

Submission to the InterAcademy Council Review of the IPCC

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Background

From 1991 to 2001 I was a Senior Economic Adviser on Energy and Environmental Policy at the World Bank. Prior to that period I was Professor of Political Economy and Chairman of the Department of Economics at the University of Edinburgh. Since 2001 I have been a part-time Professor of Economics at the University of Edinburgh and a Director of various consulting companies. The observations in this submission are strictly personal and do not represent the position of any organisation that I have been or am currently affiliated with.

I am writing because I have accumulated a lot of experience of economic work on climate change over the last two decades that is, I believe, relevant to the review being undertaken by the InterAcademy Council. Originally I joined the World Bank to serve as a co-author of the World Development Report on Environment and Development published in 1992. In particular, another member of the team and I were responsible for writing Chapter 8 on Global Environmental Issues, which provided one of the earliest quasi-official reviews of the economics of climate change. Since 1992 I have directed or participated in a large number of studies that have examined economic issues surrounding climate change at national, regional and global levels. In particular, I would highlight three major groups of studies:

- A. Analyses of environmental priorities and prospects for Asia and Eastern Europe (including the former Soviet Union), which prepared regional and country projections of economic and environmental development for periods up to 2030 under alternative policy scenarios. The relevance of this work is that the models and projections have proved much more reliable than the IPCC's SRES scenarios.
- B. Analyses of the effects of environmental pollution, including climate change, on human health by region for the whole world and for a large number of specific countries. One of the purposes of this work was to identify the relative contribution of local, regional and global environmental concerns to the overall burden of disease at the time and prospectively during the 21st century.
- C. A large study of the economic costs of adapting to climate change for the world as a whole and for specific countries.

I am an economist by training and inclination, but I have published research in scientific and statistical journals and I taught mathematics for some years. In carrying out my research and giving policy advice I have learned to understand and assess highly technical scientific, engineering and public health issues. My research interests have focused on (a) the application of statistical and econometric methods in a wide range of different fields, and (b) economic modelling of energy and environmental systems including extensive use of Monte Carlo methods to analyse uncertainty. All of this is directly relevant to any understanding of the economic implications of climate change.

In the interests of full disclosure, I should point out that I am acquainted with one member of the Review Panel – Professor Maureen Cropper. Our periods at the World Bank overlapped, though we did not work in the same Department. To the best of my recollection we did not work on the same study on more than one or two occasions, but each of us has reviewed studies that the other was involved with.

I have read the submission to the Review Panel by David Henderson on behalf of the Global Warming Policy Foundation. I will refer to it later so as to minimise duplication of material and arguments.

My view of climate change

No one can have worked on the economics of climate change and related issues for as long as I have done and not have some views about the issues that arise in scientific debate and policy analyses. Since these views shape my analysis of the performance of the IPCC, I would like to start by making my own position clear.

I would describe myself as an agnostic on many of the key scientific and economic issues concerning climate change. I mean this in the sense that, at the moment, we do and cannot have reliable knowledge about what climate change will occur and what impacts it will have. There is no dispute about some of the fundamental physical processes that are involved. But climate science – and economic analyses of climate change – relies upon complex models whose calibration, behaviour and reliability are highly uncertain and probably unknowable.

As an economist and statistician my job is to examine and, if possible, interpret observable facts. For policy purposes it is often necessary to extrapolate from what is currently known to generate projections of what might be in 10 or 20 years using more or less complex statistical and modelling tools. However, the results of such extrapolations are not “science” in the sense of systematic knowledge of facts or relationships. They must be treated as more or less well-founded speculations.

There are some important lessons from economic modelling that are relevant when dealing with climate change. Any economic modeller with a sense of caution and humility knows that it is not sufficient to test models by calibrating them to fit (approximately) past history. That is merely the first step in model construction. The next – and essential – step is to test whether they are capable of forecasting known outcomes over a short period ahead relying entirely on data drawn from before the projection period. This is not backcasting, but projection using a subset of the full data that is available. A further step is to ask how deviations in initial conditions and parameter values propagate to uncertainty in projected outcomes 10, 20. ... periods ahead. My knowledge of climate models is that they do not meet such basic requirements that would be applied to economic models.

There is a related issue that is important. All economic modellers know that positive feedbacks can lead to highly unstable behaviour and poor forecasting performance. Accelerator relationships, as they are often called, can cause models to “blow up” – forecasting never-ending booms or slumps until reality shows otherwise. There are various ways of mitigating the impact of positive feedbacks but honesty requires the admission that these are rarely more than arbitrary buffers. Positive feedbacks, particularly with respect to the role of water vapour as a greenhouse gas, are a key feature of climate models. Without such feedbacks the warming effects of higher concentrations of CO₂ and other greenhouse gases would be much smaller. I make no assumption about whether positive feedbacks in climate models have been correctly specified and calibrated. But, I do know that it is enormously dangerous to rely upon long term projections generated by models with important

positive feedbacks unless those relationships have been extremely carefully tested and have proved to be very robust.

While I am agnostic about the long term extent and nature of climate change, my experience and works leads me to believe that the overriding issue is uncertainty. The truth is that no one knows – or can reliably project - how climate change may work out. Almost everything that is claimed as knowledge or reasonable projections consists of a series of more or less arbitrary forecasts not validated by strong statistical or other evidence. Many things could happen, but this does not mean that countries or people should act as if they will happen. It seems to me that the primary need is for analysts and policymakers to address the problems that arise from uncertainty about future climate rather than to attempt to identify a narrow range of scenarios as the basis for action.

There is a corollary. Almost all of the attention of the IPCC and policymakers has focused on the evolution of average temperatures over the next century or beyond. Yet temperature is an extraordinarily poor proxy for the consequences of climate change. All economic analyses of the impacts of and adaptation to climate change highlight the critical role of (a) changes in the amount and seasonal patterns of precipitation, and (b) the severity and/or frequency of extreme weather events which are closely correlated to precipitation. Even the most cursory investigation of the results generated by different GCMs will reveal massive differences in their projections for total precipitation in, say, 2050 or 2100 by country, region or the world's land areas as a whole. In fact, it is not clear that the range of projections reflects anything much more than pure noise. What is frequently asserted as a “scientific consensus” on climate change does not exist when it comes to the things that really matter for understanding the impact of possible climate change and formulating appropriate policy responses to it.

I am not arguing that people and countries should do nothing. But it is entirely irresponsible to pretend that actions should be predicated on a scientific consensus that does not exist and on models that are systematically incapable of generating reliable projections of critical climate variables. It is unfortunate that political and diplomatic processes find it so hard to deal with uncertainty, but it is and should not be the role of the IPCC to act as though there is some degree of certainty when the real state of knowledge may be little better than pure noise.

Focus

My comments in this Submission will focus on the IPCC's documents produced by Working Groups II and III (WGII & WGIII) on the impacts and mitigation of climate change respectively. There are two reasons for this focus. First, most comments on the IPCC's work concentrate on the physical base. This is a little perverse because the observation that the world's climate is changing would be of no more than minor interest if the impacts of the change were considered to be negligible. After all, it is certain that the climate has changed in the past and will change in the future without any human involvement. So the issue of climate change would have little policy resonance unless it is believed that the potential impacts of climate change over the next 50 or 100 years were large. Equally, if mitigation was either impossible or trivial, climate change would hardly be worth the amount of attention that it receives. So, in practice, all of the work of the IPCC is predicated on prior assumptions that (a) the impacts of climate change are probably large, and (b) the costs of mitigation may be large but not completely out of reach.

The second reason for this focus is that the analyses of the impacts and mitigation are fundamentally exercises in statistics and economics. It is not sufficient to claim, for example, that the “science” implies that human health will worsen in certain ways as a consequence of climate change. The analysis must evaluate the significance of this change against all of the other factors that might lead to either improvements in or a worsening of human health over the same period of time. Similarly, the an assessment of the technical basis for mitigation is of little assistance without an understanding of the economic factors that will determine whether or not technical solutions will in fact be adopted.

At a purely technical level, substantial parts of the analysis of the impacts of climate change produced by WGII are profoundly unsatisfactory. The key issue may be put as follows: Climate change, to the extent that it is occurring, has only generated very small changes in climate variables. Any impacts that may be linked to the climate change that has occurred are likely to be small relative to the effects of natural variability in weather conditions as well as profound changes in economic, social and other variables. Thus, in practice, there is no reasonable prospect of separating the actual impact of climate change to date from the influence of other factors by statistical or other means. No set of data is sufficiently rich to permit any degree of certainty in the results of such an exercise. Hence, inferences about the potential impacts of climate change cannot be based on observation, since other factors are so much more important, so they must rely on the interpretation of indirect evidence based upon existing (pre-climate change) differences in climate or on the effects of weather variability.

To continue the example above, any analysis of the effects of climate on human health – or the incidence of specific diseases – must involve very careful statistical investigation to avoid bias caused by omitted variables and/or other departures from classical statistical assumptions. Few of the studies cited by the IPCC even consider this issue and it is clear that the chapter authors have no idea about the difficulties of making reliable inferences from such studies.

Attempting to infer the effects of climate change from weather variability is even worse, though all too common. As an illustration, the AR4 WGII Chapter 8 on Human Health leads with a box (Box 8.1) on the European heatwave in 2003. This is just disgraceful. Of course, there is indisputable evidence that heatwaves in countries with relatively mild climates lead to short term spikes in mortality and hospital admissions. But, this tells us about the effect of weather variability around some normal pattern and nothing at all about the impact of a long term change in the “normal” climate to which society and individuals can and will adapt. Indeed, the evidence cited in the chapter demonstrates exactly that point. Further, there is no evidence cited that heatwaves will become more severe relative to the “normal” climate or that societies will fail to adapt even if the ratio of maximum to mean temperatures does increase – consider the Arabian Gulf or Central India.

As an illustration, the UK has a mild climate with regular rainfall. Severe weather in winter and prolonged droughts in summer cause considerable disruption and cost, because it is not economic to build infrastructure to cope with extended periods of cold weather or drought. But, if the climate were to change so that either or both of these became regular occurrences, then the standards for constructing infrastructure would be modified to take account of a different calculus balancing the costs and benefits of minimising the impact of cold weather and droughts. It is reasonable to note that the costs of such changes are a consequence of climate change. But, it is completely misleading to claim that the impacts of climate change will include outcomes that will not occur because of predictable changes in behaviour.

Unfortunately, this kind of error is not a rare occurrence because many chapters of the AR4 WGII are characterised by similar errors, giving the impression that the various authors set out to present the

most pessimistic defensible assessment of the potential impacts of climate change. Whatever the reasons for such errors, an uncommitted and careful observer would have to conclude that the assessment does not demonstrate either intellectual rigour or careful scrutiny of the evidence in reaching its conclusions. Since, as I have noted, the WGII report is central to the case that is made by the IPCC, this must be a source of grave concern.

Diagnosis

There are different views of the role and working of the IPCC. I would suggest that the public persona of the IPCC, underpinned by its own statements and the official response to its work, is that it functions as an independent entity which receives and weighs evidence before reaching conclusions based on that evidence. Under most legal systems this implies that the evidence is carefully examined against conflicting views to test its reliability and any conclusions are supported by detailed analysis of those conflicting views. Yet nowhere in the IPCC's reports will one find the type of reasoning that would be a minimum requirement in any serious judicial judgement. In fact, IPCC reports have the character of expert reports submitted in the course of court or arbitration hearings or appeals before they are tested by cross-examination and weighed by an independent panel.

No one familiar with the composition and activities of the IPCC would be surprised at this outcome. For a long time it has been obvious to insiders that the IPCC operated as body committed to forging a "consensus" around one general view of climate change, so that those unable to reconcile themselves with this general view were gradually excluded from the process. The expulsions were not explicit but rather a consequence of the fact that busy people are not inclined to waste their time bashing their heads against a brick wall. Since it is universal experience that academic science and other subjects tend to operate through a series of self-referring cliques, exclusion from the IPCC process tended to mean that potential dissenters diverted their efforts into other issues rather than challenging what was asserted to be a mainstream set of conclusions. The result is a self-selected representation of authors, literature and arguments.

I understand that this process of self-selection may be seen as unavoidable and even necessary if some kind of semi-agreed report is to emerge within a reasonable time period. But no-one should describe it as a consensus or a settled view of the evidence. In all of the areas that I am familiar with the contributors to the Third and Fourth Assessment Reports do not include large numbers of people who have carried out serious work in relevant areas. Many of the missing experts are notable for their disagreement with some or many of the views expressed in the IPCC reports.

The failure to encompass a wider variety of views is unfortunate. It should be clear to everyone that both climate models and analyses of the impacts of climate change are far being settled. Improvements must depend in part on taking account of challenges and new evidence, even when these are generated by those who are seen as being hostile to the general conclusion. In any kind of independent enquiry or judicial process, cross-examination of expert testimony is one element in an effort to test the reliability of the evidence and to reach a better appreciation of its strengths and weaknesses. Yet, the IPCC process seems to be incapable of dealing with potentially unfriendly challenges to the views of the primary participants.

In his response to the Review Panel, David Henderson has referred to this as a problem of "unwarranted trust" in the reports produced by the IPCC. It is reasonable to point to the uncritical

treatment of IPCC reports by governments and other agencies responsible for formulating policies based upon these reports. But, the IPCC remains responsible for the poor quality of its own work.

As an example, I would like to return to Chapter 8 (Human Health) in the AR4 WGII report on Impacts, Adaptation and Vulnerability. One would have thought that this covers a rather important aspect of climate change and warrants very careful quality control. Yet the chapter is littered with tendentious statements based upon incorrect interpretation of evidence and unsupported extrapolation from past experience. It starts with a summary that makes probability statements about various impacts of climate – e.g. “[climate change will] increase the burden of diarrhoeal diseases (medium confidence); increase cardio-respiratory morbidity and mortality associated with ground-level ozone (high confidence); ...”

Such statements are a statistical absurdity because they fail to specify baseline numbers of episodes of disease without climate change or how an “increase” relative to this baseline is measured and for which the probability limits are applied. The evidence cited in support of the second statement consists of studies that, for example, document the occurrence of ground-level ozone in summer time and the epidemiology of associations between exposure to ozone and various diseases. None of these studies document a convincing link between changes in climate and ozone-related morbidity on a global scale.¹

In my view, this chapter illustrates a disgraceful tendency through the AR3 and AR4 reports to misrepresent evidence with respect to the impacts of climate change. It relies heavily upon naïve extrapolation of correlations between temperature or other weather variables and various diseases for assumed patterns of climate change. No serious attempt is made either to model the effects of economic development on the incidence of disease for a baseline scenario without climate change or to take account of autonomous changes in behaviour in response to climate scenarios. The discussion of adaptation is vacuous with a variety of hand-wringing assertions that ignore practical experience in managing climate-related diseases.

Let me be clear. I am not claiming that climate change will have no significant impact on human health. That remains an open question. What is true is that Chapter 8 provides no convincing evidence for its assertions and for the policy conclusions based on those assertions.

This chapter also illustrates a more general issue. The IPCC claims that its reports provide a synthesis of academic and other research on climate change. However, this chapter demonstrates that there is little or no convincing analysis of the effects of climate change on human health. There are many detailed studies of the epidemiology of disease in which possible dose-response relationships between weather and/or climate variables and the incidence of disease are examined. But this does not tell us anything directly about the impacts of climate change on health outcomes unless such dose-response relationships are (a) properly calibrated to take account of the effects of economic growth, demography, urbanisation, etc over the next 50 or 100 years, and (b) integrated with one or more GCMs to generate projections of regional or global health impacts by aggregating over grid cells or countries and climate scenario.

¹ Three studies are cited in Table 8.4. One for the UK does not support the claim. The other two studies for (i) New York City and (ii) 50 cities in the Eastern US report results that are an order of magnitude different. Only one set of results (for New York City) could possibly be statistically significant given the level of uncertainty about the parameters in the dose-response relationships. That study fails to separate changes in ozone exposure due to non-climate factors and those due to climate change on its own.

There are few studies which have attempted such an exercise and none of them is particularly satisfactory or comprehensive. I know this because colleagues and I reviewed the literature in 2009 as part of the large study of adaptation to climate change that I referred to at the beginning of this submission. That study provides some estimates of the more important indicators of health outcomes – infant and under-5 mortality, low birthweight babies, survival to age 65 – for developing countries by region.

Thus, as a matter of fact, the IPCC has not considered and synthesised an existing literature on the health impacts of climate change. Rather, it has constructed its own interpretation of possible linkages that have not, in fact, been examined in any detail in published research and supported this by reference to a number of detailed micro-studies which cannot provide an overall assessment of the effects of climate change in general. It is for others to decide what weight should be given to the interpretation put forward in the IPCC report, but there can be no doubt that the probability statements made in the chapter summary are entirely unjustified and give a seriously misleading impression of the state of knowledge in this area.

I have focused on the issue of climate change and health because this is an area with strong links to issues on which I have worked for more than two decades. I could make similar comments about several other chapters in the AR4 WGII reports of which I have detailed knowledge.

The AR4 WGIII report on Mitigation is, in most respects, even worse. It does not even pretend to be a synthesis and analysis of academic and other reputable research on adaptation to climate change. Each of the chapters is an attempt by a small group of authors to suggest how emissions of greenhouse gases might be reduced in a variety of specific sectors and what the order of magnitude costs might be. No serious attempt is made to undertake any type of cost-effectiveness analysis. Personal hobby horses are waved vigorously and there is no consideration of alternative views. Most of the chapters are little better than the kind of promotional literature produced by vendors of the latest weight loss plan. Even pharmaceutical companies are required to be rather more careful in the material that they circulate to patients and doctors.

My conclusion is that the IPCC does not attempt to provide a consensus view of existing research. Both of the WGII and WGIII reports adopt a very clear and deliberate strategy of extrapolating research results far beyond any reasonable or cautious assessment of the evidence, presumably with the goal of drawing conclusions. Again, I should emphasise that such an exercise may be useful. But it is not what the IPCC claims that they have done. Indeed, on various occasions the current Chairman and others closely associated with the IPCC have criticised those who have undertaken similar exercises but who may differ from the IPCC in the conclusions that they draw from such work.

Prescription

The problems in the IPCC process stem from a confusion of assessment and advocacy. Some parts of the AR4 report are simply outrageous if it is a body that is expected to provide a careful and dispassionate assessment of the evidence that is currently available. In many areas, the dispassionate conclusion – for the time being – must be that we do not know. Clearly, that answer is viewed as not being acceptable by those who are firmly convinced that something – anything – should be done to address what they believe to be the consequences of climate change. But, passionate opinions must not be treated as evidence.

If the Review Panel considers that it is appropriate for the IPCC to be an advocate for some action designed to address issues of climate change, then let us be clear that this is the way in which it operates and everyone can stop pretending that it provides a dispassionate assessment based upon evidence alone.

On the other hand, if the Review Panel considers that the IPCC's role is to provide independent assessment rather than advocacy, then the body must step back from any involvement in discussions of how to respond to the possibility of climate change. It cannot, for example, be involved in any negotiations concerning future treaties about climate change other than at a purely technical level. This should apply not only to the IPCC as an organisation but also to any individual who plays a substantial role in carrying out the assessments and writing the reports. This is a standard principle for avoiding conflicts of interest which is routinely applied to judicial bodies and must operate in this context.

David Henderson's submission has addressed matters of disclosure/transparency, inclusiveness and audit. All of these are important and relevant if the IPCC is to carry out a function of independent assessment. I would add that the IPCC should not attempt to create a consensus when none exists. It can, of course, report differences of evidence and interpretation of that evidence. It might call for additional investigations which could shed light on or even settle such differences.

I would also emphasise that there can be no mixing of advocacy and assessment. This particular well is so polluted with mistrust and confusion that the IPCC has to go down one route or the other. Indeed, it may now be the case that no one will believe that the IPCC is capable of acting as an independent body charging solely with the responsibility for assessing the evidence concerning climate change. If that is, indeed, what the Review Panel believes that its function should be, then something close to a new start is required with a very clear break from the past methods of working and behaviour.

At an absolute minimum, no chapter or Working Group report should proceed to publication unless and until it can be positively demonstrated that the team responsible have made all reasonable efforts to canvas and incorporate the full range of evidence and analysis relevant to the topic of the chapter or report. This is not merely a matter of soliciting such material, but a positive obligation to seek it out and incorporate it in the final text. Reporting that there is an agreement to differ and presenting two or many sides of one or many issues is acceptable, but any failure to report on differences should lead to suspension of publication and, if necessary, replacement of the authors and/or editors of the chapter or report.

It is sad but not entirely surprising that the work of the IPCC has become so contentious. The world does not lack passionate advocates for action to address climate change. But there is no other organisation that is equipped to undertake the essential function of dispassionate assessment. If that is to be the role of the IPCC in future, then a clear set of rules designed to avoid all actual or apparent engagement in activities that might be classed as advocacy must be instituted. Countries with experience of quasi-judicial independent panels or inquiries can provide various models of what is required to avoid conflicts of interest. But it is important to realise that the primary job of a reformed IPCC should not be to reach definitive conclusions but to report on the evidence that has been submitted and to present or clarify matters of dispute. Reporting on the examination of such evidence is part of that job, but the outcome may well be a conclusion that no particular case can be regarded as more likely or proven.