



THE WOODS HOLE RESEARCH CENTER

149 Woods Hole Road · Falmouth, MA 02540-1644 USA
Telephone 508.540.9900 · Fax: 508.540-9700 · www.wbrc.org

Fiddling While the World Burns

By George M. Woodwell

*An ecologist speaks on the rising costs of ignoring global warming. (Copyright 2001 by George M. Woodwell. First published in the **Amicus Journal**)*

Six billion people have filled the world to overflowing and feel so good about it that they promise to add two billion more in just a decade or two. There are a few problems: space to live, water to drink, air to breathe, a global disruption of climate, and a progressive loss of the benefits of civilization over large sections of the earth.

In regions where wealth has accumulated, these global exigencies seem remote. But the big issues of governance have to do increasingly with environment, and those issues do not go away. The overriding one is the global disruption of climate.

The problem is not new. It was recognized and defined more than a century ago by scientists who realized even then that burning coal and oil and gas would increase the amount of carbon dioxide in the atmosphere and warm the earth. Accurate measurements of the composition of the atmosphere, however, had to wait until infrared gas analysis was invented. Instruments became available in the 1950s that could, for all practical purposes, detect a single molecule of carbon dioxide in the atmosphere. These instruments made it possible to monitor the atmosphere around the world.

Suddenly, data were available showing a year-by-year accumulation of carbon dioxide in the atmosphere. They showed, also, powerful evidence of the importance of the interactions between the atmosphere and natural ecosystems: an annual cycle of rising and falling carbon dioxide concentrations following the seasonal metabolism of northern-hemisphere forests. In data collected in the 1960s at Brookhaven National Laboratory's meteorology tower, my colleagues and I could see the carbon dioxide concentration in the atmosphere fall every summer as the forests of North America took up carbon, and rise every winter as respiration dominated over photosynthesis and the forests released carbon. It was clear that forests have a very large role in determining the composition of the atmosphere. Such a thought was heresy at the time, but is now universally accepted.

The scientific community, taken as a whole, is conservative. Yet it has been forthright and surprisingly effective in defining the problem of global climatic disruption and its urgency. That definition has accumulated over a full century, but the work has been especially rapid and urgent since 1970, when preparations were underway for the 1972 international Stockholm Conference on the Human Environment.

At that time there were data showing the changes in the composition of the atmosphere but no data showing any consequences, and the scientific community was restrained in its comments. But for scientists to refrain from voicing the logical prediction that the accumulation of heat-trapping gases would warm the earth was a denial of their own experience and knowledge; to refrain from urging that steps be taken to avoid that disruption was a denial of the very utility of science. Over the decade, the community came to accept its appropriate role. Scientists increasingly began voicing warnings. Hearings were held in Congress. Steps were taken to strengthen subsidies for alternatives to fossil fuels. Solar panels for hot water were installed on the White House as an example for the nation.



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Under the Reagan administration, however, those initiatives were canceled. The solar panels were removed, with the purpose of setting a different kind of example. Two decades of delay ensued, punctuated by only halting progress and virtually no leadership from government in resolving a clear threat to the public welfare.

Most recently, the Sixth Meeting of the Parties to the Framework Convention on Climate Change, held in November in The Hague, failed. The nations were neither imaginative enough nor flexible enough to reach agreement on implementing the Kyoto Protocol's provisions for reducing carbon emissions. The meetings need not have faded had the United States offered the enthusiastic and constructive leadership that the world expects and depends on. Instead, the Clinton administration approached the talks with a retrograde bargaining position, in deference to a recalcitrant U.S. Congress.

The new administration, drawn heavily from the wealth of the oil patch and allied interests, seems certain to delay constructive action still further. The world at the moment is at an impasse. Every day that passes is another delay won by the petroleum and other fossil fuel interests and their allies. The impasse cannot be allowed to continue. Time is short. The problem does not offer the world decades to dither. The price of inaction mounts daily and raises the potential for massively costly environmental surprises, beyond any modern experience or capacity for correction.

The carbon dioxide content of the atmosphere is 33 percent higher now than it was in the latter part of the nineteenth century and rising daily. The total release of carbon from burning coal and oil and gas is now about 6.5 billion tons annually. There is an additional release of carbon from the destruction of forests, about 1.6 billion tons annually. Of that sum 3 to 4 billion tons accumulate every year in the atmosphere. There they cause the rapid, continuous warming of the earth as a whole; changes in precipitation patterns; migration of climatic zones at a rate of one to several kilometers per year; the melting of glaciers; an accelerated rise in sea level; an expansion of the regions affected by the great tropical diseases; and an increased range and frequency of climatic extremes, including large storms. These changes are not hypothetical. They are measurable now and accelerating.

Where does the rest of the carbon dioxide go, the difference between the total emitted and the accumulation in the atmosphere? It is absorbed by diffusion into the surface layer of the oceans; apparently, it is also absorbed into forests of the northern hemisphere that are expanding into lands abandoned from agriculture in the late nineteenth and early twentieth centuries. As the earth warms most of these "sinks" for carbon dioxide are diminished. Other sources of carbon, such as the decay of organic matter in soils and in the peat of the tundra, appear. So there is no cure for the warming in the warming itself. As the warming proceeds, there is only a greater tendency to disrupt climates globally. No end is in sight on the present course until the world exhausts its supplies of coal and oil and gas sometime in the next few centuries.

Meanwhile, the heat-trapping gases continue to accumulate in an atmosphere that has already accumulated enough potential for further warming, unrealized as yet but awaiting us in the future, to take the world far beyond the range of reliable predictions. If by some magic we were to realize immediately and fully the objective of the Framework Convention on Climate Change - stabilization of the heat-trapping gas content of the atmosphere at the current level - this further warming would still occur over years to come. It will push the climate well beyond the realm of what scientists can predict in any detail and into the realm of surprises.



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Just what are the implications, for example, of an Arctic Ocean that is consistently open in summer, no longer a cold, reflective white surface of ice but a warm, black surface of open water, free to absorb the heat of the twenty-four-hour summer sun through evaporation? The global climate is driven by the latent energy of water vapor; what will be the effects of a large new source of this energy entering at the polar extreme? At what point in the disruption of the global climatic system will the circulation of the oceans suddenly shift, altering the flow of the Gulf Stream, which now carries heat to northern Europe and keeps coasts ice-free in the north as far east as Novaya Zemlya? What are the costs around a world of 6 billion people when continental centers become progressively arid and increasingly subject to extremes of climatic variation?

Further, what are the implications of the progressive impoverishment of forests and other stable landscapes as chronic changes in climate become acute? The biophysical stability of the human habitat is totally dependent on the stability of the functions of natural ecosystems. Destabilization moves the world down the slippery slope of biotic impoverishment. To see the result in its extreme form, we need look only to Haiti, where the landscape and concomitantly the people have become so thoroughly impoverished that no government can stand long enough to establish a program of recovery.

What is to be done? We hold the chart and the possibility of rescue. What is needed now is U.S. leadership, strong and effective leadership in realizing the full objectives of the Framework Convention on Climate Change, which we and 180 other nations have ratified and made the law of the whole earth. The first step is for the United States to develop its own plan for encouraging first the conservation of fossil fuels and then their displacement as the main source of energy driving industrial society. A host of studies show economic advantages as well as environmental stability emerging from this transition.

Ratifying the Kyoto Protocol immediately is part of the process. The protocol, however, is a mere first step. It must be extended and strengthened, once ratified, to encourage the global transition away from the production of heat-trapping gases and toward the restoration of stable atmospheric composition and global climate.

The issue is a global emergency, a disaster underway. It is not a potential threat. It is with us now and gathering costs, immediate and future, daily. If we can maintain a \$300-billion-a-year military establishment against potential threats of potential enemies, if we can cruise around the world underwater with enough nuclear weapons to turn the world to a cinder in a few hours with no earthly enemy in sight, we can marshal tens of billions to the purpose of restoring climatic stability to the only human habitat.

Perhaps the worst example in U.S. history of a ruinous policy left standing, long past the time it had been recognized as a destructive curse, is slavery. Climatic disruption and slavery are in no way similar problems; nor does the moral position of those who use fossil fuels begin to approach that of one who lays claim to owning a human being. But in each case, the policymakers who colluded through inaction in the perpetuation of the problem did so with full knowledge of the scale of the evil. In the case of slavery, political expediency, seen always as necessity, was allowed to dictate a compromise and enabled the drafters of the Constitution to remain silent on a practice grossly inconsistent with the principles of the Declaration of Independence and the dreams for the new nation. The ultimate price was greater than even the most vigorous, shrill, and imaginative abolitionists anticipated: more than 75 further years of slavery, followed



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by 600,000 deaths in a bitter civil war whose scars remain, 140 years later, and are made the deeper by festering problems with race.

In the case of climate, expediency is again turning a blind eye to a destructive curse. Once again, those who make the choice - the wealthy of the United States, the worst carbon culprits, who share the greatest capacity for instituting the needed changes - will suffer least. Once again, others - such as the many poor of the world who will drown or starve in Bangladesh, sub-Saharan Africa, and the Pacific Islands - will pay the highest price. The costs of our scandalous neglect are with us now, accumulating daily, and they will be levied on all the world's billions, here now and to come.