

## An 'insult to science'

Leading economists want a full review of the UN's 100-year economic models for climate change, which they say contain "material errors" that invalidate temperature forecasts

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Anyone puzzled by the science behind Kyoto should take a look at the economics. In the words of one leading economic modeller, the central 100-year economic projections behind Kyoto and global warming policymaking is an "insult to science" and "an insult to serious analysis." And that's probably the good part of any criticism. It is also clear that the economic work of the Intergovernmental Panel on Climate Change (IPCC) is driven by systemic ideological preferences for state intervention.

A vocal group of economists around the world -- including some of the leading figures in the field of global economic modelling -- believe the core economic analysis behind the United Nations climate change initiative is based on seriously flawed modelling principles. If their analysis is correct, the central scientific tenets of global warming, including 100-year carbon emissions forecasts and temperature increases, are likely grossly exaggerated.

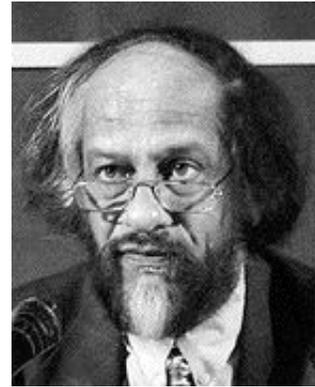
Contrary to popular belief, the theory that the world is heading for major temperature increases over the next century is not primarily a scientific issue. The main framework for long term predictions that temperatures could rise up to 4.5 degrees between now and 2100 is based in large part on economic models, not science models. But according to many economists, the economic models used by the IPCC contain what are described as "material errors."

These technical errors, which include what might be deliberate use of inappropriate exchange rates and unbelievably high growth rate assumptions, have major implications. The possibility that the central economic foundation for global warming projections might be riddled with errors will be brought before the full IPCC Bureau next month, according to Dr. Rajendra Pachauri, head of the IPCC. In a letter to Ian Castles, an Australian economist who believes the IPCC's economic forecasts are wildly off base, Dr. Pachauri said he planned to initiate a "full consultation" to get to the bottom of the issue.

Mr. Castles, former head of Australia's statistics bureau and department of finance, sounded the alarm over the economic projections last August in a letter to Dr. Pachauri. In the letter, distributed to associates around the world, Mr. Castles said it is important "that governments be advised as soon as possible that the economic projections used in the IPCC emissions scenarios are technically unsound."

David Henderson, former chief economist at the Organization for Economic Co-operation and Development, has also written to Dr. Pachauri urging review of "the whole scenario exercise." He said the economic departments of all governments and international institutions should take an "active part" in examining the economic projections and scenarios. "Their expertise is pertinent, and the economic stakes are high enough to require their attention. They should not remain on the sidelines," said Mr. Henderson, who is now a professor at Westminster Business School in London.

The views of Mr. Castle and Mr. Henderson are generally supported by economists who work in the modelling field. Don Drummond, senior vice-president and chief economist at the TD Bank in Toronto, said his reading of the commentaries prepared by Mr. Castles and Mr. Henderson lead him to conclude that "If what they say is true, then the methodology used is untenable and hence the results are the same. I can't believe anyone would start with an emissions projection, then make an estimate of the relationship



**RAJENDRA PACHAURI: will review climate economics in December.**

between emissions and growth, and finally calculate growth residually. This is the relationship absolutely backward."

But that, apparently, is exactly what the IPCC's economic project did: It worked backward. Formally known as the Special Report on Emissions Scenarios, the official IPCC group set about creating economic forecasts that appear to support average world temperature increases of somewhere between 1.4 and 5.8 degrees over the next 100 years. But the SRES, by imposing emissions forecasts on economic models, adopted scenarios that economists say make no sense.

One leading economic modeller, John Reilly of the MIT Joint Program on the Science and Policy of Global Change, said "the SRES scenarios were just, in my view, a kind of insult to science." Were they also an insult to economics? "Well, to anything; an insult to serious analysis."

Prof. Reilly, who is otherwise broadly supportive of global warming theory and long-range forecasts that support the idea that temperatures will rise over the next 100 years, said the official SRES approach began with long range carbon emissions scenarios. He has studied the Special Report in detail, but says he is at a loss to explain how the carbon emissions were translated into economic models. "This is a little mysterious - - somehow out of a discussion one ended up with specific scenarios for multiple variables. I imagine someone with graph paper and a magic marker drawing a candidate line through the literature estimates, and then someone else bumping it up a little in one place and down another, taking some emissions from one region, and adding them to another, shaving GDP here and boosting it there."

At one point, he says, the IPCC group attempted to find economists to "tweak" long-range models to get the desired emissions results. "They wanted our group [at MIT] to do this, but we just refused."

Not only did the modelling warp economics. The overall ideology of the operation appears to have been to create scenarios that would fulfill a larger objective. "The bigger issue," says Prof. Reilly, is the SRES vision of an economic future of "equal incomes" among all regions of the globe. He calls it the "social justice" issue. "They are of the view that the future world is a matter of human choice. If we want a world where the United States stops growing, and developing countries grow and catch up, we can choose that world. It's not something you can project. You just choose that scenario and if it's a scenario we as a world like, we will make it happen."

Does that not seem like an unusual foundation for a 100-year modelling exercise? "I think it's lunacy," said Prof. Reilly. "But they've gone around the world and convinced the world" that it can be done.

The idea that most regions of the world economy -- the developing nations, Asia, Africa and Latin America -- can be purged of differences in income levels with the developed world of Europe, Japan and North America dominates the SRES outlook. It also produces long-range growth projections that, by any historical standard, are out of this world.

A sampling of these unbelievable projections can be found in the table. In 1990, the combined GDP of OECD nations (Japan, North America, Europe) was \$16.5-trillion while the combined GDP of the major developing regions (Africa, Latin America, Asia) totalled \$3.5-trillion. The SRES projections propel the developing nations onto a growth trajectory that overtakes OECD nations in about 30 years, and then soars to almost three times OECD levels by the end of the century.

Even more astoundingly, the SRES projects that on a GDP per capita basis, the developing world will overtake OECD nations by about 2060. These and other projections, says Ian Castles in his letter to the IPCC, "imply that real incomes in the whole of the developing world will be many times greater than those in the richest countries in the world today."

Growth rates are also beyond any historical experience. Between 2000 and 2050, per capita growth rates in Asia and Latin American countries are projected to roar ahead by between 50% and 65% per decade, non-stop. At the same time, per capita growth in OECD nations is projected to grind to a near stop. Prof. Reilly at MIT believes U.S. growth is expected to stall in about 2030, a development that belies 300 years of North American history.

Critics charge that, to get to such incredible scenarios, the SRES injected "patently unrealistic assumptions"

and "technically unsound" modelling procedures. It also botched the exercise right from the beginning. It failed to correct, for example, for the collapse of the Soviet Union in 1990, and the dramatic reductions in carbon emissions that followed. By the year 2000, when the report was issued, the projections were already out of date.

Far more serious, according to Mr. Castles and David Henderson, is the SRES use of market exchange rates as the basis for its 100-year projections. By using market exchange rates instead of purchasing power parity values -- considered essential by the International Monetary Fund and other agencies and modellers -- the SRES projections grossly overestimated the current gap between developed and developing countries. As a result, the modellers were forced to exaggerate the growth rates needed to support the catch-up -- and the emissions scenarios..

The market value method used by the SRES severely distorts reality. It converts the local currency income of somebody living in a developing nation, say Bangladesh, into U.S. dollars at market rates, and then assumes that the Bangladeshi spends his income purchasing goods and services at going world market prices. No Bangladeshi does this. Economists have compensated by developing methods of estimating local incomes using purchasing power parity calculations. Purchasing power parity (PPP) values are not perfect, but they are considered essential to any long-range forecast, especially one that improbably reaches out 100 years.

Based on market exchange rates, for example, the current \$500 per capita income in Asia implies that the \$20,000 per capita in OECD nations is 40 times greater. Mr. Castles says that, properly measured on a PPP basis, the income gap between the two groups is more like 10 to 1 rather than 40 to 1. But if the gap is only 10 to 1, then the amount of growth needed to close the gap would be far smaller than projected by the SRES. It follows, says Mr. Castles, that the growth in carbon emissions would also be far smaller. And so, presumably, would the risks of temperature increases.

It is from these "fantastic assumptions," says Mr. Castles in his letter to the IPCC, that the official modellers accommodated soaring emissions growth estimates. In the emissions scenario that accompanies the growth rates in the chart nearby, for example, the SRES estimated that in this decade alone carbon emissions would increase by 800 million tonnes in the developing world. "In other words," writes Mr. Castles, "the modellers assumed that increases in emissions in each of the SRES developing regions would be greater in the current decade than the increase for the world as a whole between 1990 and 2000."

On the basis of these assumptions, which are "completely unrealistic," he says the SRES proposes that carbon emissions of fossil carbon dioxide will increase between 24% and 46% in developing countries during this decade. "On this basis, output [under this model] suggests that GDP per head could rise by around 50% in both regions." That's impossible, he suggests. It is already certain that growth of that magnitude will not occur. The IMF's latest World Economic Outlook forecasts don't even come close to forecasting such growth.

The same story carries on, decade after decade. Third World nations balloon in growth, the United States and the OECD nations stagnate, and climate changing carbon emissions soar -- all on the basis of modelling that worked backward and employed flawed and untenable methods. The SRES modellers began with extremely high emissions projections, allocated the emissions to developing countries, and then created faulty and impossible economic scenarios to accommodate the emissions.

So what should be done? Mr. Henderson, in his letter to the IPCC a couple of weeks ago, said the growth rates are more than double what they might be under realistic modelling scenarios. The implication is that the prospective extent of global warming might be much lower than currently anticipated by the models. "For this reason alone," he said, "there is a good case for reviewing the whole scenario exercise." It is also time, he said, for "the central economic departments of state -- treasures, ministries of finance, ministries of economics" -- to take a part in the modelling review. That would include the department of finance in Ottawa, where climate change has been a no-go zone for most of the last decade.

For his part, Mr. Castles wants the IPCC to act quickly. There is a risk Dr. Pachauri and the IPCC bureau could agree to review the models, but delay reporting back until 2007 or some other date. Mr. Castles says that's not good enough. The models are patently flawed, unrealistic, and not credible. A review should take place immediately. All Mr. Pachauri has promised for the December meeting of the IPCC is to "take a very serious interest" in the criticisms and report back "in some detail."

Whatever the IPCC findings, none of this implies that future economic models will find carbon emissions and climate risks do not exist. John Reilly at MIT, along with others, has produced separate modelling work that appears to support the idea that long-range economic forecasts, properly constructed, can still produce carbon emissions projections that are comparable to the SRES results. The difference is that his projections are based on economic models that can be dissected and analyzed on the basis of sound economics.

What it means, though, is that the economic analysis of climate change on a global basis has not yet started.

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