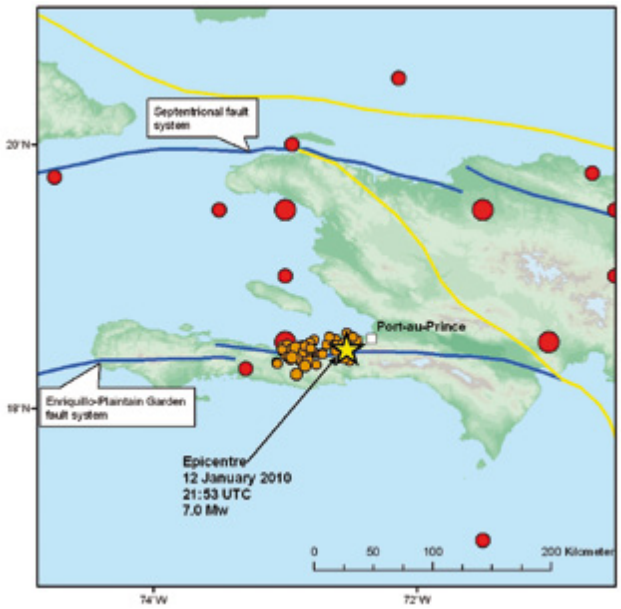
Natural disasters such as the Haiti and Chile earthquakes can devastate lives, the environment and the built infrastructure. Unfortunately, in the future, events such as these are a case of 'when' rather than 'if'. **David Kerridge** asks if we are prepared for the next 'big one'.

Predict or prepare?

Risk and impact assessments consider how to control the ingredients combining to create a disaster: the hazard, exposure and vulnerability. Scientific research into processes, supported by ground- and space-based measurements, is rapidly improving our knowledge and understanding of natural hazards. However, we do not usually have the ability to intervene to control the hazard, especially where processes, such as those in earthquake generation, are involved.

Global population is increasing rapidly and concentrating in urban areas. The megacities in the world's poorer nations have rapidly growing informal settlements and many are in locations prone to damaging events. Where planning and construction standards are poor, vulnerability is high and large populations may be exposed to multiple natural hazards. It is probably impossible to reverse the drivers leading to migration to cities, but it is entirely realistic to make cities more resilient, which is a theme of the UN International Strategy for Disaster Reduction. Science (and engineering) can contribute significantly to this goal, given effective communication resulting in take-up of knowledge by policy- and decision-makers, planners, and civil communities.

Future earthquakes damaging many of the world's major cities are inevitable; it is a case of 'when' rather than 'if'. Science can readily identify the areas at risk and methods for engineering earthquake-resistant buildings, including retro-fitting of structural supports, are well established and add comparatively little to overall construction costs. It is generally well appreciated that, in purely monetary terms, the costs of disaster recovery can be very significantly reduced by investment in disaster



The two images above relate to the Haiti earthquake. In 2010 the destructive power of the magnitude 7 earthquake is believed to have claimed 230 000 lives; in contrast current estimates of fatalities caused by the magnitude 8.8 Chilean earthquake stand at less than 1000, even though the earthquake released 500 times the energy of the Haiti event.

A plume of volcanic ash from the eruption of Eyjafjallajökull, Iceland, was a potential hazard for aeroplanes. UK airspace was closed from 15–20 April 2010, causing significant disruption, and was reopened following new guidelines about ash densities that could be tolerated by aircraft.

preparedness and mitigation. This understanding has translated into policy in some countries but not in others. The comparative number of deaths in Haiti and Chile illustrates this point (see Haiti photograph). It is not an exaggeration to say there is the potential for the loss of a million lives in a future earthquake. The earthquake cannot be prevented, but the human cost can be reduced through actions taken in advance.

It is natural to ask 'Why wasn't the earthquake predicted?' after disastrous events, but despite decades of research, earthquake prediction remains beyond our reach. To reduce the consequences of future earthquakes it is more pertinent for societies, planners and decision-makers in earthquake-prone regions of the world to ask 'Are we prepared for the next major earthquake', and to seek scientific and engineering advice on this question. The difficulty of earthquake prediction should not be allowed to diminish confidence in the ability of science to help reduce earthquake risk.

In April 2010 many airports in Europe were closed because of ash clouds from the eruption of the Eyjafjallajökull volcano. This developed into an emergency as the number of days of air travel shut-down increased. But why were we taken by surprise? We are very familiar with volcanoes such as Krakatoa, Vesuvius, Etna, Pinatubo, and Mount St Helens. It was simply 'business as usual' for Icelandic volcanoes; and an international network of Volcanic Ash Advisory Centres has been running for a number of years as a service to aviation. While the threat had been recognised, not all the consequences had been realised. Growth in air travel, the dependence on air transport for trade, and the operating regimes of modern jet engines are all factors increasing vulnerability.

For earthquakes and volcanoes the natural hazard is not changing in any unusual fashion, but risk is increasing because of human activities. It is important to manage exposure and vulnerability, using scientific advice, to keep risk within tolerable bounds.

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A BGS team visited the erupting Eyjafjallajökull volcano in Iceland in May 2010. They made observations of the eruption column and took samples of ash for further analysis. The samples will be used for both chemical and physical analyses to help assess the impact of the eruption plume.