Seminar: Dr. Martin Manning: Climate Change 2007: Physical Science Considerations for Policymakers

Martin left NIWA in 2002 to be a Director of the Intergovernmental Panel on Climate Change (IPCC) Working Group 1. His holiday in New Zealand means he is only working a 9 hour day rather than 12 hours (or so claim his wife and daughter).
Martin started by showing how Nobel Prize winner Arrhenius in 1906 predicted that CO2 in the atmosphere would raise temperatures by 4 degree Celsius under then policies and technologies. The 1996 IPCC report gave a range of 1.5-4.5 degrees Celsius - where did that bold certainty among scientists go?

The first topic was that of the IPCC process, designed to ensure not only independence of the science but also government acceptance of the science and the results. The scope of the report is agreed to by all the governments, and then the scientists are appointed; the scientists assess the relevant peer-reviewed literature, but do not conduct new research themselves. Governments can comment on the reports but cannot change the reports. Their comments, and the over 30,000 responses, are all archived and are accessible by Google search.

Guidelines have been developed to deal with the degree of uncertainty about scientific results. The guidelines separate out the level of confidence you have over the process (using the analogy of a bungee-jumper who can look at past track records of the provider) and the likelihood of results occurring (an unmanipulated roulette wheel, where the probability can be determined). This then leads to clearer statements about climate change: IPCC think it is very likely that most global warming is due to greenhouse gases, but it is likely that the impact will differ by continent.
The 2006 report did not contain any total range of estimates of the impact of climate change (in 1996 the range was given as a 1.4 to 5.8 degrees Celsius change). Instead, it broke down the uncertainty estimate into - how much greenhouse gases will be released - and then the impact that the release will have on temperature. They provided a best estimate figure and a likely range on temperature change for different scenarios of CO2 emissions.

In terms of timescales, until 2050 temperatures are likely to rise by 0.2 degrees per decade (0.1 degree if emissions stabilised now), but temperature growth then increases until 2100. But the real issue is not the shift in the mean temperature, but what it does at the extremes. While there will be fewer really cold days, there will be a significant increase in periods of extreme hot weather, and climatic events and heat waves will be 20 times more likely. A question was raised whether there may be more policy traction from concentrating on the increased likelihood of extreme events than from just looking at the average. Sea level change was modelled to be 0.5 metres by 2050, but rather than levelling off as with the temperature effects after 2100, sea levels were likely to rise for another 100 years.

Different greenhouse gases have different effects and lives. CO2 has the longest life, with 20% of today's emissions still there in 1000 years, whereas aerosols have a very short life, and banning them would probably result in a short-term increase in temperatures. Methane reduces exponentially with a mean life of 10 years - some economic models show a bigger B/C ratio by delaying the reduction in methane.

Policy responses need to take account of these complex interactions as well as the confidence/likelihood split. There is greater scientific certainty over the link between level of concentrations of greenhouse gases and climate change than there is between the level of emissions and the degree of concentrations in the atmosphere - an example was whether the Amazon would remain or turn into a Prairie. This led into a debate over where the policy (and future science) response should commence. Should it start at the end and work backwards from acceptable rise in temperature, through required level of concentrations, emissions to the required technology, or should it start from desired concentrations or emissions and work back and forward? The more steps in the process, the greater the range of uncertainty. But the next IPCC report may well start from concentrations.

Bob Stephens