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**

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