nature

15 March 2001 Volume 410 Issue no 6826

Better climate data required

The global observing system provides the raw data climate research relies on. But the quality of the gathered data is patchy. The system needs improvement — on land and on sea.

In January, the Intergovernmental Panel on Climate Change (IPCC) startled the world with a frightening climate scenario: by 2100, global temperatures could rise by almost 6 °C. Fortunately, this is only a worst-case scenario. Other models predict a temperature rise of only 1.4 °C. Most probably, the rise in the next decade will lie between these extremes. But there is also a small chance that none of the IPCC's scenarios will come close to reality.

So is climate prediction no more than a game of chance? Not quite — but it is closer to one than it need be. The accuracy of any model depends significantly on the quality of the underlying raw data. The problem is, the quality is patchy.

Monitoring and predicting the global climate requires a reliable system of constant observations, rapid data exchange and long-term recording, in standardized formats. That is why, in 1992, the Global Climate Observing System (GCOS) was established. Its aim is to ensure that climate-relevant information is obtained and made available to all potential users. The creation of GCOS was a major advance, but the reporting system has significant deficiencies, and there are large gaps in global and regional coverage, which seriously affect climate assessment and modelling efforts.

Terrestrial climate monitoring is currently based on a network of around 1,000 GCOS observation stations. But the reliability of the data that some of them collect is inadequate, and a disproportionate number of these stations are in rich countries, with sparse coverage in many regions of Africa, South America and Asia. Although no one can say how many climate data are needed for accurate monitoring, clearly the geographical distribution should be as even as possible.

But a GCOS station costs up to $500,000 per year to operate and maintain — too much for poorer countries. And maintenance costs are particularly high in remote polar regions; over the past years, several stations have been closed, for example, in Russia and Canada.

Under the United Nations Framework Convention on Climate Change, all countries are required to set up and run appropriate observation programmes, and to exchange data with other nations and with international organizations. But in practice, many poorer countries spend little on their regional climate observations. The training of technical staff and the maintenance of instruments at their observation stations are often inadequate. Through misreporting, instrumental drifts and biases, unreliable communication infrastructures or political unrest, about half of the world's climate data potential is lost or corrupted each month.

The World Meteorological Organization gives regional training and technical support. But this is not enough. The United Nations should also help poor countries to collect and distribute accurate and consistent data sets.

Sea-based climate observation and ocean monitoring, which is likely to add significantly to our knowledge of what drives atmospheric processes, is only just beginning. The deep oceans in particular are still under-observed. Efforts must continue to implement a more systematic ocean observation system. The Global Ocean Observing System (GOOS), founded with GCOS, has the right approach. GOOS coordinates the use of new technologies, such as meteorological buoys, which measure climate-relevant variables in and over the oceans. But it must be expanded.

A worldwide network of sea-based observation buoys will not come cheaply, and will need strong international coordination. Projects such as the Tropical Ocean Global Atmosphere programme, which ended in 1994, have shown that systematic ocean observation is essential for predicting El Niños or seasonal weather. There is a strong case for heavy investment in ocean meteorology. ■

A danger to society

Research into the biological basis of psychopathy deserves higher priority.

Considering the acres of newsprint devoted daily to the exploits of cold-blooded killers, our ignorance of their underlying personality disorder is rather shocking. More than a quarter of the inmates of many high-security prisons can be classified as psychopaths — individuals with an emotional deficit that renders them fearless and lacking in empathy. Many psychiatrists now accept that the underlying condition is biological, and can even be viewed as a 'disease'.

Unfortunately, our understanding of the biological basis of psychopathy remains rudimentary. There has been but a smattering of research into its physiological correlates, and attempts to apply the techniques of neuroimaging to study the brains of psychopaths have so far generated as much heat as light (see page 296). But, at present, we do not even know the incidence of psychopathy in the general population. Could it be true, as some psychopathy experts have only half-jokingly hypothesized, that the traits of psychopathy are actually an advantage in some careers, such as politics?

A comprehensive programme of research — ranging from neuropharmacology, through brain imaging, to traditional psychiatric and behavioural approaches — could help to identify what makes criminal psychopaths notorious recidivists, and how best to treat them.

Such arguments lack popular appeal. The public seems more concerned about punishing violent criminals than rehabilitating them. The idea of sending such people for treatment in secure mental hospitals, rather than to prison, is widely disparaged as a 'soft' option.

We can argue about whether criminal psychopaths are mad, or bad. But there is no doubt that they can be extremely dangerous to know. And the current system, in which violent criminals may be released without having addressed the personality disorder that predisposed them to offend in the first place, serves no one well. There must be a better way, and research into the biological roots of psychopathy may lead us there. ■