Asking the Right Questions About Climate Change & the Kyoto Protocol

by Ross McKitrick

Let us begin by dispensing with the wrong questions about climate change. Example: What do the world's scientists say about global warming? (They will tell you not to assume that "the world's scientists" all agree on complicated issues and that enforced groupthink is fatal to scientific progress.) Example: We had a warm November and December—is this a sign of global warming? (No more than last year's record cold November and December was a sign of a coming ice age.) Example: How much are we prepared to pay to save the planet from destruction? ("Saving" or "destroying" the planet is beyond our capabilities.)

What, then, are the right questions? I propose the following: 1) Are infrared-absorptive gases (IRAGs) causing climate change? 2) Is the current climate change process harmful? 3) If so, will the Kyoto Protocol solve the problem? 4) Could the resources used up implementing the Protocol do more good elsewhere?

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You'll note I didn't refer to a "greenhouse" effect or to "greenhouse" gases. We have to begin using better metaphors if we are to link the science to the policy discussions without generating serious distortions in the process. Greenhouses stay warm by physically impeding convection of warm, moist air. The earth is not a greenhouse. Carbon dioxide absorbs narrow bands of infrared emissions from the earth's surface and from other gases, as does water vapour (to a much greater extent). Radiation and convection transfer energy from the earth's surface to the top of the atmosphere in a process that is incomprehensibly complex, and which is only represented in very tentative and rudimentary ways by even the best climate models. Changing the mix of CO_2 in the atmosphere would certainly cause atmospheric warming if we had a very simple, dry atmosphere—i.e. one without water vapour and convection. But when convection and radiation occur together the physics becomes infinitely more complicated, and simple predictions cannot be made. This leads to the first question.

Are infrared-absorptive gases causing climate change?

The Intergovernmental Panel on Climate Change (IPCC) relies on three lines of evidence to link IRAGs and climate change. First, climate models "predict" warming in response to CO_2 increases. Second, "signal detection" studies have concluded that the recent warming cannot be explained by natural processes. Third, paleoclimatic studies show the late twentieth century to be unnaturally warm compared to the past millennium.

As to the first, climate models do not "predict" anything, and if you check you will see that the IPCC is careful to refer to model outputs only as "illustrative scenarios" or "simulations." Only politicians and the media use the term "predictions." Simplified models such as those used for the recent Third Assessment Report are programmed to a predetermined "climate sensitivity" chosen by the researcher. For instance, Wigley reports on climate simulations from a suite of IPCC models and comments:

> Figure 4 (top) shows temperature changes relative to 1990 for a climate sensitivity of 2.5 °C equilibrium warming for 2xCO_2… Figure 4 also shows the temperature reductions for the central scenario (B=CONST) for different climate sensitivities [1.5-4.5 °C] to illustrate the dependence of the results on this *parameter*." (Emphasis added.) (Wigley, 1998, p. 2287)

The differential equations describing temperature change due to variations in the optical depth of the atmosphere are

so sensitive to minor changes in the lapse rate (the rate of cooling as you gain altitude) and the surface albedo (reflectivity) that actual temperatures could go up *or down* in response to CO_2 increases (Essex, 1991). Models that always predict temperature increases in response to CO_2 doubling must be parameterized to do so. In practice, they all are. Unfortunately, the fact that they all now "predict" temperature increases is taken as evidence that temperatures will increase as carbon concentrations go up.

Signal detection studies (e.g. Wigley *et. al.,* 1998; Tett *et. al.,* 1999; etc.) work by using climate models to generate estimated changes in averaged global temperature anomalies in response to individual forcings like volcanoes, IRAG emissions, etc. These model-generated series are called "signals," and linear regression is used to see if they explain a significant portion of the twentieth century temperature record. The results are very dependent on the mix of signals included. It is typical to use only solar changes, volcanoes, IRAGs, and sulfur dioxide emissions, since adding more signals leads to insignificant results.

The problem with this "evidence" is that the models must be correct if the resulting signals are to have any meaning. Yet the IPCC freely admits there is very little understanding of the direct and indirect temperature effect of aerosols; there is extensive uncertainty about the size of the solar signal (based on what, if any, internal processes amplify it); and if we knew the climate sensitivity to CO_2 well enough to generate the signal vector we wouldn't need signal detection studies in the first place.

Current signal detection methodology ultimately embodies a circular argument. It presupposes that the models that generate the signals are correct. The models build in the assumption that warming always occurs in response to IRAG increases. This assumption is then justified on the evidence of signal detection studies.

The recent Fraser Institute publication by Soon *et. al.* provides an extensive critique of the science behind the IPCC models. Professional courtesy does not forbid us from pointing out that the burden of proof still rests on climate modelers to demonstrate that their models are reliable enough for forecasting. Continued reliance on flux adjustments, and recent failures to reproduce the twentieth century climate history (Delworth and Knutson, 2000; Dai *et. al.,* 2001), make me skeptical.

The third line of evidence is based on a study using tree-ring records and ice-core thicknesses to reconstruct historical temperatures (Mann *et. al.,* 1999) This reconstruction has been contradicted by countless other published climate reconstructions showing that in every region of the world, temperatures were higher 1000 years ago than they are today, sometimes by quite a bit. Of particular note, globally-averaged temperature reconstructions from geothermal borehole measures (Huang *et. al.,* 1997) are far more geographically representative than tree-ring studies (i.e., approximately 6000 sites versus about 15 for tree rings). They show the medieval era averaged between 0.1 and 0.5 degrees warmer than today over a 500 year-long interval. At its peak, globally-averaged temperatures were as much as a full degree above today's. The IPCC ignored this study in their recent report. The Mann *et al* study was highlighted to the exclusion of all others, despite the fact that the same authors, in a paper in *Nature* the year before (April 23, 1998, pp 779-787) dismissed their own pre-1400 data because it has no detectable correlation with temperatures.

Is the current climate change process harmful?

IPCC simulations typically assume that CO_2 concentrations will grow by at least 1 percent per annum for the next century. The observed average annual growth rate since the record began in 1958 is just under 0.4 percent. At no point in the available record has CO_2 ever grown by 1 percent in a single year, let alone over a long period. At the current rate, atmospheric CO_2 will only rise by 50 percent over the next 100 years, and it would take 174 years to for it to double. Clearly, if the rate of growth of carbon dioxide is less than half that assumed in the IPCC projections, then any climate changes will be less dramatic as well. And remember that any temperature effect is proportional to the logarithm of the CO_2 concentration, meaning that emissions have declining marginal impacts.

The growth rate of methane was just under 1 percent per year back in the 1980s, but has steadily fallen since then. It averages about 0.3 percent per year now, and last year methane concentrations actually declined (NOAA, 2002).

The warming that occurred 1000 years ago coincides with indications of prosperity around the world. It was an age of ample crops, cathedral building in Europe, expansion of ancient civilizations in Mexico and South America, and monument building from Easter Island to Malaysia. By contrast, the cold centuries that followed are known to have been years of hardship as harvests fell, fuel became scarce, and poverty spread. Looking at the past 1000 years, it is apparent that warming is a better trend than cooling, and temperatures at contemporary levels are associated with general prosperity.

Early studies on the economic impacts of climate change did not take full account of the adaptation measures people would employ in response to warming trends (this is sometimes called the "dumb farmer" assumption). By accounting for feasible adaptation to changing growing conditions, more recent studies have shown net gains in global agriculture (Mendelsohn *et. al.* 1999, 2000) and forestry (Sohngen and Mendelsohn, 1998) due to climate warming. Manufacturing and other indoor production is pretty much unaffected by local climate.

There is a perception that as the world warms the weather becomes more deadly. This is not true, and a careful read of the IPCC reports will show that they do not make this claim (though the summaries insinuate it). Over the past century, despite the observed warming, there is no upward trend in the frequency of storms, nor is there any upward trend in the severity of storms (Landsea *et. al.,* 1996, Zhang *et. al.,* 2000).

As for ice caps melting, the Gulf Stream shutting down, and so on, models can be rigged to cook these things up, but they remain purely speculative and improbable.

If so, will the Kyoto Protocol solve the problem?

If the reader is still convinced that IRAGs are warming the climate and that this is a bad thing, this still does not provide support for the Kyoto Protocol. If we suppose that the Protocol is fully implemented, the effects on the climate are negligible. Wigley (1998) presents forecasts based on three Kyoto scenarios. Under the basic implementation scenario, with universal compliance, no defections and no leakage effects (transfers of emitting activity into non-compliance zones), a doubling of the concentration of CO_2 in the atmosphere is only delayed by about 5 years. Globally-averaged temperatures in 2100 are only 0.08 ^oC below the baseline (2.5 ^oC) increase. With Kyoto plus 100 years of ever-tightening constraints on carbon dioxide emissions, temperatures are only about 0.3 ^oC below baseline. If a 2.5 ^oC warming is a problem, so is 2.2 or 2.4 degrees.

Furthermore, the compromises worked out at Bonn and Marrakech, which among other things, give Russia the right to practically unlimited credits for CO_2 sinks in its forests, make Kyoto pretty much useless.

Could the resources used up implementing the Protocol do more good elsewhere?

In popular discussions of public policy the distinction between costs and benefits is often confused. Suppose the government introduces a policy requiring all buildings to be painted pink. There would, of course, be a sudden surge in the demand for pink paint. Paint factory owners would hail the policy for its far-sightedness as they gear up production, hire new staff, and build new plants. Some observers might consider the value of all this new employment and production as a *benefit* of the policy, but this is a mistake. These are the *costs* of the policy. The labour, materials, and capital devoted to repainting all the buildings was taken out of useful service in the production of other goods which, had it not been for the regulation, the public would have preferred to receive. The benefits of the pink-building policy are the good ends served by having all those pink buildings. If, on reflection, the nation decides there is no benefit to making all buildings pink, then the policy yields no benefits. The labour and materials used up in the painting process cannot be cited as a benefit, because those factors would have been employed elsewhere, producing goods and services of greater value to society.

Many people make this mistake in discussing global warming policy. The fact that sellers of efficient engines or natural gas equipment would benefit in the short run from the implementation of the Kyoto Protocol is totally irrelevant. Their profits belong on the cost side of society's ledger. The benefits of Kyoto are measured by looking at the environmental good it will do. The above sections showed that the Kyoto Accord will not yield any environmental benefits.

Some defenders of global warming policy claim that it will yield beneficial side-effects by reducing a host of other air contaminants related to fossil fuel use. But the need to reduce, say, sulphur dioxide emissions, or ground-level ozone, justifies policies which target these particular contaminants directly: it does not justify policies which are themselves pointless but which might indirectly alleviate these. Any benefit gained as a side effect of carbon dioxide reductions could have been achieved more cheaply by policies that focus on the particular contaminant directly. Many air contamination problems are caused by a complex combination of factors, including but not limited to fossil fuel combustion. In Ontario, vehicle-kilometers traveled rose by 71 percent between 1971 and 1995, yet carbon monoxide (CO) emissions fell by 87 percent over the same period, largely because of improvements in emissions control technology (Ontario, 1998). To have tried to achieve the same reduction

in CO emissions by cutting gasoline use would have been far more costly.

If global warming is real, then the climate is going to warm to the same extent with or without the Protocol, so Kyoto is a waste of money. But if global warming is not real, and the climate is not warming, then Kyoto is an even bigger waste of money. Our challenge is to learn to adapt to change, not to expend resources in a futile attempt to prevent it.

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