

SPECIAL REPORT

Climate takes aim

Attention is now turning to the developing world, where those least equipped to handle it will bear the brunt of global warming. **Michael Hopkin** reports.

BRUSSELS

The Intergovernmental Panel on Climate Change (IPCC) is not known as a bearer of good news. In February, it reported that human activities are almost certainly causing the planet to warm (see *Nature* 445, 578–579; 2007). On 6 April in Brussels, Belgium, it delivered an even more sobering message: that billions of the world's poorest citizens are at risk of hardship and disease as a result of climate change.

Attention is now shifting from arguments over whether the world is warming to what should be done about it. And all six-billion-plus on the planet should be concerned, the IPCC's report implies. The people most vulnerable will be those who live at or near sea level, often crowded into cities along the coast. But drought, disease and extreme weather events will also become more frequent around the world, threatening the lives and livelihoods of countless more.

"No one will escape the impacts of a warming planet," says Patricia Romero Lankao, a sociologist at the National Center for Atmospheric Research in Boulder, Colorado, and an author of the report.

What's more, many of the effects of climate change are already evident in physical and biological systems, the report says (see map). Regional climate changes are affecting natural systems on every continent, with the Arctic, sub-Saharan Africa, and Asian mega-deltas among the worst affected.

The *Climate Change Impacts, Adaptation and Vulnerability* report is the second instalment of the IPCC's Fourth Assessment, a summary of the current state of knowledge about climate change. The third assessment was published in 2001. Crucially, this report is the first to link actual data on how natural systems are responding to the amount of warming they have experienced. "For the first time we are no longer arm-waving with models," says Martin Parry, co-chair of the IPCC's Working Group II.

Authors compiled more than 29,000 data sets, on everything from glaciers to the timing of spring foliage, and compared the trends with the amount of regional warming observed in each area since 1970. In more than 90% of cases, the changes in natural systems were consistent with predictions of how they would behave in a warming world. "Regional changes are happening on a global scale," says Parry, although more data are needed from the developing world.

The report was also the first major attempt to predict what physical changes might take place under a range of future warming scenarios. At high latitudes such as in northern Europe, crop yields are expected to flourish under modest climate warming. But rises of greater than about 2 °C look set to diminish agricultural productivity the world over (see 'What's new').

By evaluating which systems are the most likely to be altered by future climate change, the report's authors have tried to predict the

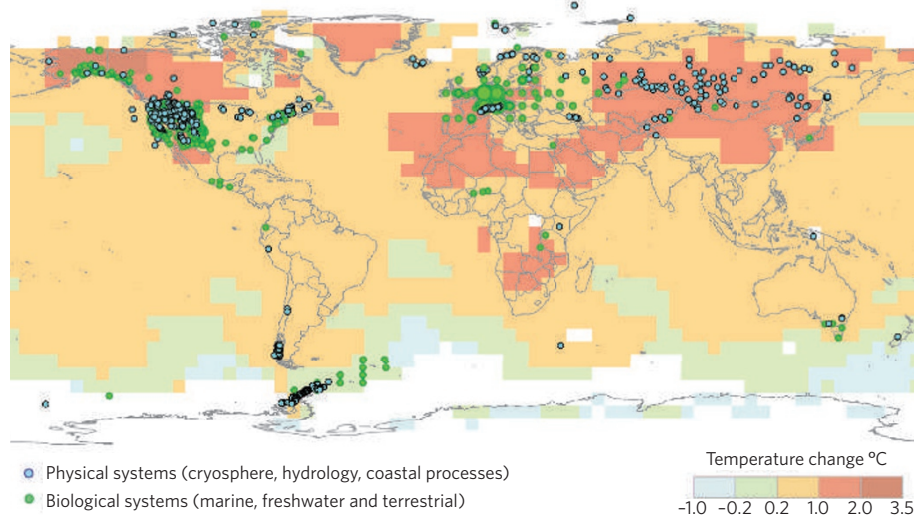


knock-on effects for humans. Most at risk are the estimated 100 million people who live within a metre of sea level. Meanwhile, as many as 250 million Africans are predicted to be at risk of water shortages, and drought will also damage agriculture at low latitudes. "We have 500 million people hungry today," says Parry. "We're gonna get a lot more."

In terms of health, vector-borne diseases such as tick-borne encephalitis and dengue fever are expected to increase as insects expand their range. So too will extreme weather events such as the 2003 heatwave that killed thousands of people in Western Europe.

The report builds on that of the IPCC's first working group, which announced in February that it had 'very high confidence' that global warming can be attributed to human activities. But whereas the report from the first working group was carefully couched in language of confidence and likelihood, many such phrases are absent from the policy-makers' summary of the second working group's report. Before the launch in Brussels, the report's lead authors stayed up all night deliberating the finer points of the policy-makers' summary, which boils more than 1,500 pages down to a mere 23. Several delegates from the research community

Observed changes in physical systems, biological systems and temperature for 1970–2004



SOURCE: IPCC



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NASA

FLPA



At high latitudes, crop yields may improve with modest climate warming.

What's new?

Compared with the last report of the Intergovernmental Panel on Climate Change published in 2001, the latest version adds some details about the effects that can be expected from climate change. These include:

Some 20–30% of animal species — at least those studied so far — could be at risk of extinction if global temperatures rise more than 1.5–2.5 °C.

Fisheries in large lakes in Africa could be adversely affected not only by overfishing but also by rising water temperatures.

Glaciers melting in the Himalayas could reduce the amount of water available for people to drink, as well as destabilizing slopes and lessening river runoff.

More drought and fire could place croplands and forests in southern and eastern Australia at risk.

Agricultural land in Latin America could turn to desert and grow saltier.

On small islands, invasive species could arrive sooner as temperatures rise.

stormed out during the negotiations, albeit to return later. China and Saudi Arabia, in particular, were said to have put pressure on to soften the language.

Cynthia Rosenzweig of NASA, a lead author of the report and one of those who left the negotiating session, says that the differences over the confidence statements were because many of the government delegates wanted the statements to be ditched. “But we wanted governments to know that we felt strongly that the ‘very high confidence’ statement was justified,” she says. Statements of confidence remain in many phrases of the summary, and the altered phrases now reflect the evidence used to support the findings. One passage reads, for instance, that “Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases.” Rosenzweig says: “We have a direct statement now, which in some ways implies a confidence level.” Removing qualifications, she adds, “has nothing to do with climate evangelism.”

Although the report’s predictions are certainly serious, Parry denies that they are dire. “It is a good, tight process, and the real key is

that governments have to buy into it — it is an intergovernmental panel,” he says.

That government buy-in should take the form of both adaptation and mitigation — the two buzzwords of how to deal with climate change. Although the second working group’s brief was to examine only one of these approaches — adaptational measures, such as improved healthcare or flood defences — the report also included a chapter on combined approaches that involve both adaptation and mitigation, such as carbon-reducing policies. The third working group of the IPCC is due to release its report, specifically on mitigation, in Thailand on 4 May.

Adaptation is the key to the next few decades, says Saleemul Huq of the International Institute for Environment and Development in London, one of the report’s authors. The report says that even if no more carbon is put into the atmosphere, average warming of 0.6 °C can still be expected over the rest of the century. “Adaptation is the only option in the short term,” Huq says. “However, as we extend to the longer term — the next ten or fifteen decades — the only solution for that is to do mitigation now. If we

fail to do either of them now we will suffer.”

Ivo de Boer, executive secretary of the United Nations Framework Convention on Climate Change, which governs the Kyoto Protocol regulating greenhouse-gas emissions, hopes that the report will provide impetus for negotiations for a climate treaty to replace Kyoto when it runs out in 2012. “I hope it will make it clear to politicians that time is running out,” he says.

One of the cruel ironies is that among the few set to gain, at least in the short term, from the agricultural benefits conferred by climate warming are those with the highest greenhouse-gas emissions. And yet the central message of the report is that climate change is likely to hit hardest those who can do least to defend themselves.

Nevertheless, the risks are not confined to poor countries, says IPCC chair Rajendra Pachauri. “It is the poorest of the poor, even in richer societies, who will be affected the most significantly,” he says. “People who are poor are least equipped to be able to adapt to the consequences of climate change.”

Michael Hopkin

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