Dynamics of Disasters

Volcanic disasters

Since the lava and mud flows from volcanoes create fertile soils, it is inevitable that volcano slopes attract farming communities, yet the most obvious predisposing factors for volcanic disasters are the siting of human settlements and activities close to a volcano.

The risks are heightened if such settlements are in the direction of prevalent winds, in the paths of possible channels for lava or mud flows, or close to waterways likely to flood silted up. Other factors include the roofs that do not prevent or resist the accumulation of volcanic ash, the lack of channels, dams or barriers to control, divert or prevent mud, lava or pyroclastic flows

With long-term monitoring and systematic measurement of dormant and active periods, it will usually be possible to predict a volcano's behaviour sufficiently well to issue advance warnings of likely activity, although complete confidence in predictions is not yet possible

The trigger for a volcano disaster will be the eruption of molten rock or lava, ash and gases The volume and rate of eruption is determined mainly by the rate of gas outflow and the viscosity of the magma, or molten rock Earthquakes frequently accompany eruptions but are rarely large enough to cause severe damage.

Almost every volcano emits ash over a wide area, generally less than one cubic kilometre, although the volume and intensity vary. Some eruptions cause pyroclastic flows, which are the most dangerous volcanic phenomenon. A mix of molten rock fragments, dust and gases, pyroclastic flows can be very fast and very hot - up to 1,000°C - depositing material over several kilometres, although the frequency, duration and composition vary from volcano to volcano.

Mudflows, sometimes called lahars, are the next most dangerous volcanic phenomenon and are most frequent in regions of high rainfall. They are usually caused by heavy rain falling on ash and other loose material on volcano slopes and sometimes by melting snow or the release of water from lakes in volcano craters. The dense but fluid mixture can flow downhill at up to 100kph, destroying or burying everything in its path, silting up waterways and causing floods.

Lava flows and volcanic gases are less dangerous. Lava will destroy all in its path but its speeds of between a few metres to a few kilometres an hour usually allow people and animals to move. Some volcanic gases are lethal but are rarely the direct cause of death or injury.

The direct impact of mud, lava or pyroclastic flows will destroy homes, roads, bridges, public buildings such as hospitals and schools, agricultural land and crops. Ash containing toxic chemicals, such as fluorine, may poison land and water supplies

Deaths and injuries are most likely to result from mud and pyroclastic flows burying settlements close to volcanoes, less likely from lava or toxic gases. The main injuries will come from the impact of rock fragments and lava lumps, burns to skin and breathing passages from steam and hot dust, and respiratory difficulties from ash and toxic gases.

The response of the community to a volcanic eruption is obviously evacuation in the short term, along with salvaging what they can from

homes in the path of lava flows, and immediate search and rescue operations. Those affected will have short-term needs for food, water and shelter.

In the longer term, the community often moves back into the same areas of risk, in part because they may have no land rights

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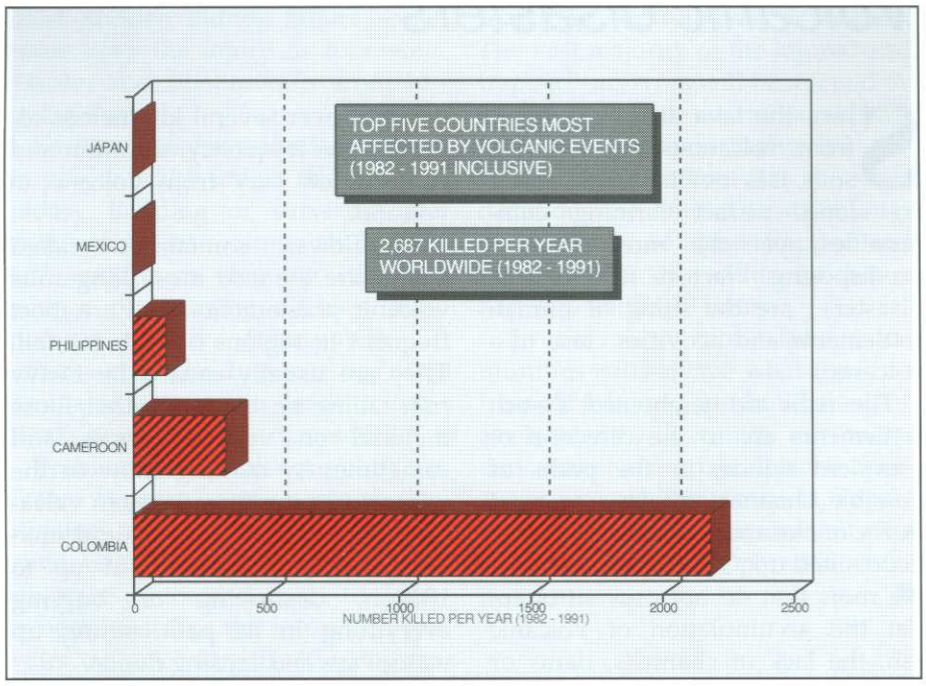

Figure 18a: Top five countries affected by volcanic events, numbers killed. Volcanic eruptions are infrequent events so average annual figures can be deceptive. The Colombia eruption of 1986 killed 23,000 people.

Focus 20: Philippines 1991, location and vulnerability

The Philippines are subject to almost every type of disaster. Typhoons hit the islands frequently, with an average of 20 entering the Philippine "area of responsibility" each year and five or six making landfall. Typhoons and the south-west monsoon bring heavy rains, leading to landslides and flooding.

Tsunamis and storm surges overrun coastal areas. Droughts occur periodically, with the western and central sections of the archipelago most often affected. Its location in the circum-Pacific seismic belt means that the country experiences devastating earthquakes and volcanic eruptions.

Because of the frequency of disasters or potential disasters, which kill hundreds and sometimes thousands of people each year and cause extensive damage to private and public property, the Philippines has established a range of disaster preparedness, prevention and mitigation programmes, including public education and training. The Philippines National Red Cross Society has a central role within these programmes.

After more than six centuries of inactivity, and following weeks of rumblings and steam emissions, Mount Pinatubo erupted at 2.55pm local time on 9 June 1991 throwing lava, mud, gas, ash and rock fragments out at 60-100kph, forcing many local people to flee.

Six days after the first eruption, the area was hit by a typhoon and, as the eruptions continued in the heavy rain, buildings collapsed under the weight of ash up to 10cm thick or from the impact of surging mudflows, while the ash and mud damaged crops. At least 321 people were killed.

The Philippines National Red Cross was involved from the start, providing emergency shelter in pre-organised evacuation camps, as well as food and health care, for more than 60,000 people out of a total evacuated of 130,000 from an area of 10kms radius of the volcano. The eruption totally destroyed more than 30,000 houses and partially damaged 55,000 more.

Hospitals in the area were affected by power cuts, while medical authorities dealing with the evacuated reported cases of conjunctivitis, upper respiratory tract diseases and diarrhoea. The livelihoods of up to half a million people were affected as fields up to 30kms from the volcano were covered with ash and other debris. Heavy rains caused rivers already filled with volcanic debris to overflow, causing flooding in some areas.

Those most vulnerable to the eruption included people living high up the sides of Pinatubo who did not move early enough, and those whose housing collapsed. The eruption increased the vulnerability of those made homeless or those whose crops and livestock were lost.

Volcanic disasters: Volcanoes have localised effects but, as their slopes offer rich agricultural land which can easily be poisoned or covered in ash, they do more to destroy livelihoods than to cause death Italy, 1971. Ferdinando Scianna/Magnum.

elsewhere, and because the volcano slopes contain highly fertile soil. The people affected may require long-term assistance in relocation assistance, credit, and agricultural aid.

Their decision to return underlines their vulnerability. The people lack any real choice because of their poverty and lack of rights before the disaster, a situation exacerbated when the volcano erupts and forces them to flee. Like the families on unprotected islands in Bangladesh, the communities on the slopes of a volcano live on the edge of disaster, figuratively and literally. ■

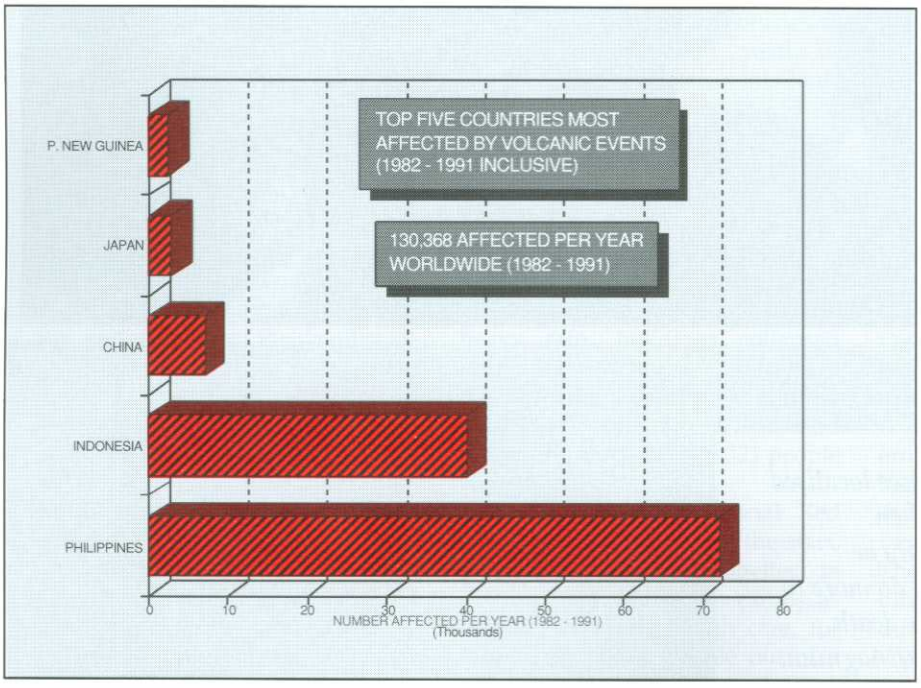

Figure 18b: Top five countries affected by volcanic events, numbers affected. For most people, ample warning is given of impending volcanic eruption so loss of life may be small, but many more people have their lives ruined as farm land is covered in ash and buildings are destroyed.