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Submission to UK House of Lords: INQUIRY INTO ASPECTS OF THE ECONOMICS OF CLIMATE CHANGE

0 Introduction

I am an Associate Professor of Economics at the University of Guelph in Ontario, Canada. I specialize in environmental economics and issues related to climate change. My research is funded by the federally-funded Social Sciences and Humanities Research Council of Canada, through peer-reviewed grant competitions.

I am pleased that your Inquiry is taking up issues related to the IPCC process. I have observed this organization very closely over the past few years and I believe a critical outside assessment is overdue. The IPCC exerts tremendous global influence over energy, environment and climate policies, yet is effectively unaccountable. They have not won over any of their prominent critics since the mid-1990s, meanwhile new, credible experts continue to come forward with doubts about the IPCC's credibility.

In this submission I would like to explain two concerns I have regarding the IPCC:

- It appears to have little or no working relationship with the mainstream academic economics community;
- It has exaggerated the rigor of its scientific review process.

1 The lack of connection between the IPCC and the academic economics community.

One of the striking differences between the Second Assessment Report of 1995 and the Third Assessment Report of 2001 is the loss of participation of mainstream economists in the latter. A comparison of the lists of chapter contributors (especially in Working Group

II) between the reports will confirm that the IPCC could no longer claim to have the participation of mainstream professional economists after 1995.

In recent years some economists have taken greater notice of the IPCC's work because of the efforts of Ian Castles and David Henderson to focus expert attention on the "Special Report on Emission Scenarios" (SRES). This has led to a growing body of criticism of the IPCC's handling of economic issues. The SRES does not use conventional economic modeling to produce what would normally be called "forecasts" or "projections". They call their outputs "storylines" and "scenarios" and emphasize that they are speculative, yet at the same time they market the results as "predictions." For example, the back cover of the SRES Report states (emphasis added):

The [IPCC] Special Report on Emission Scenarios describes new **scenarios** of the future, and **predicts** greenhouse gas emissions associated with such developments....The scenarios provide the basis for future assessments of climate change and possible response strategies.

The list of contributors to the SRES and to the IPCC (WGII) Report¹ includes a small and non-representative sample of economists, amongst a long list of government bureaucrats and academics from other disciplines. Moreover I know that some of the contributing economists are quite critical of the final Reports. One of them is John Reilly of the Massachusetts Institute of Technology. In an article in Canada's *National Post* (Nov. 27, 2002) he said that the SRES exercise was "in my view, a kind of insult to science" and the method was "lunacy." He said his lab refused a request from the IPCC to let their models be "tweaked" to support the IPCC scenarios.

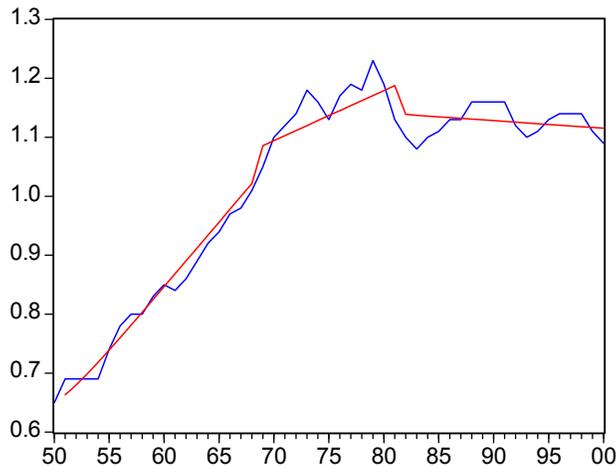
In Canada there is a large community of academic economists, many with an international reputation, working in the fields of natural resource, energy and environmental economics. None of the participants in our annual research study group, numbering close to one hundred members drawn from universities across Canada and the US, is involved with the IPCC or had any hand in the SRES Report.

I recently completed a study,² coauthored with Mark Strazicich of Appalachian State University, that confirms the SRES emission scenarios are unrealistically high. We used time series econometric methods to analyze data on per capita carbon dioxide emissions for 121 countries around the world. We are able to show that the global per capita CO₂ emissions level is a stationary constant (neither drifting nor trending upwards) with a long term mean of 1.14 tonnes per person and a standard deviation of 0.02. The mean has not changed for several decades, and indeed is trending slightly downwards since the early 1980s (see figure below). If emissions average just over 1.1 tonnes per person, and population peaks (as expected) at about 9 billion mid-century, we can expect peak

¹ For the Working Group II list see http://www.grida.no/climate/ipcc_tar/wg2/688.htm.

² McKittrick, Ross and Mark C. Strazicich (2005). "Stationarity of Global Per Capita Carbon Dioxide Emissions: Implications for Global Warming Scenarios" University of Guelph Department of Economics Discussion Paper 2005-03. (submitted for publication)

emissions of about 10 billion tonnes by 2050. Yet most IPCC scenarios are between 15 and 30 billion tonnes at 2050, a range that sits well above the plausible upper bound.



**Global Per Capita
Carbon Dioxide
Emissions in tonnes per
capita**

1950 - 2000

Trend after 1982 is
-0.001 tonnes/year

(Data source –Oak Ridge
National Lab, USA)

We calculated the implied global per capita emission levels associated with each of the 40 SRES scenarios over the next 50 years and computed the probability of observing each one. Only 7 of the 40 SRES scenarios remain within five standard deviations of the current mean through the year 2050. Many depart more than ten standard deviations above the observed mean; 8 lie more than *fifty* standard deviations above the observed mean.

Most scenarios are so improbable they should never have been published in the first place. The 7 scenarios that we found remotely possible imply a range of total global CO₂ emissions from 9.1 to 11.2 Gigatonnes as of 2050, with a mean of about 10.1 Gigatonnes as of 2050. Yet, as I mentioned, the bulk of the SRES scenarios imply emissions of 15 Gigatonnes or more as of 2050.

I should emphasize that what Mark Strazicich and I did was merely to apply some standard statistical tests for evaluating economic forecasts. It would have been obvious to most economists to do so. In presenting it to our colleagues a typical reaction is surprise that the IPCC didn't check these things themselves. A recently received comment (from one of the few academic economists in North America who has studied the SRES scenarios closely) stated: "the key findings really are important. Essentially, I think they demolish the SRES exercise--something that I think was overdue."

The fact that the SRES document was used for the Third Assessment Report without discovering these (and other) problems illustrates my first concern about the lack of serious economics capability in the IPCC milieu.

2 The exaggerated rigour of the IPCC review process

Of even more concern to me is that, even after serious flaws in the SRES have come to light, the IPCC has chosen to use *the same scenarios* for the Fourth Assessment Report (AR4), even though it is not due out until 2007. In making this decision, the IPCC has effectively communicated to the scholarly community that external criticism will have little impact on its work. This further diminishes the incentive for outside experts to bother checking over the IPCC Reports.

Another case I have been involved in recently illustrates both that experts in the field put little effort into critically assessing the IPCC's work, and that the IPCC overstates the quality of its own internal peer review system. In 2003 I got involved in a project with Stephen McIntyre, a mineral financing consultant in Toronto, to replicate one of the central aspects of the IPCC case for global warming, the so-called "hockey stick" graph³ of Mann, Bradley and Hughes. This graph purports to show that the climate of the late 20th century is unusually warm compared to the past thousand years. Full details of our work are available on my web site⁴ and on a new web page set up by Mr. McIntyre (www.climateaudit.org).

The IPCC deliberately highlighted the Mann et al. hockey stick. It appears five times in the TAR, each time in bright colour and often occupying at least half a page. No other graph is so prominent. The IPCC *Summary for Policymakers* (p. 3) used this figure as the basis of its claim that it is likely "that the 1990s has been the warmest decade and 1998 the warmest year of the millennium" for the Northern Hemisphere. The graph was subsequently reprinted countless times and used by governments around the world.

Had the IPCC actually done the kind of rigorous review that they boast of, they would have discovered that there was an error in a routine calculation step (principal component analysis) that falsely identifies a hockey stick shape as the dominant pattern in the data. The flawed computer program can even pull out spurious hockey stick shapes from lists of trendless random numbers, a point we showed in a recent article in *Geophysical Research Letters*.⁵

Further scrutiny of this study has been stymied by the fact that the authors refuse to divulge most of the computer code used to produce their results, a situation that the IPCC never took notice of nor has shown any apparent willingness to remedy. However our replication of the method is sufficiently accurate to prove that it fails all basic tests of

³ Based on Mann, M.E., Bradley, R.S. & Hughes, M.K. (1998) *Nature*, 392, 779-787 and Mann, M.E., Bradley, R.S. and Hughes, M.K., (1999). *Geophysical Research Letters*, 26, 759-762.

⁴ <http://www.uoguelph.ca/~rmckitri/research/trc.html>.

⁵ McIntyre, S. & McKittrick, R. *Geophysical Research Letters* Vol. 32, No. 3, L03710 10.1029/2004GL021750 12 February 2005.

statistical significance. Corrected calculations show that the data in question do not support the claim that the late 20th century climate is outside the bounds of observed natural variability, opposite to the assertion by the IPCC.⁶

It was the IPCC that highlighted the hockey stick data as the canonical representation of the Earth's climate history. Due to a combination of mathematical error and a dysfunctional review process they ended up promoting the exact wrong conclusion. How did they make such a blunder? They cannot claim that since they surveyed thousands of articles they should not be expected to scrutinize each one closely. The vast majority of articles they cite play little role in their main conclusions. The Summary for Policymakers highlighted three lines of evidence: the hockey stick, the 20th century surface thermometer record and the climate model forecasts. Having singled out the hockey stick there is no excuse for failing to exercise basic due diligence on it.

The hockey stick flew in the face of the more conventional representation of millennial temperature history, which suggests conditions in the medieval era were relatively warm compared to today. Last year Steve McIntyre and I received the following email from an IPCC expert reviewer.

“...I was one of a myriad of “reviewers” of the IPCC 2000, prior to its publication. One of the major concerns I expressed was the high level of credence given to the Mann et al. temperature history, without it having been seriously subjected to testing. I strongly recommended that this had some dangerous implication, should the reliance upon that research prove premature....”

It is ironic that, despite having received such warnings, it took two people outside the IPCC process to provide a critical reappraisal of the hockey stick. I think this points to the need for some external oversight to put proper checks and balances into place.

3 Recommendations for governments that rely on the IPCC.

In the private sector, no one would invest a million dollars in a mining project without putting the prospectus through multiple layers of due diligence, including complete audits of supporting calculations by independent professionals. Imagine if your financial advisor proposed putting a large fraction of your pension funds into stocks of mining companies which have only released unaudited financial statements and promotional brochures. No rational investor would consent to this, yet in setting large-scale climate policy, worth many billions of dollars, this is effectively what is happening.

⁶ McIntyre, S. & McKittrick, R. *Energy and Environment* 16(1) pp. 69-100.

The standard should be set very high for the information used in the policymaking process. I would like to see the following initiatives considered.

- The economic aspects of the IPCC work, including its emission scenarios and model runs based thereupon, should not be used for policymaking purposes until a representative panel of expert economists has conducted a thorough critique. Such a panel should consist of experts fully independent of the IPCC and government environment ministries, and should include, at minimum, experts in growth theory, measurement theory and international economics. It should also include representatives of government finance ministries and statistical agencies.
- A group of experts fully independent of the IPCC should be assembled immediately after the release of any future IPCC Reports to identify the key studies on which the Report's conclusions have been based, and audit those studies, with a view to verifying that, at a minimum:
 - The data are publicly available,
 - The statistical methods were fully described, correctly implemented and the computer code is published,
 - If the findings given maximum prominence are at odds with other published evidence, good reason is provided in the text as to why these findings have been given prominence.

Any competent scientist can assess these things. My strong recommendation is that such a panel be drawn from the ranks of competent mathematicians, statisticians, physicists and computer scientists outside the climatology profession, to prevent the conflict of interest that arises because climatologists face career repercussions from publicly criticizing the IPCC. Also, participation should exclude officials from environment ministries, because of the conflict of interest entailed in the fact that environment ministries are the main financial beneficiaries of the promotion of global warming fears.

I believe both initiatives are necessary, overdue and would carry only minimal costs. They ought to be taken by governments proposing to use the IPCC Reports for policymaking purposes. For those who feel there is no need for such "audits", and that implicit trust can be placed in the IPCC not to make any serious mistakes, my research over the past few years prevents me from sharing that optimistic assumption. Considering the enormous costs of climate policy and the large budget allocations at stake, surely a modest investment in due diligence is warranted.