

## Post-Climate Tipping Point Negotiations: Do They Serve Any Useful Purpose?

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Recently, the InterAcademy Panel on International Issues (IAP 2009), which is an association of 70 national science academies worldwide, issued a report on the effects of carbon dioxide on ocean acidification. Carbon dioxide has received much attention as a greenhouse gas, but practically no attention for causing ocean acidification. Although the statement did not use the phrase *ecological tipping point*, it left no room for doubt that a major tipping point on pH had been passed. Whatever the outcome of negotiations in Copenhagen (The United Nations Climate Change Conference, Copenhagen, Denmark, December 7 – December 18, 2009), that is, even if ocean acidification gets the attention it deserves, irreversible damage has already occurred in coral reefs and other species with calcium carbonate structures. The rapid and continuing increase in anthropogenic carbon dioxide emissions, which began with the Industrial Revolution, has exceeded the assimilative capacity for carbon dioxide in the biospheric life support system. For example, the “loss of carbonate ions produce lower saturation levels for the carbonate minerals, aragonite and calcite, which are used in many shells and skeletons. Carbonate ion concentrations are now lower than at any other time during the last 800,000 years” (IAP 2009). Clearly, this phenomenon was a major ecological tipping point.

However, dwelling on this unfortunate event would be a disastrous mistake except with respect to adjusting to this new situation. Passing a tipping point means that the ecological damage is irreversible in any timeframe presently of interest to humans. The IAP (2009) report states: “Ocean acidification impacts on marine life will depend on the rate and magnitude of changes in ocean chemistry and biological responses. While the ocean chemistry changes are predictable with high certainty, our understanding of the impact is still developing. Nevertheless, there is strong evidence emerging for a range of biogeochemical processes that affect the carbon cycle. The long-term consequences of this are difficult to predict.” In short, the new dynamic biospheric equilibrium will possibly, even probably, result in conditions unfavorable to, even hostile to, *Homo sapiens*.

Politicians have become fixated on the dates of 2020 and 2050 for reducing atmospheric carbon dioxide emissions because these years are perceived as far in the future, but the ecological evidence for cessation of emissions by these dates is far from robust. Rogelj et al. (2009) state: “National targets give virtually no chance of constraining warming to 2 °C and no chance of protecting coral reefs. . . . More than 100 nations endorse a goal of limiting global warming to 2 °C or less. . . . many of the most vulnerable nations . . . have called for warming to be limited to 1.5 °C above pre-industrial levels. To constrain global warming to within 2 °C, developed countries would need to cut their emissions to 25-40 per cent below 1990 levels by 2020 and to 50-80 per cent below 1990 levels by 2050. . . .” However, Earth has already passed two climate tipping points and, even if the goals enumerated are reached, Earth will not regain the favorable climate that existed in 1990. If the negotiations at Copenhagen fail to live up to expectations, as they did in Kyoto, the consequences could be reaching more climatic tipping points more rapidly. “Without the enthusiastic participation of China – and, of course, the United States – negotiations in December in Copenhagen aimed at writing a new global agreement to replace the expiring 1997 Kyoto Protocol are almost sure to fail. The health of the planet is equally at stake. The United States is the largest per capita emitter of greenhouse gases; China is the biggest overall emitter. If they cannot agree on a common strategy, atmospheric levels of carbon dioxide are likely to reach potentially disastrous levels” (Editorial 2009). For the oceans, which cover 70% of Earth’s surface, atmospheric carbon dioxide emissions have already reached disastrous levels for marine ecosystems. “Washington’s leverage over Beijing is not great. Its best option, by far, is to set a positive example: to press ahead with Mr. Obama’s initiatives, to keep investing in cleaner technologies, to enact meaningful legislation. This may not be enough to get the Chinese to do what’s necessary, but it will take away an important excuse” (Editorial 2009).

### What About Negotiations Between Tipping Points?

Negotiations between tipping points focus on political strategies, not ecological processes. A recent survey (Yale Project on Climate Change 2009) “found that concerns about the economy dwarfed all other

issues: 76 percent of Americans said that the economy was a 'very high' priority." This perspective is not a good one for global tipping points in the future. All complex systems have a series of tipping points or thresholds after which return to predisturbance conditions is highly unlikely. Predicting the most obvious chemical consequences of oceanic acidification was fairly easy, but predicting the biological and ecological consequences is still extremely difficult.

So what do the negotiators at a climate conference discuss (negotiate)? On ocean acidification, even if humankind could return atmospheric carbon dioxide to 1980 levels, a return to 1980 ecosystems would not be possible. Additional tipping points will probably never be known until they have been passed. A sound goal would be to keep anthropogenic greenhouse gas emissions within Earth's assimilative capacity for them. However, assimilative capacity is not constant and is unlikely to be so. Anthropogenic greenhouse gas output would have to be adjusted to the assimilative capacity, which would, temporarily at least, have adverse effects upon economic growth.

As a young research investigator, I actually believed that, if others saw the same evidence I had seen, they might reach the same conclusions. I soon learned that all the evidence in the world would not persuade people to believe something they did not want to believe. Rubin (2009, p. 17) notes: "It is hard to say which possibility is more alarming to economists – that the world has reached its peak oil production plateau, or that the rules of their vocation don't seem to be working anymore." However, keeping anthropogenic carbon dioxide emissions within Earth's assimilative capacity for them involves yet another heresy – the human economy is a subset of global ecology and subject to natural law.

How did humankind arrive at the point where at least two ecological tipping points have occurred and negotiations continue despite irreversible change? One of the problems is the high priority given to economic growth despite its deleterious effects upon the biospheric life support system. Another unfortunate assumption is that all ecological damage can be repaired. Investigators and researchers engaged in ecological restoration have routinely noted that a return to predisturbance conditions is not always possible. Clearly, this message has not gotten through to everyone. In addition, natural law must be obeyed – politicians cannot negotiate more favorable terms. Furthermore, as already noted, the human economy is a subset of the biosphere and humans must act accordingly. Violations of natural law result in severe penalties that cannot be avoided.

So, the negotiators at Copenhagen can continue negotiations centered on the old assumptions that failed to produce effective results at Kyoto or they can reexamine their assumptions to ascertain which appear valid and which do not and start from there. This unfolding will be fascinating to observe – the lives of the current generation and those of posterity depend on the process.

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