SPECIAL REPORT

From words to action

The scientific case for global warming is overwhelming. So what next for the IPCC? Helping policymakers decide what to do now may require radical reform, reports **Jim Giles**.

The disturbing predictions about global warming in the latest report from the Intergovernmental Panel on Climate Change (IPCC) mark a turning point. That's not because of the figures themselves, which are largely in line with previous IPCC forecasts, but because the science behind them is now certain enough to make a serious response from policymakers almost inevitable. The debate is no longer about whether we can believe the numbers, but what we should do about them.

And so the report, released in Paris on 2 February (see 'Behind the scenes'), may be the harbinger of another change. As the debate evolves, say climate researchers, so must the IPCC. Many now feel that its weighty structure — the latest report has more than 1,200 authors and reviewers — is no longer useful. If the panel is to guide policymakers in the future, it must slim down, and become more focused on producing data that politicians can use. "The IPCC needs a complete overhaul," says Mike Hulme, director of the Tyndall Centre for Climate Change Research in Norwich, UK. "The structure and process are past their sell-by dates."

This might seem contrary, given the panel's enormous influence. But the proposed shift is partly a recognition of the success that climate scientists and the IPCC have had in revealing the scale of the problem. The latest report, the panel's fourth, is peppered with predictions classified as "highly likely" and "unequivocal". It notes with over 90% certainty that recent temperature increases are driven by human activity, and describes detailed impacts in more places than ever before, from melting ice sheets to shifting wind patterns.

Some of that confidence comes from the accuracy of previous IPCC predictions, such as estimates made from 1990 onwards, that global temperatures would rise by between 0.15 °C and 0.3 °C per decade. Temperatures have climbed steadily since: the ten hottest years on record all postdate 1990, and the rate of warming, 0.2 °C per decade, fits the initial prediction.

More sophisticated models and mounting observational data have also reinforced simulations of future climate. For example, the new report is the first to go into detail on how warming will affect the carbon cycle. The previous report, released in 2001, was unable to say whether rising temperatures would further increase atmospheric carbon levels by speeding up the decay of organic matter in soils, or cut levels by promoting plant growth. It's now clear that the former effect dominates, says Peter Cox, a climate modeller and IPCC author based at the University of Exeter, UK. "All the models give positive feedback."

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The report is the first to give a best estimate — 3 °C — of 'climate sensitivity': the global mean temperature rise resulting from a doubling of carbon dioxide levels. The range of possible values has also been tightened, to 2.0–4.5 °C. This feeds into predictions of the temperature increase over this century, which is now given as 1.1–6.4 °C, compared with 1.4–5.8 °C last time. Where we end up on that scale will depend mostly on how much fossil fuel the world burns.

"The report is an unequivocal set of evidence on how we are affecting our planet," concludes Achim Steiner, executive director of the United Nations Environment Programme. "The focus of attention must now shift to what we are going to do about it."

In the short term, attention will focus on further IPCC publications. The working group behind the current report looked only at the physical basis of climate change, but the IPCC has two other working groups that focus on the impact of climate change and what can be done about it. These will issue their 2007 conclusions in April and May, respectively.

After that, the decision about what to do rests with politicians. And if climate scientists are to inform those decisions they may need to reform the IPCC. Publishing coordinated and lengthy assessments at six-yearly intervals makes it difficult for authors to deliver timely advice and deters those from different working groups from collaborating. That's a problem, says Jonathan Overpeck, an IPCC author and palaeoclimatologist at the University of Arizona, Tucson, because producing research that can inform policy requires social and natural scientists to work together.

For example, the new report contains detailed regional predictions, such as that the western United States will warm on average by 5 °C by 2100. Such predictions will be needed regularly in the future, says Overpeck, and must include details such as the impacts on agriculture and water resources. Hulme agrees,

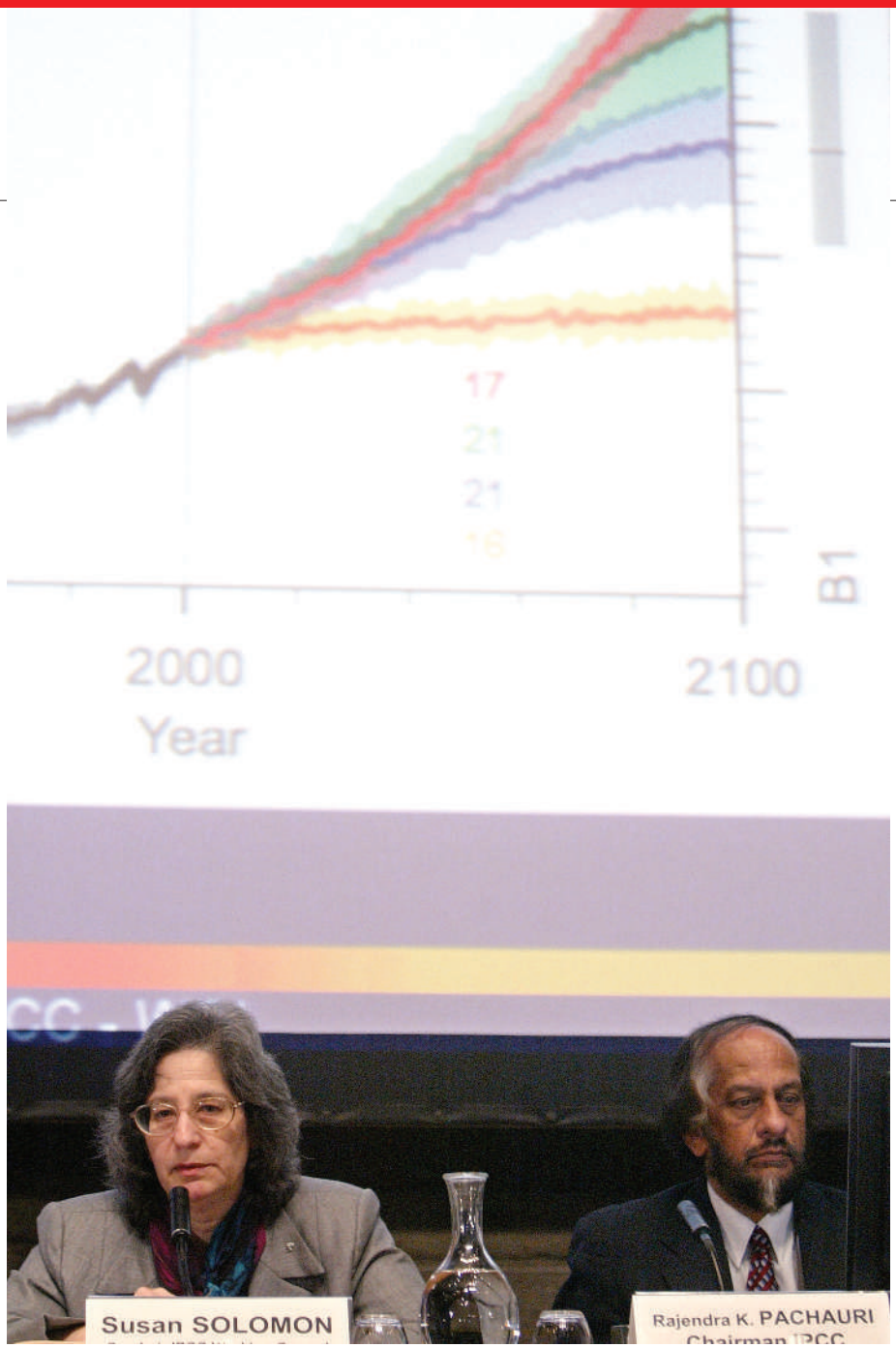
Behind the scenes

With the world's media ready to leap on the report's long-awaited conclusions, deciding the final wording of its summary was a sensitive process. After climate scientists completed a draft document last year (see *Nature* **441,** 6–7; 2006), political representatives spent the Paris meeting negotiating the summary line by line, with researchers in attendance to make sure vested interests didn't distort the science.

The consensus from the scientists is that the process worked well, with the final summary a fair representation of their conclusions. The United States has in the past been accused of seeking to play down some of the more alarming conclusions, but no such charges were levelled on this occasion.

There were a couple of sticking points. The Chinese and Saudi Arabian delegates annoyed scientists by insisting that a line stating that man-made warming "is at least five times greater than that due to solar output changes" was cut. But the data remain in the report.

Another hot topic was the contribution that melting polar ice makes to sea level rise. The publication of new papers on the subject, one on the day before the report itself (see page 580), prolonged the debate. But some researchers still felt the new results weren't properly considered, and that the final figures, which predict a sea-level rise of 0.18–0.59 metres by 2100, are too conservative. **J.G.**



E. CLEMENT/UPI PHOTO/NEWSCOM

Bearing bad news: senior IPCC figures Susan Solomon and Rajendra Pachauri unveil the panel's report.

adding that as the emphasis shifts from talk to action, IPCC reports will need to come in regular "digestible chunks" for policymakers.

Climate modellers must also aim to produce information that can inform policy directly, says Kevin Trenberth, a climate researcher at the National Center for Atmospheric Research in Boulder, Colorado. That means filling the gap between long-term simulations looking decades ahead and weather forecasts, to provide predictions for the next 20 or so years. "Some of what is in the research domain needs to become operational," argues Trenberth.

Rajendra Pachauri, chair of the IPCC, says he will circulate a document on possible reforms in the next couple of months, adding that he supports the suggestions made by the report's authors. Any change needs the approval of the political representatives who sit on the IPCC plenary and meet once or twice a year.

But some urge caution. The IPCC already produces reports from across the working groups, such as its 2005 study on carbon capture and storage, points out Halldor Thorgeirsson, a deputy executive secretary at the United Nations Framework Convention on Climate Change, the body that oversees the Kyoto Protocol. And the IPCC process drives research — because climate modellers pool resources when a report is coming up. That informs all three working groups. "We can't allow the scientific activities that underpin the assessments to dry up," says Thorgeirsson. ■

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WHAT THEY'RE SAYING

"This may be remembered as the day the question mark was removed from whether human activity has anything to do with climate change."
Achim Steiner, head of the United Nations Environment Programme

"Now is not the time for half measures. It is the time for a revolution."
French president Jacques Chirac

"The question is, what can we do now? There's very little we can do about arresting the process."
Anote Tong, president of the Pacific island nation of Kiribati

"This should compel all of us towards action rather than the paralysis of fear."
Martin Rees, president of the United Kingdom's Royal Society

"Now it's time for us — the policymakers — to do our jobs."
Bart Gordon, Democratic Congressman from Tennessee and chair of the US House Committee on Science

"This is a group of climate experts attempting to reach a scientific consensus. It doesn't commit governments to any course of action."
Pradipto Ghosh, senior official at India's Ministry of Environment and Forests

"For sure, humans cause global warming!"
Headline from China's Xinhua news agency

"Let's be realistic. You can only run power stations in a modern Western economy on fossil fuel, or, in time, nuclear power."
Australian prime minister John Howard, whose country has not ratified the Kyoto protocol

"Those who continue to ignore the threat will be doing the greatest disservice imaginable to current and future generations."
Marthinus van Schalkwyk, environmental affairs minister for South Africa