Montserrat residents 'lost faith' in volcanologists' warnings

[LONDON] Scientists on the Caribbean island of Montserrat lost credibility in the eyes of the island's inhabitants by wrongly predicting when its volcano would erupt during 1996 and 1997, according to a survey of the island's residents.

The survey is due to be published within weeks, and could have a significant impact on debates about the role of science communication in disaster management policy.

David Sanderson, a researcher at the Oxford Centre for Disaster Studies and co-author of the survey, says the island's residents were disappointed when scientists made mistakes, and were confused by their use of complicated jargon when explaining the volcano's activity.

Sanderson says that the scientists were not only expected to know in advance when the volcano would erupt, but also to communicate this information in layman's terms.

The British government commissioned the survey in the aftermath of major volcanic activity last year. More than 20 people died trapped in their homes, despite daily warnings to leave the area. Preliminary findings were revealed at last week's annual meeting of the Geological Society of London.

Stephen Sparks, professor of volcanology at the University of Bristol and chief scientist at the Montserrat Volcano Observatory, accepts that mistakes were made, and that scientists working in disaster situations need help communicating risk information.

AP/CHRIS BRANDIS

Heated debate: a resident of Montserrat discusses a deal offered to inhabitants of the island by the British government last summer, as ash and steam billow from the Soufriere Hills volcano behind. Volcanologists on the island, criticized by residents for their poor forecasting of eruptions, say it proved difficult to convince those who have lived safely in an area all their lives that it had become dangerous.

"Volcanology is an uncertain science," he told the meeting. "There are aspects we do not understand. But we are not trained to communicate doubt and uncertainty." Sparks added that scientists need feedback from the public as well as "help from people like sociologists and disaster managers".

The findings of the survey also have implications for the role of scientific advice to governments involved in disaster situations. Some scientists at last week's meeting said privately that their task of communicating information about risks was further complicated by the lack of a disaster preparation plan, as well as by politicians' unrealistic demands on their expertise.

Montserrat is a small island 11 miles long. The volcano is in the south, and has been quiet for much of this century. Volcanic activity was renewed in July 1995. Much of the south, where most people lived, is now covered in ash following the 1997 eruption. Most of the island's 12,000 residents have been evacuated; the rest are now in the safer north. The volcano is now relatively quiet.

Local criticism of the observatory stems from the scientists' patchy record in predicting eruptions, and the direction of the flows of hot ash and magma — known as pyroclastic flows. The observatory's staff failed to predict the explosion of magma on 17 September 1996, which caused a 40,000-feet high plume of ash, and deposited 600,000 tonnes of ash on the south of the island.

Their prediction of a similar eruption in December the same year turned out to be a false alarm. Residents who had been evacuated were sent back to their homes.

Six months later, more than 20 people died in and around their homes during a third major eruption in June 1997. Sparks says an evacuation order warning of this eruption had been given months in advance. "We don't really understand why people were still in there against official advice." One possible reason, says Sanderson, is that people were reluctant to move to the less developed north of the island.

Sanderson says that many of the island's residents said they felt the scientists' prediction record was sometimes no better than their own. Islanders said that generations of residents had monitored the volcano all their lives, and had observed changes in rockfalls, pyroclastic flows, sea level, humidity and animal behaviour.

They wanted scientists to tell them more than they already knew. "I still believe that the scientists do not have the capability to alert us when it's needed," said one resident. "You have to alert yourself."

The survey also revealed that there was

Australian research centres escape axe

[SYDNEY] **After a long battle, the future of Australia's Cooperative Research Centres (CRCs) seems to have been secured. The latest review of the scheme has led to the Coalition government committing annual funding at the reduced level of last year — A$138 million (US$104 million) — and approving a round of applications for new centres, in competition with the 35 existing ones which are eligible for renewal.**

The CRC scheme is widely seen as a successful strategy linking government, university and industry researchers on tightly focused tasks, mostly with medium-term, commercial goals. Successful centres have previously had to raise substantial funding from partner organizations to supplement a government grant of about A$2 million a year for seven years, with the possibility of a second seven-year term.

But the scheme, established by the previous Labor government, had recently appeared vulnerable under the conservative Coalition, with cuts in last year's budget and a drastic call from an industry review for a 70 per cent cut in government support (see *Nature* 387, 222 & 388, 507; 1997).

The decision, announced last week by the science minister, John Moore, was greeted with relief by the heads of the 67 CRCs, who had mounted a sustained lobby to defend the scheme. But the government has not yet released details of changes recommended in the latest review, 'guided' by the chief scientist, John Stocker, and former banking chief Don Mercer. This is now a focus of some lingering concerns.

Paul Wellings, the official in charge of science and technology in Moore's department, says there will be more emphasis on the commercialization of research. "The CRCs [need] very good business plans and a clear sense of what they are going to deliver," he says. Peter Pockley

widespread confusion about the eruption warning system put in place by scientists and the local authorities, as well as tensions between scientists and the authorities over the nature of this warning system.

The system used sirens to alert residents of an impending eruption, daily newspaper and radio reports by scientists, and maps agreed by government and scientists indicating the risks in different areas.

But survey respondents voiced dissatisfaction with most of these methods, and relied instead on information passed by word of mouth. The radio reports were considered by some to contain too many technical words. And the 'risk maps' introduced after the September 1996 eruption to educate people about the level of risk caused much confusion, and had to be simplified.

The early maps divided the island into seven zones, each with one of six different levels of risk, or 'alert level'. The maps were updated six times as data changed.

Sanderson says this level of detail baffled residents, and the maps were simplified to just three zones as the volcano became more active. Many islanders were unaware of the existence of the earlier maps. Others did not know which zone they lived in. Some were unaware of changes to the status of their zones. "Eighty-eight per cent of respondents in a zone previously considered 'unsafe' did not know that this had changed to a zone considered highly dangerous," says Sanderson.

"All this talk of zoning is confusing the man on the street," said one respondent. "All these words such as 'progressive gravitational induced collapses', and pumice falls and all this — what does it mean?"

The risk maps had to be cleared by the authorities, and scientists and politicians had differing views on what they should contain. Richard Robertson, of the Seismic Research Unit at the University of the West Indies, says that scientists favoured simpler maps. But the authorities insisted on 'micro-zonation', as they did not want to evacuate the whole of the south, even though the scientists themselves were not sure of the accuracy of their predictions.

The question of whether scientists could forecast the timing and direction of pyroclastic flows to within a margin of error of metres is a "moot point", says Geoff Wadge of the University of Reading, who also worked at Montserrat. He says scientists were never forced to do anything. But he acknowledges "pressure to do micro-zonation".

Wadge says that, despite its failings, micro-zonation at Montserrat had its uses. He says that the authorities there have a difficult job. They need to balance the desire not to destroy a stable community with that of public safety. A complete evacuation and no eruption would have damaged the economy, but allowing people to live as normal might have led to many more deaths. **Ehsan Masood**

UCAID

Hot wired: the new Abilene network will form a high-speed data communication backbone serving the main research universities in the United States. Fibre-optic cables will run mainly under railway lines, where they will be relatively safe from accidental disruption.

Faster Internet system will overcome congestion

[WASHINGTON] Research universities in the United States will gain access to a new and immensely powerful Internet upgrade early next year. It should enable them to by-pass congestion on the existing Internet and conduct experiments that involve a far larger volume of data transfer than is now possible.

Under an agreement announced at the White House in Washington last week by Vice-President Al Gore, the new network will be built and operated by private contractors. It will serve as a backbone network for Internet2, a project involving 160 US research universities that have combined to arrange faster links than are at present available from commercial suppliers.

The network, called Abilene, is being built by Qwest Communications — a telecommunications corporation based in Denver, Colorado — together with two technical partners, Nortel and Cisco. Most of the backbone will run under railway lines, where its fibre-optic cables are relatively safe from accidental disruption.

When it comes on line at the end of this year, the network will allow data transfer at up to 2.4 gigabits per second, later rising to 9.6 gigabits per second. The existing very high performance Backbone Network Service (vBNS), which the telecommunications company MCI operates between 92 research universities for the National Science Foundation (NSF), runs at 600 megabits per second. Most domestic and commercial users of today's Internet are lucky to get 100,000 bits per second in the United States, say experts.

Qwest and the other commercial suppliers say they do not expect Abilene to generate substantial direct revenues from the research universities using it. According to Joseph Nacchio, president of Qwest, the university network will be useful to his corporation mainly as a test-bed for future commercial networks, and also as an entrée to telecommunications business from the universities.

Analysts expect these new research networks to serve as precursors for the public Internet of the future, paralleling the way NSFnet, the network that NSF operated for the universities in the early 1990s, foreshadowed the existing public Internet.

Gore extolled the new agreement as "a startling advance" and predicted that advances in voice interaction technology would soon make the World Wide Web available to "hundreds of millions of people". Researchers will use it for real-time access to supercomputers and to construct Internet applications in fields such as 'telemedicine' and industrial control that need prompt, reliable delivery of information.

The Internet2 consortium was established last year by research universities worried about severe congestion on the Internet. Each of the 160 institutions has paid $25,000 to join the consortium and pledged to spend at least $500,000 upgrading its own systems to link with the backbone networks.

Abilene will run alongside vBNS, but will run faster and is due to continue operating after NSF's support for vBNS expires in the year 2000. US government agencies are already researching even faster links under the Next Generation Internet initiative. Gore also announced last week the award of 27 major research grants by the Defense Advanced Research Projects Agency, worth $50 million over three years, to develop applications for this still-faster network.

Some observers believe the availability of these high-speed links will lead to new pricing structures that will directly charge their users. "We are going to see a replay of the situation we used to have with mainframe computers, where you pay for what you use," predicts Stephen Wolff, a former network manager at NSF who now works for Cisco.

The deal suggests that universities may get cheap access to fast networks from suppliers interested in the much larger market that will emerge when industry and business start using the technology. **Colin Macilwain**