

Is There Still Time to Avoid 'Dangerous Anthropogenic Interference' with Global Climate?*

A Tribute to Charles David Keeling

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David Keeling altered our perspectives about global change with his painstaking observations of atmospheric carbon dioxide. The now famous 'Keeling curve', measuring both the pulse of Nature and a steadily rising human impact on atmospheric composition, is invariably hailed as our most rigorous and fundamental measure of global change. Carbon dioxide is joined by other key metrics that help define the causes and consequences of global climate change. The Earth's history provides our best indication of the levels of change that are likely to have deleterious effects on humans and wildlife, and constitute "dangerous anthropogenic interference" with nature.

The Earth's temperature, with rapid global warming over the past 30 years, is now passing through the peak level of the Holocene, a period of relatively stable climate that has existed for more than 10,000 years. Further warming of more than 1°C will make the Earth warmer than it has been in a million years. "Business-as-usual" scenarios, with fossil fuel CO₂ emissions continuing to increase ~2%/year as in the past decade, yield additional warming of 2 or 3°C this century and imply changes that constitute practically a different planet.

I present multiple lines of evidence indicating that the Earth's climate is nearing, but has not passed, a tipping point, beyond which it will be impossible to avoid climate change with far ranging undesirable consequences. The changes include not only loss of the Arctic as we know it, with all that implies for wildlife and indigenous peoples, but losses on a much vaster scale due to worldwide rising seas. Sea level will increase slowly at first, as losses at the fringes of Greenland and Antarctica due to accelerating ice streams are nearly balanced by increased snowfall and ice sheet thickening in the ice sheet interiors. But as Greenland and West Antarctic ice is softened and lubricated by melt-water and as buttressing ice shelves disappear due to a warming ocean, the balance will tip toward ice loss, thus bringing multiple positive feedbacks into play and causing rapid ice sheet disintegration. The Earth's history suggests that with warming of 2-3°C the new equilibrium sea level will include not only most of the ice from Greenland and West Antarctica, but a portion of East Antarctica, raising sea level of the order of 25 meters (80 feet).

Contrary to lethargic ice sheet models, real world data suggest substantial ice sheet and sea level change in centuries, not millennia. The century time scale offers little consolation to coastal dwellers, because they will be faced with irregular incursions associated with storms and with continually rebuilding above a transient water level.

The grim "business-as usual" climate change is avoided in an alternative scenario in which growth of greenhouse gas emissions is slowed in the first quarter of this century, primarily via concerted improvements in energy efficiency and a parallel reduction of non-CO₂ climate forcings, and then reduced via advanced energy technologies that yield a cleaner atmosphere as well as a stable climate. The required actions make practical sense and have other benefits, but they will not happen without strong policy leadership and international cooperation. Action must be prompt, otherwise CO₂-producing infrastructure that may be built within a decade will make it impractical to keep further global warming under 1°C.

There is little merit in casting blame for inaction, unless it helps point toward a solution. It seems to me that special interests have been a roadblock wielding undue influence over policymakers. The special interests seek to maintain short-term profits with little regard to either the long-term impact on the planet that will be inherited by our children and grandchildren or the long-term economic well-being of our country.

The public, if well-informed, has the ability to override the influence of special interests, and the public has shown that they feel a stewardship toward the Earth and all of its inhabitants. Scientists can play a useful role if they help communicate the climate change story to the public in a credible understandable fashion.

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