The First Principles for Climatic Stabilization

Scientific Objectives for the Conference of the Parties to
The Framework Convention on Climate Change
Copenhagen, December, 2009

On the eve of the most important global conference on climate ever held, political and economic compromise has lost its connection to the biophysical requirements for success in deflecting the trends in climate.

The governments of essentially all the nations including the United States have ratified the 1992 Framework Convention on Climate Change. In ratification, those nations have agreed that the common welfare requires stabilization of the composition of the atmosphere with respect to heat-trapping gases at levels that will protect human interests and nature. There is now broad agreement in the scientific community, and a general understanding among the public, that the accumulation of heat-trapping gases has drifted above the levels at which serious deleterious effects are occurring globally. It is less clear to the public and to political leaders that the speed of the climatic disruption is accelerating. The causes are three-fold. First, emissions from fossil-fuel burning and land clearing are increasing. Second, the natural processes that soak up some of the anthropogenic emissions, such as oceanic sinks for CO_2, appear to be weakening. Third, positive feedbacks driven by the warming itself, such as the melting of permafrost and mobilization of massive stores of previously frozen soil carbon, may already be speeding further warming. These trends are exceeding earlier predictions and bold action is needed that looks beyond what is convenient to achieve what is necessary to protect civilization and the biota.

Political and economic objectives and arguments currently obscure the facts of the changes in the atmosphere, their causes, costs to the public and to nations, and the objectives in correcting the drift into deeply disruptive climate change. There is moreover, an explosion of political and economic proposals nominally aimed at providing relief. These proposals include the substitution of biofuels for oil and the separation and storage in deep wells of carbon released in burning coal among many other proposals. While many of these proposals are important components of a global strategy for stabilizing climate, they are insufficient in themselves. And some solutions advanced now, such as corn ethanol, may actually exacerbate the climatic disruption when indirect effects on forest destruction are considered. Current discussions of an acceptable increase in global mean temperature by 2ºC do not take into account the range of regional variation such a target would imply. Under such a mean, the Arctic could see increases of 6ºC with associated drastic ecosystems responses. Defining an acceptable long-term risk to the climate system and the civilization that it supports should be based on scientific evidence and rationale rather than on short-term political and economic compromises.

The scientific community, operating largely with public funds and in the public interest, has a responsibility to provide timely and accurate assessments of the state of scientific knowledge. Staff of the Woods Hole Research Center have studied this topic for decades and offer the following observations.

1. The costs of the upward drift of global temperatures are already affecting major segments of civilization and will rapidly become more severe as the disruption of climate proceeds.

2. Objectives in correcting the trend must now include steps not only to stabilize the heat-trapping gas content of the atmosphere but also to start the process of reducing it toward long-term levels approaching the approximately 300 ppm of 1900. A short-term, decadal, target of 350 ppm is appropriate.

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3. The oceans currently absorb more than two billion tons of carbon annually, approximately 25% of the CO_2 generated by human activity. This absorption is leading to acidification that affects the ability of many marine organisms to grow normally. Increasing the carbonate concentrations and temperatures in oceanic surface waters diminishes the absorption of CO_2.

4. Stabilization of the atmospheric concentration at this moment requires removal from current annual releases an amount equal to the annual increment of carbon dioxide accumulating in the atmosphere. The annual accumulation is 4-5 billion tons of the 10 billion tons of carbon released annually from human activities (about 37 billion tons of CO_2 equivalent). Greater amounts will have to be removed in subsequent years as the ocean sink weakens and as decay of organic matter is accelerated in high latitudes by the warming.

There are two mechanisms available at this level of control: management of forests globally and management of use of fossil fuels. No other processes or procedures alone have the potential for stopping and reversing the accumulation of heat-trapping gases in the atmosphere at the speed necessary to avoid more serious global environmental disruptions of climate and sea level.

1. Forests:

A. Conserving all remaining primary forests globally, allowing no further destruction of old-growth forests, would avoid the emission of about 1.5 billion tons of carbon annually and would confer untold other advantages in the public realm through preservation of land and landscapes and their various functions in stabilizing natural ecosystems and the human habitat.

B. Restoring forests to 1-2 million square kilometers of once-forested land would start the process of storing annually about 0.5-billion tons of carbon in trees and soils globally. Restoration and protection of marine wetlands and mangroves could store additional carbon.

2. Fossil Fuels: The remaining 2-3 billion tons of carbon to reach stability can be removed through a combination of conservation of energy and substitution of alternative and renewable fuels that do not emit carbon dioxide on a net basis. Actions need to be taken globally substantially immediately, and require leadership by the US and other industrial nations including China. More reductions will be essential and possible over time as energy systems are reconstructed to rely more heavily on alternative and renewable sources.

Our purpose is to point to the gross discrepancy between the science-based requirements for a stable and habitable biosphere, which are substantially immutable, and the current perspectives of political and economic interests who appear to believe there is ample room for, and enduring reality in, compromises with the details of its metabolism and structure. Every new suggestion needs to be tested on the basis of whether it has potential for dealing immediately with the core issue of stabilizing the biosphere by reducing by billions of tons the current emissions of carbon dioxide resulting from human activities. At this late date the opportunities for effective action are limited and require large changes in human behavior.

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