

World climate change a wake-up call

from Reggie Norton

Global response to climate change

A statement by the Joint Science Academies

Climate Change is Real

There will always be uncertainty in understanding a system as complex as the world's climate. However there is now strong evidence that significant global warming is occurring.⁽¹⁾ The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems. It is likely that most of the warming in recent decades can be attributed to human activities (IPCC 2001.)⁽²⁾ This warming has already led to changes in the Earth's climate.

The existence of greenhouse gases in the atmosphere is vital to life on earth – in their absence average temperatures would be 30 centigrade degrees lower than they are today. But human activities are now causing atmospheric concentrations of greenhouse gases – including carbon dioxide, methane, tropospheric ozone, and nitrous oxide – to rise well above pre-industrial levels. Carbon dioxide levels have increased from 280 ppm in 1750 to over 375ppm today

– higher than any previous levels that can be reliably measured (i.e. in the last 420,000 years). Increasing greenhouse gases are causing temperatures to rise; the Earth's surface warmed by approximately 0.6 centigrade degrees over the twentieth century. The Intergovernmental Panel on Climate Change (IPCC) projected that the average global surface temperatures will continue to increase to between 1.4 centigrade degrees and 5.8 centigrade degrees above 1990 levels, by 2100.

Reduce the causes of climate change

The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action. It is vital that all nations identify cost-effective steps that they can take now, to contribute to substantial and long-term reduction in net global greenhouse gas emissions.

Action taken now to reduce significantly the build-up of greenhouse gases in the atmosphere will lessen the magnitude and rate of climate change. As the United Nations Framework Convention on Climate Change (UNFCCC) recognises, a lack of full

scientific certainty about some aspects of climate change is not a reason for delaying an immediate response that will, at a reasonable cost, prevent dangerous anthropogenic interference with the climate system.

As nations and economies develop over the next 25 years, world primary energy demand is estimated to increase by almost 60 per cent. Fossil fuels, which are responsible for the majority of carbon dioxide emissions produced by human activities, provide valuable resources for many nations and are projected to provide 85 per cent of this demand. (IEA 2004.)⁽³⁾ Minimising the amount of this carbon dioxide reaching the atmosphere presents a huge challenge. There are many potentially cost-effective technological options that could contribute to stabilising greenhouse gas concentrations. These are at various stages of research and development. However barriers to their broad deployment still need to be overcome.

Carbon dioxide can remain in the atmosphere for many decades. Even with possible lowered emission rates we will be experiencing the impacts of climate change throughout the 21st century and beyond.

Failure to implement significant reductions in greenhouse gas emissions now, will make the job much harder in the future.

Prepare for the consequences of climate change

Major parts of the climate system respond slowly to changes in greenhouse gas concentrations. Even if greenhouse gas emissions were stabilised instantly at today's levels, the climate would still continue to change as it adapts to the increased emission of recent decades. Further changes in climate are therefore unavoidable. Nations must prepare for them.

The projected changes in climate will have both beneficial and adverse effects at the regional level, for example on water resources, agriculture, natural ecosystems and human health. The larger and faster the changes in climate, the more likely it is that Adverse effects will dominate. Increasing temperatures are likely to increase the frequency and severity of weather events such as heats waves and heavy rainfall.

Increasing temperatures could lead to large-scale effects such as melting of large ice sheets (with major impacts on low-lying regions throughout the world.) The IPCC estimates that the combined effects of ice melting and sea water expansion from ocean warming are projected to cause the global mean sea-level to rise by between 0.1 and 0.9 metres between 1990 and 2100. In Bangladesh alone, a 0.5 metre sea-level rise would place about 6 million people at risk from flooding.

Developing nations that lack the infrastructure or resources to respond to the impacts of climate change will be particularly affected. It is clear that many of the world's poorest people are likely to suffer the most from climate change. Long-term global efforts to create a more healthy, prosperous and sustainable world may be severely hindered by changes in the climate.

The task of devising and implementing strategies to adapt to the consequences of climate change will require worldwide collaborative inputs from a wide range of experts, including physical and natural scientists, engineers, social scientists, medical scientists, those in the humanities, business leaders and economists.

Conclusion

We urge all nations, in line with the UNFCCC principles (4), to take prompt action to reduce the causes of climate change, adapt to its impacts and ensure that the issues is included in all relevant national and international strategies. As national science academies, we commit to working with governments to help develop and implement the national and international response to the challenge of climate change.

G8 nations have been responsible for much of the past greenhouse gas emissions. As parties to the UNFCCC, G8 nations are committed to showing leadership in addressing climate change and assisting developing nations to meet the

challenges of adaptation and mitigation.

We call on world leaders, including those meeting at the Gleneagles G8 Summit in July 2005, to:

- Acknowledge that the threat of climate change is clear and increasing.
- Launch an international study (5) to explore scientifically – informed targets for atmospheric greenhouse gas concentrations, and their associated emissions scenarios, that will enable nations to avoid impacts deemed unacceptable.
- Identify cost-effective steps that can be taken now to contribute to substantial and long-term reduction in net global greenhouse gas emissions. Recognise that delayed action will increase the risk of adverse environmental effects and will likely incur a greater cost.
- Work with developing nations to build a

scientific and technological capacity best suited to their circumstances, enabling them to develop innovative solutions to mitigate and adapt to the adverse effects of climate change, while explicitly recognising their legitimate development rights.

Naturforscher Leopoldina, Germany.
Indian National Science Academy, India.
Accademia dei Lincei, Italy.
Science Council of Japan, Japan.
Russian Academy of Sciences, Russia.
Royal Society United Kingdom.
National Academy of Sciences, United States of America.

Although long-term projections of future world energy demand and supply are highly uncertain, the World Energy Outlook produced by the International Energy Agency (IEA) is a useful source of information about possible future energy scenarios.

Notes and References.

- Show leadership in developing and deploying clean energy technologies and approaches to energy efficiency, and share this knowledge with all other nations.
- Mobilise the science and technology community to enhance research and development efforts, which can better inform climate change decisions.

1. This statement concentrates on climate change associated with global warming. We use the UNFCCC definition of climate change, which is ' a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'.

4. With special emphasis on the first principle of the UNFCCC, which states: 'The Parties should protect the climate system for the benefit of present and future generations of humankind, and on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.'

Signed by the Representatives of the following Academies of Science:

Academia Brasileira De Ciencias, Brazil.
Royal Society of Canada, Canada.
Chinese Academy of Sciences, China.
Academie des Sciences, France.
Deutsche Akademie der

2. IPCC (2001). Third Assessment Report. We recognise the international scientific consensus of the Intergovernmental Panel on Climate Change (IPCC).

3. IEA (2004). World Energy Outlook 4.

5. Recognising and building on the IPCC's ongoing work on emission scenarios.