

27. Ian Castles and the IPCC – Selected Letters

The following are selected letters from Ian Castles to Dr Rajendra Pachauri, Chairman of the Intergovernmental Panel on Climate Change, between 2002 and 2004. Some attachments to the letters are not included, nor are some web references which may no longer be available.¹ To the best of our knowledge, Dr Pachauri never replied substantively to these well researched and carefully crafted letters despite their implications for the validity of the IPCC work.

The letters illustrate Castles' original criticisms of the IPCC scenarios and the methodologies involved based upon statistical and economic considerations as distinct from climate science factors. While Castles' criticisms were not properly addressed by the IPCC during this period, some have subsequently been taken into account. Castles remained, however, deeply concerned about the IPCC's work, particularly its long-term scenarios, the lack of careful assessment of their likelihood and the balancing of current costs of action against benefits far into the future.

Andrew Podger, Dennis Trewin

Letter of 6 August 2002 from Ian Castles to Dr Rajendra Pachauri

Dr Rajendra Pachauri,
Chairman,
Intergovernmental Panel on Climate Change

Dear Dr Pachauri,

1. Thank you for your interest in my criticisms of the IPCC *Special Report on Emissions Scenarios* (SRES), and for inviting me to put my concerns in writing. I am taking the liberty of sending copies of this letter to others who joined in discussions on climate change issues with you in Canberra on 23 and 24 July, and also to a 'mailing list' of my colleagues in the international statistical community, government agencies and universities who follow my ongoing correspondence about the use and abuse of statistics in public debates about

¹ Except where otherwise indicated, all figures and tables in this chapter are Castles' own.

globalisation, poverty and the distribution of incomes both within and between countries. I will of course forward any comments that you or the SRES authors may have on my criticisms to all of those to whom I am copying this letter.

Credentials

2. As mentioned in our discussions, I was formerly the Australian Statistician (1986 to 1994) and head of the Australian Department of Finance (1979-86). I am a former President of the International Association of Official Statistics (IAOS), a section of the International Statistical Institute (ISI), and have been a consultant to several national statistical offices and international organisations on a range of statistical issues.

Statistics of global poverty and inequality

3. Following the release of the UNDP's *Human Development Report 1999* (HDR 1999), I made extensive statistical criticisms of the treatment in that report of trends in global poverty and inequality. At the request of the 2000 meeting of the UN Statistical Commission (UNSC), those criticisms were examined by a group of expert statisticians constituted as the Friends of the Chair of the Commission. The report of the group upheld my more serious criticisms. In particular, the Friends of the Chair of the UNSC held that HDR 1999 had made a 'material error' (i.e. one which left the reader with 'a fundamentally distorted view of the phenomenon being described') in relying on national accounting aggregates converted into \$US at current exchange rates to compare living standards between countries.

4. The HDR Office of the UNDP accepted the report, and has made major improvements in statistical presentation and reporting in subsequent issues of the HDR.

5. Both the SRES and the Contribution of IPCC Working Group III (WG III) to the Third Assessment Report (*Climate Change 2001: Mitigation*) cite incorrect statements from pre-2000 issues of the HDR in support of claims about the international distribution of incomes. Some of these statements involve exactly the same 'material error' as that referred to in paragraph 3 above. Thus the WG III Contribution includes the following:

The distributional dimension of global poverty was illustrated vividly by the *Human Development Report 1989* (*sic* – the first HDR was published in 1990), in the form that came to be known as the champagne glass [reproduced as Figure 1.4 in the IPCC Report]. This representation of global income distribution shows that in 1988 the richest fifth of the world's population received 82.7% of the global income, which is nearly 60 times the share of the income received by the poorest fifth (1.4%).

More recent statistics indicate that inequality has widened further since then and that in 1999 the richest quintile received 80 times the income earned by the poorest quintile (UNDP 1999) (section 1.3.1).

6. Another paragraph in the same section of the Contribution of WG III cites statements in the World Bank's *World Development Report 2000* in support of similar claims about high and rising global inequality. The Australian Treasury has published a detailed critique of this analysis by the Bank, and has cited statements included in this analysis as examples of 'material errors in the use of statistics' ('Global poverty and inequality in the 20th century: turning the corner', 2001: 24-26, 34-40, available in pdf on the Treasury website at www.treasury.gov.au).

7. The SRES cites the UNDP's HDR 1993 in support of the proposition that 'The poorest 20% of Bangladesh's population ... earn per capita incomes that are a factor of 700 lower than that of the 20% richest Swiss population' (section 4.4.4.1). This comparison is invalid, because it is based on the assumption that the poor Bangladeshi family has converted the whole of its income into foreign currency, and spent it on goods and services at average world prices rather than Bangladeshi prices.

8. The same false assumption underlies the claim that 'When measured across the four SRES regions in 1990, income per capita differences are nearly 40 to 1 (between ASIA and OECD90)' (SRES, section 4.4.4.1). The difference in average incomes between these two regions, properly measured, was less than 10 to 1 in 1990, and has since contracted significantly. Thus the projected growth of real average incomes in the ASIA region (i.e. developing Asia) between 1990 and 2100 that is assumed in the A1 scenarios (an increase by a factor of about 140 to 1) and the B1 scenarios (an increase by a factor of more than 70 to 1) would take incomes in that region to far higher levels than the present OECD90 average, and possibly to higher levels than the OECD90 average in 2100. (This latter comparison is more problematic, because of the difficulty of allowing for the 'Gerschenkron effect').

9. The rates of growth in global GDP presented in the SRES significantly understate the true increases in GDP that underlie the emissions projections. This is because the regions that are expected, by assumption, to achieve the highest rates of economic growth in the twenty-first century are significantly underweighted in the calculations of global GDP. An indication of the possible extent of understatement can be derived by comparing the IMF's estimate of the average annual rate of growth in world GDP between 1994 and 2003 at market exchange rates (2.8 per cent) with the corresponding estimate of this growth measured on the correct basis using purchasing power parities (3.6 per cent). In per capita terms, calculation of the growth rate on the discredited exchange rate-based method used in the SRES yields an average annual increase over this

decade of only 1.4 per cent, compared with an increase of 2.2 per cent on the correct purchasing power-corrected basis (IMF, *World Economic Outlook*, May 2002: 157).

10. On the basis of estimates by Angus Maddison which are used in the SRES itself in other contexts, average real incomes in the United States increased by a factor of perhaps 5 to 1 in the nineteenth century, and average real incomes in Japan increased by a factor of almost 20 to 1 in the twentieth century. Thus the historical record gives no support to projections that in the course of the twenty-first century there could be increases in average incomes in the entire continent of Asia by a factor of 140 to 1 – or even of 70 to 1, which is the assumption underlying the scenario yielding the *lowest* projected level of emissions. Yet it is upon such fantastic assumptions that the IPCC's projections of emissions, and therefore of temperatures, are predicated.

The B1 IMAGE projections

11. The B1 IMAGE projection is of particular interest, because this is the marker projection that yields the lowest increase in temperature between 1990 and 2100 – between 1.4 degrees C. and 2.5 degrees C. for the seven climate models, with a projected increase averaged over those seven models of 1.98 degrees C. from 1990 and of 1.82 degrees C. from 2000 (*Climate Change 2001: The Scientific Basis*, Appendix II, Table II. 4).

12. According to the SRES Terms of Reference (SRES, Appendix I), the process for developing the scenarios was to be: 'First, key input assumptions would be provided to modelers', and 'Second, modelers would be asked to construct emissions scenarios based on the input assumptions provided'.

13. In this case, the opposite process was followed. The B1 IMAGE modelers (1) *assumed* an extraordinarily rapid growth in annual global emissions of carbon dioxide from the burning of fossil fuels (an increase of 1.6 billion tonnes between 2000 and 2010, and a further increase of 1.5 billion tonnes between 2010 and 2020, compared with increases of only 0.8 billion tonnes in the 1980s and of 0.7 billion tonnes in the 1990s); (2) allocated the whole of the very large increases in these emissions in both decades to developing countries; and (3) used the model to estimate the levels of income, energy use and emissions of other greenhouse gases and aerosols that might be associated with the assumed levels of fossil carbon dioxide emissions.

14. In the current decade, for example, the results of the B1 IMAGE model are predicated upon *assumed* increases in emissions of exactly 0.8 billion tonnes both in the ASIA and the ALM (Africa, Latin America and the Middle East) regions. In other words, the modelers assumed that increases in emissions in

each of the SRES developing regions (ASIA and ALM) would be greater in the current decade than the increase for the world as a whole between 1990 and 2000.

15. These assumptions are patently unrealistic, even for a 'high emissions scenario'. They translate into increases in per capita emissions of fossil carbon dioxide of 24 per cent in ASIA and of 46 per cent in ALM. On this basis, the output of the B1 IMAGE model suggests that GDP per head could rise by around 50 per cent in both regions.

16. In the case of the ALM region, it is already certain that such a growth in incomes will not occur. In the IMF's *World Economic Outlook May 2002*, it is estimated that real GDP per head declined in this region in 2001 and that there will be a further decline in 2002 (p. 163). Even if the IMF's rather optimistic 'world medium-term baseline scenario' for the years 2003 to 2007 were to be realised (p. 224), it would require a further increase of no less than 40 per cent in real GDP in 'ALM' in the succeeding three years to achieve the increase in decadal GDP projected in the B1 IMAGE scenario. If the modelers had followed the procedure laid down in the SRES terms of reference, they would have 'fed in' a much lower rate of growth in GDP as a 'key output assumption'. They could then have concluded that fossil carbon emissions in this region will not increase by anything like 0.9 billion tonnes.

17. The projected growth in Asian GDP in the current decade may well be realised, but with a far slower growth in carbon dioxide emissions than is assumed in the B1 IMAGE projection. There is no obvious reason why the rapid decline in 'emissions intensity' in ASIA in the 1990s should not be maintained during the current decade. Again, if the procedure for scenario development laid down in the SRES terms of reference (paragraph 11 above) had been followed, a fast rate of decline in emissions intensity in this region would have been a 'key input assumption'. The output of the model would then have revealed that carbon emissions would not need to increase by anything like 0.8 billion tonnes.

18. In short, the B1 IMAGE projection, which belongs to the 'storyline and scenario family' that features 'rapid change in economic structures toward a service and information economy', 'reductions in material intensity', 'the introduction of clean and resource-efficient technologies' and 'global solutions to economic, social and environmental sustainability', is itself a 'high emissions scenario' – at least in the early decades of the century. It assumes that there will be a sharp reversal in the downward trend in global fossil fuel emissions per head that occurred in the last two decades of the twentieth century. This seems unlikely: under the 'reference' scenario in the World Energy Council Commission Report *Energy for Tomorrow's World* (1993), global carbon dioxide emissions per head were projected to *decrease* by seven per cent between 1990 and 2020. It is significant that the WEC study, unlike the SRES, was based on purchasing power parity estimates of GDP.

Recommendations

19. I believe that it is important that governments be advised as soon as possible that the economic projections used in the IPCC emissions scenarios are technically unsound, having been derived by converting national GDPs in nominal values into a common currency using exchange rates. This procedure is not permissible under the internationally-recognised *System of National Accounts*, and was recently rejected by an expert group in a report to the UN Statistical Commission. The practice of using exchange rate conversion is especially inappropriate in relation to projections of physical phenomena such as emissions of greenhouse gases and aerosols.

20. In the introduction to the first edition of his book *Global Warming: The Complete Briefing* (1994), Sir John Houghton, then Co-Chairman of the Scientific Assessment Working Group of the IPCC, said that 'scientists have a responsibility to communicate the best possible information about the likely magnitude of climate change, along with clear statements of the assumptions made and the level of uncertainty in the estimates'. As there was no clear statement of the assumptions underlying the projections of the likely magnitude of climate change in the IPCC's Third Assessment Report, I consider it vital that governments be advised that the *lowest* of the SRES projections assumed that GDP per capita would increase to more than 70 times its 1990 level in Asia (excluding Japan) and to nearly 30 times its 1990 level in Africa, Latin America and the Middle East, by the end of the century. Contrary to statements made in the SRES, these projections 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.

21. As I mentioned in our discussions, it would also be desirable to seek the involvement of national statistical offices and of the International Statistical Institute in the new emissions projections that I understand are to be prepared for the IPCC's Fourth Assessment Report.

22. I hope that these comments are helpful to you. I repeat my congratulations to you on your appointment as Chairman of the IPCC, and wish you well in your difficult but important task.

Sincerely,

Ian Castles

National Centre for Development Studies

Australian National University

Letter of 29 August 2002 from Ian Castles to Dr Rajendra Pachauri

Dr Rajendra Pachauri,
Chairman,
Intergovernmental Panel on Climate Change
Dear Dr Pachauri,

In my letter to you of 6 August, I said that I believed that it was ‘important that governments be advised as soon as possible that the economic projections used in the IPCC emissions scenarios are technically unsound, having been derived by converting national GDPs in nominal values into a common currency using exchange rates’.

The pernicious consequences of using this false method of measuring output are apparent in the analysis of greenhouse issues in the *World Development Report 2003*, released by the World Bank last week.

For example, the Bank argues that ‘non-OECD countries use ... 3.8 times as much energy per dollar of GDP [as OECD countries]’, and claims that ‘This disparity suggests looking for ways that developing and transition countries can increase efficiency and reduce fuel costs – with reduced GHG emissions as a welcome side-benefit ...’ The Bank goes on to wonder ‘why these apparent “win-win” situations are so elusive’, and decides that the answer lies in two types of institutional failure: ‘distortions in energy policy [which] benefit special interests’, and the neglect by firms and households of profitable ways of saving energy ‘because it is simply too much trouble to pursue them’ (p. 177).

There is a simpler answer to the question that the Bank poses. The assumption of a huge margin of difference in energy intensity between OECD and non-OECD countries which the Bank is seeking to explain is false. The ratio of use of energy per unit of GDP in non-OECD countries to that in OECD countries, calculated using PPPs rather than the spurious exchange-rate conversion basis favoured by the Bank (and the IPCC), is not 3.8:1 but 1.2:1.

On the same page of *WDR 2003*, the Bank wonders what will happen when people ‘aspire to the current lifestyle of a prosperous country’, and puts forward some ‘simple arithmetic’ to show why the Bank supposes this to be impossible:

Among the prosperous countries, Norway has one of the lowest rates of CO₂ emissions per capita from energy, owing in part to ample use of hydro-power. Yet if the global population of 2050 emitted CO₂ on average at this rate, the total would be about 2.5 times current global emissions, which would greatly exceed the planet's absorptive capacity.

The argument is grossly misleading for a number of reasons. But the key point that it illustrates is the Bank's failure to understand the basis of the IPCC emissions projections, the lowest of which assumes that developing countries will not only aspire to but will in fact achieve far higher living standards than those of the most prosperous countries today.

Pasted below is the text of an article which appears under my name in this morning's *Canberra Times*, under the heading 'Greenhouse emissions calculations quite wrong'. It puts the view that the IPCC should base its climate projections on realistic assessments of future greenhouse emissions, based in turn on realistic projections of the future of the world economy, rather than on the quantification of fantastic 'storylines'.

With best wishes,
Ian Castles

Canberra Times article text

In January last year the Intergovernmental Panel on Climate Change (IPCC) released its latest projections of prospective global warming. The key finding was that "globally averaged mean surface temperature is projected to increase by 1.4 to 5.8°C over the period 1990 to 2100".

The statement led to widespread alarm. Most commentators, including many scientists, interpreted the IPCC's new projected range as a forecast of massive rises in global temperatures, but the IPCC made projections, not predictions, by feeding hypothetical levels of future greenhouse emissions into climate models. The output of such models cannot be better than the input assumptions upon which they are based.

The simulated temperature increases in the IPCC's lowest emissions scenario ranged from 1.4 to 2.5°C. Some assumptions incorporated in this scenario were conservative, but it also assumed an extraordinarily high rate of economic growth in the developing world.

Specifically, the IPCC assumed that the volume of goods and services produced per head in 2100 would be more than 70 times 1990 levels in developing countries in Asia, and nearly 30 times 1990 levels in other developing countries. Far from marking the lower bound of likely outcomes, such astronomic increases are extremely improbable.

The reasoning that produced these assumptions was as follows. Productivity in the rich countries is likely to continue to increase.

In 1990, average incomes in these countries, on the exchange rate-converted basis used in the IPCC projections, were 40 times higher than in Asian

developing countries and 12 times higher than the average of developing countries elsewhere. If this gap is to be substantially closed by 2100 on these assumptions, this century must be an era of unprecedented growth.

In fact, average incomes in developing countries are three or four times higher than the IPCC assumed. By adopting the long-discredited method of converting incomes into a common currency using current exchange rates, the IPCC modellers greatly overstated the size of the development gap, but there are two more fundamental objections to the modellers' argument.

First, living standards in the developing countries in 2100 will depend on their actual economic growth during the coming century. No significant country has ever achieved a 20-fold increase in output per head in a century, let alone the 30-fold or 70-fold increases projected by the IPCC for most of the world's population.

Secondly, and paradoxically, the IPCC's model-builders are hostile to wealth per se. They are obsessed by the belief that growth in productivity and affluence inevitably leads to unacceptable growth in greenhouse emissions. For example, they argue that "if governments support the development of rapid-growth sectors, the tendency may be to promote long-term economic growth, increase household income and consumption, and hence increase GHG emissions".

They even claim that "protectionist policies may ... reduce national economic efficiency, which dampens economic growth and tends to restrict growth in GHG emissions".

These concerns are misplaced. Economic growth maximises the output of goods and services for a minimum expenditure of scarce resources. Conversely, reductions in economic efficiency tend to increase the volume of resources required to produce a given volume of final output, and therefore raise the level of GHG emissions.

In Britain, the first developed economy, average carbon dioxide emissions exceeded 2.5 tonnes of carbon per head of the population in 1880, before the motor age began.

Now Britain produces at least five times the volume of goods and services per head as in 1880, but per capita emissions of carbon dioxide have not increased at all.

According to economic historian Angus Maddison, average incomes in China are now higher than in Britain in 1880, but China's carbon emissions are only 0.6 tonnes of carbon per head—less than a quarter of the levels in late-Victorian Britain.

And China's emissions per unit of output are less than half their levels of twenty years ago.

Global carbon dioxide emissions per head from the burning of fossil fuels reached a peak of over 1.2 tonnes per head of population in 1979. They have since declined by nearly 10 per cent.

It is not true that the per capita emissions of rich countries will necessarily increase as they become still richer. No country in western Europe today emits the 3.2 tonnes of carbon per head that Britons emitted in 1913, and per capita emissions in the United States, Canada, Germany, France, the Netherlands, Belgium and Sweden are now lower than the peak levels reached in the 1970s or earlier.

None of the high-income countries of the Organisation for Economic Co-operation and Development now emits the volume of carbon per head that the failing Communist regime in East Germany was emitting in the late 1980s, and poverty-stricken Communist North Korea emits more carbon dioxide per head than South Korea (and most other OECD countries).

It is true that per capita emissions in most developing countries will increase as the world's poor get richer, but this will be happening in a world in which emissions in many rich countries will continue to decline.

Sadly, there is a serious risk that poverty will escalate in many of the poorest countries, especially in sub-Saharan Africa. The real problem is that the people of these countries may remain very poor, not the impact on the world's climate if they and the rest of the developing world become very rich.

The IPCC should base its climate projections on realistic assessments of future greenhouse emissions, not on the quantification of improbable 'storylines' that assume that all of the world's problems except climate change will be magically overcome.

Ian Castles

National Centre for Development Studies

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Letter of 4 July 2004 from Ian Castles to Dr Rajendra Pachauri

Dr R K Pachauri

Chairman

Intergovernmental Panel on Climate Change

Dear Dr Pachauri,

1. I am awaiting your substantive reply to my letter to you of 20 April, in which I requested that the IPCC provide users of its website with access to papers relating to the Castles and Henderson critique of the Panel's economic and statistical work. My letter was written during the week before the session of the IPCC Bureau on 28-30 April, in the hope that you would have discussed my request with your colleagues at that meeting. I am now writing again to reiterate and extend my request, in the expectation that the scoping meeting for the AR4 Synthesis Report which begins tomorrow may provide a further opportunity for consideration of this matter.

The IPCC emissions scenarios are unsuitable for use in AR4

2. When I wrote to you nearly two years ago to set down my concerns about the IPCC scenarios, I thought that it was common ground that these scenarios (at least in the form in which they were published in 2000) were unsuitable for use in AR4. This assumption was reflected in the title of the session of the IPCC expert meeting at which Professor Henderson and I made our presentations in January 2003 ('Assessing importance of updating SRES on the basis of new trends and insights').

3. The explanatory text accompanying the agenda for the meeting recognised that 'A common and shared basis for research will enhance the consistency of future analyses, but may require additional efforts to make the SRES and derived research more readily available; that 'Additional information, not developed earlier, may have to be presented'; and that 'Research since the completion of the TAR suggests a variety of issues need to be addressed in order to facilitate use of the SRES as the continuing basis for analysis'. Among the issues mentioned in this connection were the need to consider 'a variety of additional emissions of either global or regional significance to radiative forcing' and 'whether it is important to provide additional information on the initial years of the SRES scenarios so that they are consistent with actual values for 2000.' The conclusion was that 'These and other issues strongly imply that a careful consideration of

how best to use the SRES scenarios will substantially improve the coherence and completeness of the analysis and will ease the eventual integration of work on many different questions by many different groups.'

4. In the event, the IPCC decided that the SRES scenarios in their original form *do* provide 'a credible and sound set of projections, appropriate for use in the AR4' ('Emissions Scenario for Use by the IPCC', Note submitted by the Chairman to meeting of the IPCC in Vienna, November 2003). The proceedings of the expert meeting in Amsterdam have not been published and the second expert meeting on the use of the SRES scenarios that had been foreshadowed at that time was abandoned.

Need for expert meeting on emissions scenarios

5. It was also agreed at the Panel's plenary session in November 2003 that 'an IPCC expert meeting [on emissions scenarios] will be organised in 2004, bringing together a wide variety of experts in the field, including experts from the fields of development economics and statistics' (IPCC, November 2003, Draft report of 21st session, Annex 5, Recommendation 3). The calendar of events for the remainder of 2004 on the IPCC's website does not yet include any notice of this meeting. (Professor Henderson offered suggestions as to venue, subject matter and possible speakers at a meeting of this kind in a short paper attached to his letter to you of 16 January 2003. This paper was subsequently published by *The Economist*).

6. The need for such a meeting has now become urgent, not least because (as I point out below) differing combinations of the original SRES scenarios are being used in 'work on many different questions by many different groups'. Whether or not this meeting is held, it is becoming increasingly difficult to see how the various strands of work by different groups will eventually be drawn together into a policy relevant Report (see paragraph 10 below).

WGCM climate simulation panel exercise and Global Environmental Change assessments

7. The Working Group on Climate Models (WGCM) Climate Simulation Panel of the World Climate Research Program (WCRP) has recently called for expressions of interest from climate modelling groups to participate in 'an unprecedented set of coordinated...climate change experiments'. The announcement (available at http://www-pcmdi.llnl.gov/cmip/subproject_announcement.pdf) states that there will be an international process to collect, compile and analyse output from this multi-model dataset 'for direct input into the IPCC's Fourth Assessment Report (AR4)'; that '*Any person or group can participate in this multi-model*

analysis activity’; and that ‘This is a way for anyone to become involved with the IPCC AR4 process’. The ‘runs being performed by modelling groups for the AR4’ include simulations of three SRES market scenarios: A1B, B1 and A2.

8. The April 2004 issue of the journal *Global Environmental Change: Human and Policy Dimensions* (which is edited by Professor Martin Parry, Co-Chair of IPCC Working Group II) consists of a series of assessments of impacts under the SRES scenarios. These assessments (dealing, respectively, with projected impacts of climate change on natural ecosystems, water resources, food production, sea level rises and exposure to malaria) are based on analyses of four SRES climate and socio-economic scenarios: the A2, B1 and B2 marker scenarios and the ‘high carbon’ A1F1 illustrative scenario. In his introductory comment, Professor Parry states that ‘This is the first global assessment of impacts under SRES scenarios, but many regional impact assessments are now underway, and will be published within the next 2 years’. He also says that these assessments ‘will form a valuable background for the Fourth Assessment Report of the IPCC, due to be completed in 2007’.

9. Thus the projects described in the two preceding paragraphs are both envisaged as providing input to AR4. But the project described in paragraph 6 calls for modelers to perform runs on the A1B scenario but not the A1F1 scenario; whereas the project described in paragraph 7 used the A1F1 scenario but not the A1B scenario, and this will presumably be true also of the ‘many regional impact assessments [which] are now underway’.

10. The data provided on projected greenhouse gas concentrations in the simple model ‘SRES Tables’ (Appendix II of the WGI contribution to the Third Assessment Report) show that emissions profiles vary greatly between scenarios. This underlines the difficulty of producing a coherent assessment from the work of different groups that have chosen different combinations of SRES scenarios (leaving aside other concerns about the scenarios – relating to plausibility, consistency and statistical methodology – that have been raised by a number of economists and statisticians).

11. In relation to atmospheric concentrations of *carbon dioxide*, for example, the projected increase between 2000 and 2100 in the A1F1 scenario (to be used in analyses of impacts, but not in the proposed climate change simulations) is 162 per cent. The corresponding increase in the A1B scenario (to be used in the climate change simulations, but not in analyses of impacts) is 94 per cent. The increase in the A2 and B1 scenarios to be used in both types of studies) are, respectively, 132 per cent and 49 per cent. And the increase for the century in the Hansen alternative scenario (not proposed to be used in either the WGI or WGII studies) is 28 per cent.

12. Similarly, the projected increase in atmospheric concentrations of *methane* between 2000 and 2100 is 94 per cent in the A1F1 scenario (to be used in analyses of impacts, but not in climate change simulations), compared with 12 per cent in the A1B scenario (to be used in climate change simulations, but not in analyses of impacts). The changes in the A2 and B1 scenarios (to be used in both types of studies) are, respectively, an increase of 112 per cent and a decrease of 11 per cent. And the projected change in the Hansen alternative scenario (not proposed to be used in either type of study) is a decrease of 28 per cent.

13. During the four years to 2003, atmospheric methane concentrations were virtually unchanged: the average annual rate of growth was less than 0.1 per cent. This implies that *emissions* of methane have been declining. Yet *all* of the 40 SRES scenarios projected that global methane emissions would continue to increase for decades. The possibility that these emissions were already declining and might continue to decline seems not to have been recognised ('Results from the 40 SRES scenarios indicate that uncertainties surrounding future CH₄ emission levels are likely to increase over time. By 2050 the range across all scenarios is between 359 and 671 MtCH₄...': SRES: 255 – even the lower end of this range implies a substantial increase on the level in 2000).

14. A body whose main activity is to 'prepare in regular intervals comprehensive and *up-to-date* assessments of policy relevant...information' (emphasis added) should now be *reassessing* projections that were made in the late 1990s and published in 2000 – not using them uncritically in 2004-05 for a Report that is to be published in 2007 and that will still be presented as containing the 'most up-to-date' assessment until at least 2012.

15. Apart from being obsolete and conceptually unsound, all three of the SRES scenarios that are to be modelled in the simulation exercise being sponsored by the WGCM are highly improbable. The two 'convergence' scenarios (A1B and B1) have been recognised by a 'larger part of the SRES authors' themselves as 'highly unlikely' (Nakicenovic *et al*, 2003, 'IPCC SRES Revisited: A Response' *Energy & Environment*, vol. 14, nos. 2 & 3: 196). And the third scenario included in the exercise – the A2 Scenario – assumes a global population exceeding 15 billion by 2100, with a projected population in mid-century which is well in excess of the 'high variant' of the UN Population Division's projections released in 2002. Such an outcome becomes more and more improbable with every passing year. (The UNPD's medium variant for China assumes that the total fertility rate for the entire period between 2000 and 2050 will be about 1.85 children per woman, whereas the estimated actual rate in 2001 was 1.14 children per woman – UNDP, *World Fertility Report 2003*: 70).

Need for greater transparency in IPCC processes

706 16. I believe that it would assist the many researchers around the world who are using the SRES scenarios if the IPCC facilitated access to the papers incorporating

the Castles and Henderson critique of the economic and statistical work of the Panel, as well as the SRES teams' responses. These papers were published in three issues of *Energy & Environment* (E&E) in 2003 and 2004.

17. The report of the 29th session of the IPCC Bureau in Paris on 18 February 2003 records that you 'noted that Dr Nakicenovic would shortly publish, in a leading international journal, an article that responds to the substance of the [Castles and Henderson] criticism' (paragraph 3.2.3). This article was prepared following a proposal made by David Henderson and me that the editor of *E&E* write to you to invite the IPCC to prepare a response for publication in the journal. We said in our 'authors' preface' to our first article that 'We are glad that an article by SRES authors is to appear alongside our own contribution' (see Castles and Henderson, 2003, *E&E*, vol. 14, nos. 2 & 3: 161).

18. I find it surprising that the IPCC does not now appear to want to assist researchers to gain access to our papers or to the responses from the IPCC teams. In fact, the Castles and Henderson critique and the SRES teams' responses do not rate a mention in the recent issue of *Global Environmental Change* which is devoted entirely to reporting a series of impact assessments based on four SRES scenarios (see paragraph 8 above). All of this research was funded by the UK Department of the Environment, Food and Rural Affairs (DEFRA), but the assessments have an international audience. If the IPCC wishes to disprove the recent claim by Lord Lawson (former UK Chancellor of the Exchequer) that it is 'an environmentalist closed shop', it should be active in alerting researchers to the continuing controversy over the soundness of the SRES scenarios and other aspects of the Panel's economic and statistical work.

19. In this connection, I attach the texts of two papers that are to be published in the forthcoming issue of *E&E* (vol. 15, no. 3) [Ed: not attached here]:

- 'Can the IPCC SRES be improved?' by the Australian economist Warwick McKibbin, David Pearce and Alison Stegman, This is a much condensed version of the paper 'Long run projections for climate change scenarios' which Professor McKibbin and his co-authors prepared for a workshop convened by the Stanford Energy Modeling Forum in February.
- 'MERs, PPPs and IPCC: Illusions and Reality' by Jacob Ryten, an eminent expert in the field of economic statistics.

20. The forthcoming issue of *E&E* will also include a paper authored by me which has been published in the Australian electronic journal 'On Line Opinion'. In its press release in Milan on 8 December last, the IPCC drew attention to comments which I made in an article published in this journal three years ago. I welcome the Panel's interest in my remarks on the international distribution of income (which are soundly based, unlike many statements on this subject in the SRES

and in other IPCC reports), but repeat my request that the IPCC also provide a link with my more recent article in the same journal, which is more directly related to climate change issues.

21. I also attach three files containing charts [charts only shown below] which provide graphic comparisons of selected SRES scenarios with scenarios from other sources:

- Figure 1 compares concentrations of greenhouse gases from 2000–2100 under the three SRES scenarios included in the WGCM-sponsored simulations (see paragraph 7 above) with the ‘Hansen 1% scenario’. Figure 2 provides a similar comparison between the four SRES scenarios included in the *Global Environmental Change* assessments (paragraph 8 above) with the ‘Hansen 1% scenario’. The indexes for each scenario are based on 2000=100, and represent the total concentration in CO₂ equivalent of three major greenhouse gases (carbon dioxide, methane and nitrous oxide) aggregated using the ‘Global Warming Potential’ technique described in the Glossary of the SRES (592).
- Figures 3 and 4 show, respectively, the growth rate and the level of GHG concentrations for the period 2000–2050, for the three SRES scenarios in the WGCM-sponsored simulations and the ‘Hansen 1% scenario’. Figure 1 also includes corresponding data for the period 1960–2000. Further details are given in the ‘Sources’ notes which follow the figures.
- Figure 5 compares an average carbon emissions per capita of Non Annex 1 countries under two SRES scenarios (A1 ASF and B1 image) for the period 2000–2030 with corresponding projections of average emissions for some alternative scenarios. The alternatives include the simulations of projections using MER and PPP by Professor Manne and Dr Richels to which reference was made in the IPCC press release of 8 December 2003, using data provided to me by Dr Richels. I attached this chart to my letter of 9 January last to the Australian Minister for the Environment and Heritage, Dr David Kemp (copy of which I sent to you). I also sent a copy of the message and attached chart to Dr Richels, for any comments that he might have. As he has not responded, I assume that my charts correctly present the results that he supplied to me.

22. I am sending copies of this message and its attachments to the list of interested persons to whom I sent my earlier correspondence with you, and to some others who have subsequently asked to be added to my list. I would welcome comments, including corrections to the charts. If the projections of emissions and concentrations of greenhouse gases in the various scenarios are correctly plotted in these charts, I do urge the Panel to arrange for further work on long-run projections for climate scenarios to be undertaken for AR4, along the lines canvassed in the conclusion of the paper by McKibbin *et al* (see paragraph 19 above).

23. I also request that the IPCC make publicly available the reports of the 30th and 31st sessions of the Bureau of the IPCC held in, respectively, Vienna (early November 2003) and Geneva (28-30 April 2004). The most recent report of an IPCC Bureau meeting on the IPCC website relates to the session in Paris on 18 February 2003. I do not believe that the Bureau is able to provide adequate support to the AR4 process if summary reports of its meetings are not accessible to the thousands of participants in the process.

Publication by WWF: 'A way forward for Australia'

24. I conclude by stressing that there is an urgent need for a re-evaluation of the IPCC and alternative emissions scenarios, and for scientists and governments to be informed of the results. Many scientists have a poor understanding of the significance of the SRES projections. Only today, WWF Australia has released a publication entitled 'A way forward for Australia', the authors of which include a number of Australia's leading climate change scientists. Under the heading of 'Set a national target of 60% reduction in greenhouse gas emissions by 2050', the authors claim that

To avoid a high level of climate-change damage, Australia must cut emissions by at least 60% below current levels, as must the rest of the world.

25. This assertion may be based on the same misinterpretation of the IPCC Third Assessment Report as that made in a recent publication of the New South Wales (NSW) Greenhouse Office (to which I referred in my letter of 8 June to Dr Greg Ayers of CSIRO, copy of which I sent you). An extract from my letter to Dr Ayers follows:

The IPCC indicate that a 60 per cent reduction in emissions will be required by mid-century, to stabilise atmospheric carbon dioxide levels and limit global average temperature to an increase of around 2 degrees C.' The [NSW Greenhouse] Office sources this claim to the 'IPCC 2001 Third Assessment Report – Synthesis Report, pp.10-11, scenario B1'. But it is clear from the relevant chart in this Report (Figure (b): 10) that under scenario B1 (the green line), CO₂ emissions go on *rising* up to about 2050: see http://www.grida.no/climate/ipcc_tar/vol14/english/fig3-1a.htm. Far from requiring a 60% reduction in emissions by mid-century, the IPCC's B1 scenario assumes a *growth* of 70% in fossil CO₂ emissions over this period.

26. Under the latter scenario, the projected increase in global temperatures in the 21st century, on a 'simple model' average of seven climate models, is less than two degrees C. The increase in some other scenarios in the SRES B1 family would be lower than this, but *all* SRES scenarios assume substantially *higher*

levels of CO₂ emissions in 2150 than in 2100. Thus the IPCC Third Assessment Report does not provide any projections of future climate that are based on an assumption of stable levels of global emissions in the current half century, let alone an assumption that emissions will be reduced by 60 per cent by mid-century.

27. The Hansen alternative scenario requires the growth rate in CO₂ concentrations 'to average about the same in the next 50 years as it did in the past 20 years, which was 1.5ppm per year'. According to Dr Hansen, 'This means, to first approximation, that CO₂ emissions from fossil fuel use would need to remain about the same as today or begin to decline slightly' (see James Hansen's 'Open letter' of 26 October 2000 to 'Natural Science').

28. The Goddard Institute of Space Studies (GISS) model projections using this emissions profile are for a maximum rise in global temperatures of slightly more than one degree C, which occurs between 2125 and 2150. Presumably the eventual increase in temperatures projected by the GISS model for a 60 per cent reduction of projected emissions, as called for by the authors of the Australian WWF study, would be substantially lower than this. The lowest of the 40 SRES scenarios projects a global level of CO₂ emissions in 2150 which is three times as great as the level to which these emissions must be reduced according to the WWF study. And the lowest of the SRES scenarios that have been or will be used in the studies described in paragraphs 7 and 8 above (the B1 image scenario) projects global CO₂ emissions at over four times the level to which they must be reduced, according to the WWF publication.

29. McKibbin *et al* argue that 'it is crucial to understand the drivers of emissions projections and their sensitivity to key assumptions', but stress that 'this understanding cannot be gleaned from the SRES in its current form' (see attached paper 'Can the IPCC SRES be improved': 13 [not attached]). It follows that the SRES and other IPCC Reports do not provide support for the claim by the authors of the Australian WWF study that global emissions must be reduced by 60 per cent by mid-century if dangerous climate change is to be averted. None of these authors was involved in the SRES and, so far as I know, the socio-economic and climatic implications of a '60% reduction by 2050' scenario have not been subjected to scientific assessment.

With best wishes

Ian Castles

Visiting Fellow

Asia Pacific School of Economics and Government

The Australian National University

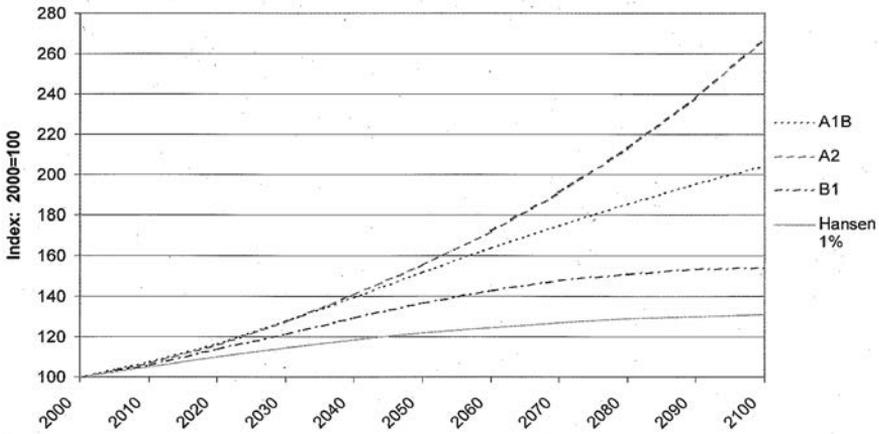


Figure 1 Concentrations of three greenhouse gases. SRES Scenarios from WGCM Climate Simulation Panel Project and Hansen Alternative Scenario

Source: Author's own work.

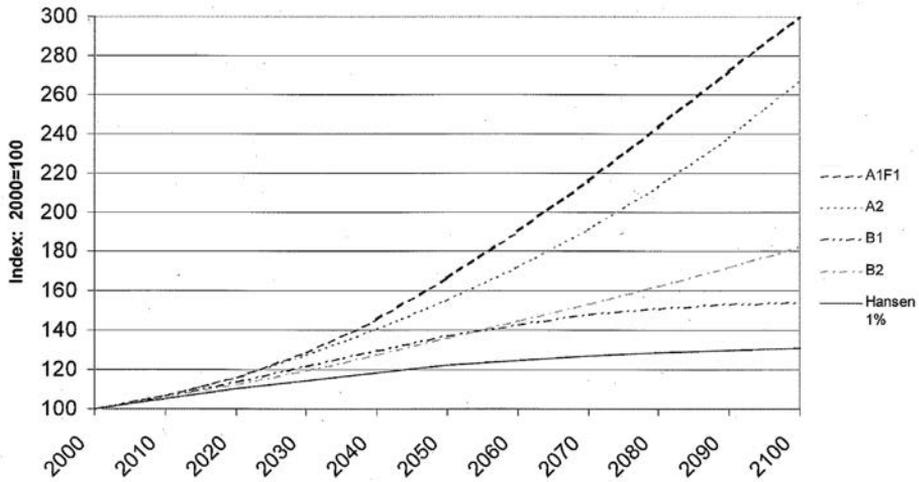


Figure 2 Concentrations of three greenhouse gases. SRES Scenarios from Global Environmental Changes Assessment and Hansen Alternative Scenario

Source: Author's own work.

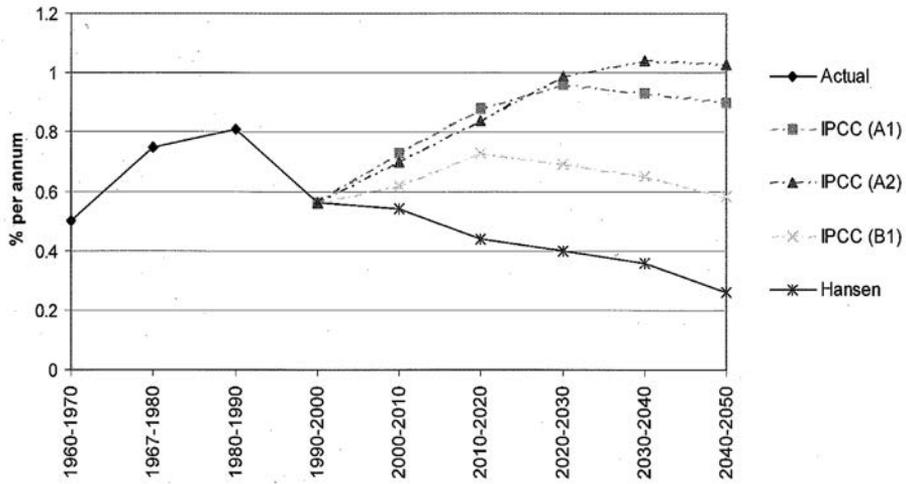


Figure 3 Growth rate in greenhouse gas concentrations 1960-2050: three IPCC Scenarios and Hansen Alternative Scenario²

Source: Author's own work.

² The data represent the growth rate in GHG concentrations measured in equivalent CO₂ which the IPCC defines as 'The concentration of CO₂ that would cause the same amount of radiative forcing as the given mixture of CO₂ and other green-house gases' (IPCC, 1997. *An Introduction to Simple Climate Models Used in the IPCC Second Assessment Report*. John T Houghten *et al* Technical Paper 2).

1960-2000 – Hansen, James and Makiko Sato (2000). *Data for Well Mixed Greenhouse Gases*. (The trends are shown in finer detail in Bjorn Lomborg (2001). *The Skeptical Environmentalist*, Figure 148: 279.

2000-2050 – IPCC Scenarios: IPCC (2001). *Climate Change 2001: The Scientific Basis*, Appendix II: SRES Tables. Hansen Alternative Scenario: Hansen, JM and 27 others (2002). 'Climate Forcings in S12000 Simulations, *Journal of Geographical Research*, 187 (D18), AC12, Table 1.

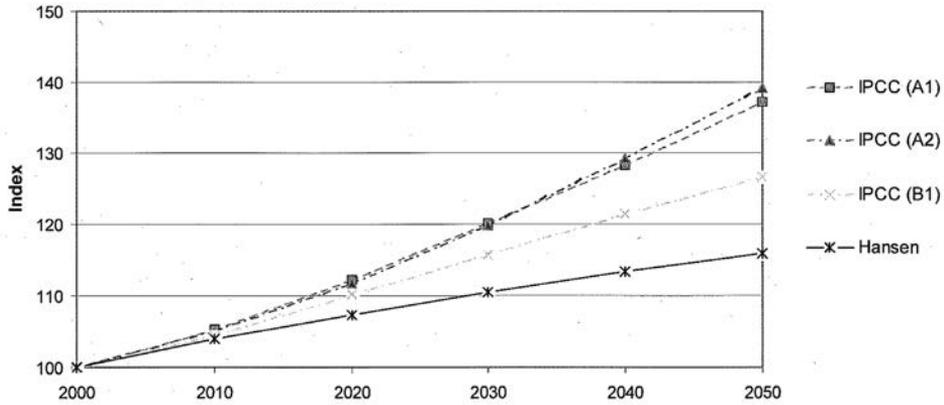


Figure 4 Atmospheric concentrations of major greenhouse gases: three IPCC scenarios and Hansen Alternative Scenario³

Source: Author's own work.

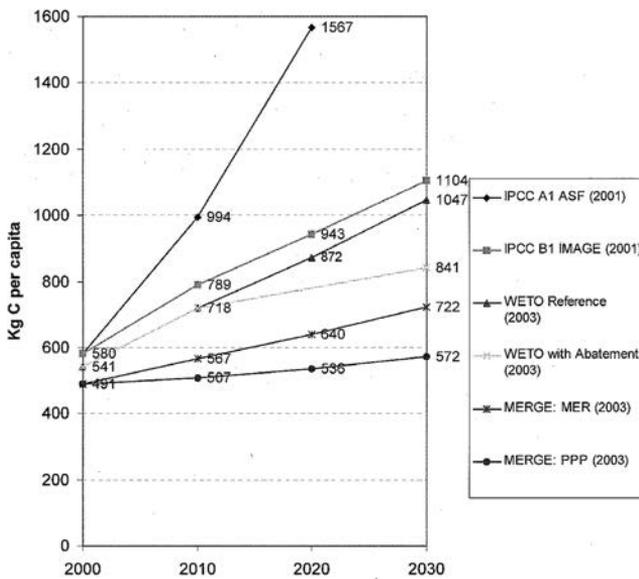


Figure 5 Carbon emissions of Non-Annex 1 Countries 2000-2030 per capita

Source: Author's own work.

3 As for Figure 1 (2000-2050 data). The concentrations of greenhouse gases have been aggregated using the Global Warming Potential factors over a 100-year time horizon adopted by the IPCC: 1 unit CO₂ = 21 units CH₄ = 310 units N₂O. Note: The trends relate to the well mixed greenhouse gases CO₂, CH₄, N₂O and CFCs. For the 2000-2050 period, CFCs have not been included (the changes in the CO₂ equivalent atmospheric concentrations of these gases in recent years have been very small).

Letter of 30 July 2004 from Ian Castles to Dr Rajendra Pachauri

Dr R K Pachauri

Chairman

Intergovernmental Panel on Climate Change

Dear Dr Pachauri

1. In its most recent press statement (issued on 8 December 2003), the IPCC dismissed the Castles and Henderson critique of its emissions scenarios on the grounds *inter alia*, that 'over a long period of time as poorer countries increase their incomes, PPP [purchasing power parity] and MEX [market exchange rate] income data tend to converge'. The Panel argued that 'In the IPCC-SRES scenarios exercise (over a 100 year period) it would not matter much what unit is used'.

2. Of course it *does* matter if inter-country differences in output are not properly measured in emissions scenarios, irrespective of whether or not the erroneous estimates affect projections of emissions. One effect of the use of flawed GDP numbers based on market exchange rates is to distort measures of energy and emissions intensities. For example, I pointed out in my letter to you of 29 August 2002 that it is not the case that energy use per unit of GDP is nearly four times as great in non-OECD countries as in OECD countries, as is implied in analyses relying on exchange rate conversions. On the contrary, energy use per unit of GDP is not greatly different between these two groups of countries. This is a point of the highest importance for policy, which is not well understood and continues to remain obscure because of the practice of the IPCC and many other bodies of measuring energy intensities in relation to GDP at market exchange.

3. An important element of the Castles and Henderson critique of the economic and statistical work of the IPCC was our claim that the mistaken use of MER-based comparisons had not only led to misleading conclusions about relative energy and emissions intensities between rich countries and poor but that, taken together with questionable assumptions about 'closing the gap', had imparted an upward bias to projections of economic growth in developing countries – hence to projections of total world emissions.

4. As an example of the potential importance of this apparent upward bias, we roughly reworked the GDP projections for the B1 IMAGE scenario – the IPCC scenario with the lowest cumulative emissions during the twenty-first century. Our conclusion was that '*the prima facie effect of taking a PPP-based gap as a point of departure at the beginning of this century is to reduce prospective world GDP in 2100 in this scenario by over one-quarter*'. And we drew corresponding

conclusions for projected emissions, inferring that ‘even the scenarios that show the lowest cumulative emissions over the present century do not present lower limits’ (Ian Castles and David Henderson, 2003, ‘Economics, Emissions Scenarios and the Work of the IPCC’, *Energy & Environment*, vol. 14, no. 4: 425-27, emphasis in original.)

5. In a recent article in the *Australian Financial Review* (AFR), one of Australia's leading economists, Warwick McKibbin, says that it is ‘surprising that the IPCC has dismissed the Castles and Henderson critique’. Professor McKibbin argues that the PPP v MER issue is ‘potentially important’ in at least one of the leading global climate models, and gives the results of simulations using this model which show an upward bias in emissions that is comparable in magnitude to that inferred in the extract of our paper which is quoted in paragraph 4 above:

Using the G-Cubed multi-country model, one of the major global economic models used for climate change policy evaluation, we show that emission projections based on convergence assumptions using market exchange rates can be 40 per cent higher by 2100 than emissions generated using purchasing power parities (AFR, 24-25 July 2004: 62).

6. The full text of the article (‘Flaws in climate-change research need fixing’) is attached [Ed: not attached here].

7. In an accompanying editorial, the *AFR* states:

Professor McKibbin...is one of Australia's leading macro-economists, sits on the board of the Reserve Bank of Australia and is a non-resident senior fellow, in climate change, at Washington's Brookings Institution... Professor McKibbin and his colleagues have...estimated that market exchange rates can inflate carbon emissions by up to 40 per cent by 2100...In the context of a debate about man-made global warming, a 40 per cent increase in carbon emissions can have enormous consequences. You would think that the IPCC would want to clear this up but it has been breathtakingly slow to do so.

8. The IPCC's press release of 8 December asserted that ‘The claim of [Castles and Henderson]...that there is an upward bias in the SRES scenarios is totally unfounded’. The findings of Professor McKibbin and his colleagues imply that it may well be the case that it is the IPCC's *rejection* of our claim that is ‘totally unfounded’.

Assessing the probability of the IPCC scenarios

9. It is important to stress that the indicative measures of upward bias in the SRES scenarios which are cited in paragraphs 4 and 5 above relate *solely* to the technical error that is introduced in ‘convergence’ scenarios if the initial gap in

incomes per capita is overstated as a result of the use of market exchange rates to convert values in national currencies into a common unit. The measures attempt to quantify the consequences of this mis-specification of the initial values, but do not say anything about the likelihood that other assumptions underlying the scenario storylines will be realised.

10. For example, the A1 scenarios assume a world 'in which regional average income per capita converge – current distinctions between 'poor' and 'rich' eventually dissolve' (SRES: 179). This convergence occurs at levels of average income which are several times higher than those of the richest countries in the world today. The authors of the IPCC scenarios themselves do not believe that such a scenario is likely to be realised:

Mr Castles and Mr Henderson obviously consider scenarios of a long term closure of the North-South income gap *highly unlikely*, and many (including a large part of the SRES authors) would agree with them (Nakicenovic *et al*, 2003 'IPCC SRES Revisited: A Response', *Energy & Environment*, vol. 14, nos 2 & 3: 196, emphasis added).

11. Many of the IPCC scenarios assume rates of growth in average incomes in the whole of the developing world in the 21st century which exceed the highest rates that have ever been sustained for such a long period in the past, even by the most successful countries. According to the SRES Team:

...in A1 scenarios per capita income in *Asia* increases by a factor of 143.8 between 1990 and 2100 when measured in MER..., but only by a factor of 37.8 when measured in PPP (Nakicenovic *et al*, *ibid*: 194, emphases added).

12. In the past, no individual country has increased its average income level by a factor of about 40 in a century or so, let alone by a factor of 140. Scenario storylines that embody such assumptions for the entire region of *Asia* (with more than half of the world's population) are, literally, 'fantastic': they are the product of a fantasy. It was in relation to projections such as these that David Henderson and I commented:

it is a dubious procedure to project a specific sequence of future outcomes and events, not on the basis of argument and evidence, but on the grounds that the world would be a better place if it occurred (Castle and Henderson, 2003, *op cit*: 424, emphasis in original).

13. In justification of the modelling of storylines such as the A1 scenarios, the SRES team asked the rhetorical question:

[Is] it illegitimate to explore in a ‘what if...then’ scenario exercise the implications in terms of GHG emissions if indeed such developments were to take place...? (Nakicenovic *et al*, *op cit*: 196).

14. The answer is, of course, that it is legitimate to *explore* these implications, but that there is little point in doing so in the absence of any assessment of the likelihood of the ‘developments tak[ing] place’. As Warwick McKibbin writes in his article in the *AFR*:

Another problem with the methodology of the SRES...is that it follows a ‘storyline approach’ in which there is no assessment of the likelihood of alternative scenarios. For each scenario, a set of assumptions about economic, social and political conditions over the next century is created and emission outcomes projected from a range of models. This means users such as policymakers, and advocates for either the ‘take extreme action’ or ‘do nothing’ approaches can choose from a range of possible futures to suit their own agenda.

15. An obvious example of a user choosing a ‘future that suits their own agenda’ was the decision to choose the ‘very high growth fossil intensive’ A1F1 scenario (in preference to the ‘very high growth balanced energy sources’ A1B scenario or the ‘very high growth with high technology’ A1T scenario) as one of the ‘scenario futures’ whose projected impacts are reported in the suite of studies included in the April 2004 ‘theme issue’ of the journal *Global Environmental Change* (the characteristics of the scenarios are taken from SRES, Table 4-2: 178). This journal is edited by IPCC co-chairman Professor Martin Parry and the studies reported in the special issue were funded by the UK Department for the Environment, Food and Rural Affairs (DEFRA).

16. On 21 April last, the Minister responsible for DEFRA said in reply to a question in the UK House of Lords that ‘The implications of the rate of change to our planet are so serious that the Government are committed to continuing to be very cautious about listening to those...who say that we are taking the matter too seriously and assuming the worst’. It is reasonable to infer from these comments that the decision to choose the A1 scenario that ‘assumes the worst’ was probably made on political grounds, and is not based on any informed assessment that it is likely, or even conceivable, that an unimaginably wealthy world would continue to choose to rely mainly on fossil fuels for its energy supplies.

17. A starting point for such an assessment is Box 4-9 of the SRES (216-220), which provides *inter alia*, minimum and maximum projections of the unit costs of, and quantity of energy supplied from, each of 22 different energy technologies for each of seven scenarios for each of the years 1990, 2050 and 2100. All of the

technologies included in the table had already been demonstrated to function on a prototype scale at the time that the SRES was finalised (see fourth paragraph of accompanying text).

18. The table shows, for example, that under the A1T scenario the projected global output of energy from hydrogen fuel cells in 2100 is comparable to the entire global output of energy from all sources in 1990. The accompanying commentary notes that 'the revolutionary change may well be less the hydrogen-powered fuel cell car itself, but rather that it could generate electricity when parked, dispensing entirely the need for centralized power plants and utilities.' According to the A1T projections, unit costs of energy from most sources, expressed as a proportion of average incomes, will be infinitesimal by comparison with those today.

19. By way of contrast, the A1F1 scenario projects that by 2100 the per capita use of energy derived from fossil fuels will increase more than fourfold, and that the per capita carbon dioxide emissions from the burning of these fuels will increase almost fourfold, by comparison with present levels. No one can assert that these developments are impossible, nor can it be established with certainty that the massive increases in per capita output and real incomes that are projected in all of the A1 scenarios are incapable of realisation. But there is nothing in the April 2004 theme issue of *GEC* to indicate that the decision to use the A1F1 scenario in preference to the A1B and A1T scenarios in the impact studies was informed by any expert assessment of their relative probabilities. It is possible that the A1F1 scenario was chosen precisely because it 'assumes the worst' (so far as emissions of greenhouse gases are concerned).

Conclusion

20. Professor McKibbin concludes his article in last weekend's *AFR* with a plea that the problems with the SRES be openly addressed:

It is critical that the technical analyses used to inform policy decisions, and which drive other research on the impacts of climate change, be thoroughly understood, properly debated and, wherever possible, improved. The problems with the [Special Report on Emissions Scenarios] that have been identified by many different people should be openly addressed before using this body of research as the basis for the next round of assessment.

21. Regrettably, it is clear from the Report of the 'IPCC Expert Meeting on the Science to Address UNFCCC Article 2 including Key Vulnerabilities', which was held in Buenos Aires on 18-20 May, that research using the flawed SRES projections is proceeding apace.

22. It is stated in the first paragraph of this Report that ‘Consistent with the principles of the IPCC, this [Fourth Assessment] will be carried out in a comprehensive, objective, open and transparent manner’. In the interest of ensuring that the Assessment will indeed be carried out in this way, I join with Warwick McKibbin in urging that the problems that David Henderson and I (and others) have identified in the SRES be openly addressed as soon as possible.

With best wishes

Ian Castles