will cause ice to melt and hence sea level to rise as the global volume of ice moves toward the quasi-equilibrium amount that exists for a given global temperature [53]. As ice melts and ice area decreases, the albedo [*i.e. reduced solar reflectivity*] feedback will amplify global warming.

***Impacts on humans (excerpt):***

Impacts of climate change cause widespread harm to human health, with children often suffering the most. Food shortages, polluted air, contaminated or scarce supplies of water, an expanding area of vectors causing infectious diseases, and more intensely allergenic plants are among the harmful impacts. More extreme weather events cause physical and psychological harm. World health experts have concluded with ''very high confidence'' that climate change already contributes to the global burden of disease and premature death [26].

IPCC [*Intergovernmental Panel on Climate Change*] projects the following trends, if global warming continue to increase, where only trends assigned very high confidence or high confidence are included:

(i) increased malnutrition and consequent disorders, including those related to child growth and development,

(ii) increased death, disease and injuries from heat waves, floods, storms, fires and droughts,

(iii) increased cardio-respiratory morbidity and mortality associated with ground-level ozone.

While IPCC also projects fewer deaths from cold, this positive effect is far outweighed by the negative ones.

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*See the full report at:*
*http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0081648*