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LIVING ON THE EDGE

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ILLUSTRATION: ALLAN M. BURCH

In New Zealand, being a seismologist is the nearest you will get to "glamour science." In fact, being a "natural hazards scientist" (seismologist, volcanologist, landslide engineer, or hydrologist) means that you are likely to be quite a hit at parties. Apart from the inevitable "Did the Earth move for you" line that slips easily from drunken lips, the conversation is likely to stray to "I saw you on TV" or "I heard you on the radio." You may even be asked about your science: "Why do earthquakes happen in Wellington?" "Did the nuclear tests in India and Pakistan cause more earthquakes for us?" and the inevitable "Aren't we due for the Big One?" By this stage your entomological and paleontological friends have had to resort to witty conversation about local government reform.

In the immediate aftermath of a natural disaster, natural hazards scientists have an easy time bridging the gap to the national consciousness because suddenly everyone understands how relevant science is to their lives. Research funding seems to travel swiftly on the heels of a major earthquake or volcanic eruption (as happened after the 1995 Kobe, Japan, and 1989 Loma Prieta, California, earthquakes). But after things have quieted down and the ground has stopped shaking, nobody wants to hear from seismologists or volcanologists any longer. The money dries up and people begin to talk about "welfare for scientists." During these "quiet" times, people come out of the woodwork shouting, "If you can't stop earthquakes, why are you spending all this money studying them?" or, "If we need seismologists, why don't we just hire some from California?"

These peaks and troughs of popularity and funding are most keenly felt by my volcanological colleagues. Before 1995 no New Zealand volcanic eruptions had had a significant effect for 50 years, although 337 people have been killed by them since 1846. In 1995 and 1996, relatively minor eruptions of Ruapehu, an andesitic volcano in the central North Island, caused havoc with air traffic and wiped out two skiing seasons. Volcanologists, already working mind-numbingly long hours, had to contend with such intense media interest that they were stretched to keep up with data analysis in anything like real time. After Ruapehu quieted down, the real eruptions began: "Who was going to pay for all of these scientists?" "Should scientists get overtime—don't they just do it for fun?" While research contracts covered the scientific work, they did not cover all of the extra hours of work required to inform the national and international media, to supply industry-specific information to utilities, government agencies, and transport operators, and to provide information to a very curious public. The scientists work for the government-owned Crown Research company, which is expected to operate in a businesslike manner. But is it businesslike, or even fair, for a company to be expected to have staff on call 24 hours a day to provide information to the public? The debate around this is still going on and will probably recur the next time we are shaken up as the planet lets off a little steam.

Because most of us watched the Ruapehu eruption on television or on the Internet, safe and far away from the actual event, we could view it as just another entertainment experience. But things were very different for the locals, people who had built their lives around the skiing industry. They were outraged because it affected their livelihoods, their homes, and their lives. Why, they asked, wasn't the government doing something?

Some might say that they had a fair point, while others might say that life is a series of choices and risks, and that choosing to base your life on literally shaky ground is a risk to be considered at the outset. If you build a house on an active floodplain, it seems reasonable to expect floods. Equally, if you live on a volcano it is reasonable to expect volcanic eruptions—after all, that is what volcanoes do! As individuals in an informed society, we have to recognize the link between risk that is freely entered into, and personal responsibility.

Many New Zealanders seem to believe that the potential for large-scale natural disasters disappeared around the time that the first European settlers arrived (about 1840), and while that is not the case, their attitude is understandable. In 1855 a large (magnitude 8.2) earthquake occurred less than 50 kilometers from Wellington, the present capital, and while all brick buildings were destroyed, there was little loss of life because the population of about 6000 was mostly living in wooden houses. But as a seismologist, I am acutely aware of the risks associated with earthquakes, and I know that a major fault dissects Wellington city. I also know that recent research shows that major earthquakes (magnitude ~ 7.5) have occurred with a return period of 600 ± 300 years. The last large rupture on this fault was about 350 to 450 years ago, and this significantly increases the probability of a major earthquake in the next 50 years. My house is within 500 meters of the Wellington Fault, and I have five colleagues who live within 50 meters of it. Does this knowledge change the way we live as Wellingtonians and New Zealanders? Do we lie awake at night worrying about earthquakes? No, but many of us take earthquake preparation seriously—we have planned for batteries, food, water, and family communications—and agree that since we cannot stop it, there seems little sense in worrying about it.

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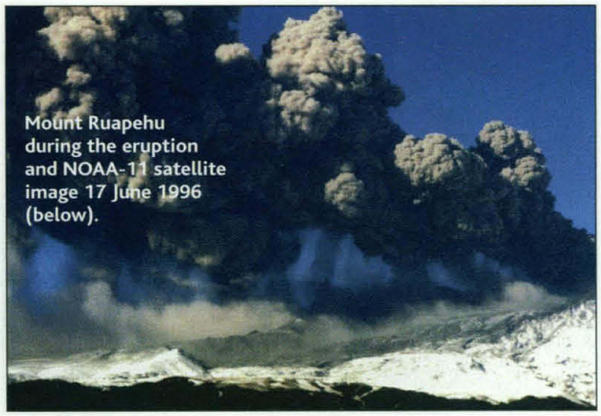
In the Wellington region (population ~ 200,000), the local authority has worked through the scenario of a shallow-depth magnitude 7.5 earthquake centered on the capital city. Their models suggest over 17,000 displaced households representing nearly 53,000 people. Reinstatement of lifelines such as water, energy, telecommunications, and transport systems is likely to cost around U.S.$9 billion. For a country as small as New Zealand (population 3.4 million) this scenario is daunting, but it is sobering to compare it with the relatively moderate 1994 Northridge, California, earthquake (magnitude 6.7) which occurred in a residential area of 1.2 million people. Even taking into account the different population bases, the 57 fatalities and total cost of over U.S.$30 billion for the Northridge earthquake would need to be scaled up for Wellington. Authorities are working to minimize the disruption and loss of life by identifying and securing major lifelines, but full mitigation is neither practicable nor economically viable. When it comes to the inevitable, the best we, as citizens, can expect is that local authorities have realistic response plans in place to pick up the pieces as quickly as possible.



Mount Ruapehu during the eruption and NOAA-11 satellite image 17 June 1996 (below).

GERALD SPEERS

"IN THE IMMEDIATE AFTERMATH OF A NATURAL DISASTER, NATURAL HAZARDS SCIENTISTS HAVE AN EASY TIME BRIDGING THE GAP TO THE NATIONAL CONSCIOUSNESS BECAUSE SUDDENLY EVERYONE UNDERSTANDS HOW RELEVANT SCIENCE IS TO THEIR LIVES."

This brings me back to the question of why we should bother with research if we cannot stop natural disasters. I believe that there is a strong obligation for governments to fund risk analysis work because each and every one of us deserves the best possible information about natural hazards. If we are to make informed choices about living in Wellington, for instance, we should understand the risks as much as possible. In many instances the value of information-gathering of natural hazards is marginalized and confused with their "entertainment" value because people love to know about the disaster sciences (earthquakes, floods, hurricanes, volcanoes, and landslides). Indeed, natural hazards programming is competing with "real life" hospital dramas as the stock-in-trade for prime-time television and movies.

Science's role of providing information for risk analysis involves more than the collection or interpretation of data. Science also seeks to promote a clear understanding of the complex human interactions that arise in response to crisis. Where natural hazards are concerned, informing people of the risks is not sufficient. The Ruapehu eruption is a prime example of this—there was no shortage of warnings about the volcano and what might happen. However, many people seem not to have heard the message, while others chose to discount it as fear-mongering from pointy-headed scientists.

We need a better understanding of how people respond before, during, and after a hazard. This lack of understanding was brought sharply into focus when several Maori people living near Ruapehu announced that they were unwilling to evacuate their homes. Even if the eruption became extreme they would not leave because they were bound to the land by strong spiritual links. Fortunately, the volcano did not become a full-scale eruption, and emergency response organizations were spared from deciding how best to deal with the situation.

The interaction between science, public perceptions, and risk analysis is changing. In the past, scientists ruled. We determined probabilities, sometimes told the public about them, then retreated to our labs. Now the public demands more. It wants a voice in deciding what is acceptable risk. The BSE (bovine spongiform encephalopathy, or "mad cow disease") experience was a turning point for all scientists, and we are unlikely to regain the moral high ground that we once occupied so confidently.

In New Zealand we tend to focus on the fire-and-brimstone natural hazards, but the arrival, natural or not, of a serious biological pest would also have profound effects on our economy and ecosystems. The likelihood of such a biosecurity hazard eventuating is high. Research shows that species brought to New Zealand 40 to 50 years ago are now proving to be the pests that are invading our relatively pristine indigenous ecosystems. Every year about 600 new species of garden plants are brought into New Zealand. Will the home gardeners of 50 years ago stand up and take responsibility? Will the home gardeners of today be prepared to have their choices limited because of potential risk? It seems clear that, no less than the informed choice and personal responsibility attached to living on an active floodplain, personal and public policy decisions that affect our ecosystem must be based on a strong understanding of it.

STEPHEN MCNEILL/LANDCARE RESEARCH

Living in a country like New Zealand—shaped by the effects of natural hazards—brings with it the responsibility of understanding and acknowledging risk, and this requires a strong research base that informs our personal and collective judgment because research that simply informs of risk is not enough. The creation earlier this year of the Environmental Risk Management Authority (ERMA), and the new Emergency Management Organization—a parallel organization to manage "civil" hazards—is tacit acknowledgement that the government recognizes its critical role in this undertaking. Working within the Ministry of Civil Defense, the challenge for these organizations will be to successfully manage public expectations and promote better understanding of risk. The task of developing a common understanding between scientists, the public, and political systems will be our next party trick.

ILLUSTRATION: TERESE WINSLOW