Chapter 6

PERCEPTION AND ACCEPTABILITY OF RISK

6.1 Nature of the problem

In the two preceding chapters we have described the measures that can be taken to provide some degree of on-site protection of life and property against volcanic hazards, and to facilitate the orderly evacuation, when this becomes necessary, of areas threatened by those volcanic phenomena against which there is no protection other than flight.

At all stages of a volcanic emergency, choices between various possible courses of action have to be made by individuals, by family groups and by persons in positions of responsibility for the safety and well-being of the community as a whole. In all but situations of immediate and obvious danger, the choices made will depend on judgements in which the perceived risks to life, limb or valued property will be weighed against the inconvenience, hardship or cost of protective measures or of evacuation. The factors likely to influence these judgements, and the conditions favourable to the choice of the optimum courses of action, are discussed in this chapter.

6.2 Economic factors

Whatever protective action is taken, it will involve some cost to individuals or to the community. In the case of the on-site measures described in chapter 4, such as the protection of property against heavy ash falls, it is usually possible to estimate their cost with some precision and to compare it with the value of the property thus protected. Decisions regarding the application of such measures can be based on purely economic considerations.

However, when human lives are at stake and decisions have to be made, individually or collectively, whether or not to evacuate certain areas, the situation is far more complex. In the case of the more violent manifestations of volcanic activity, such as pyroclastic flows and large lava or mudflows, the loss of property in the areas affected will in any case be total.

The cost of evacuation, temporary housing, feeding and eventual resettlement of the population of these areas will always represent an additional loss to the economy which may be difficult to justify in *purely economic* terms. It is difficult or impossible to attach an economic value to human life.

On the other hand, it may safely be assumed that no community, whatever its social or political structure, will tolerate a refusal or failure to take action which may save the lives of people threatened by a volcanic eruption, simply because of the cost of such action to the community. It seems therefore that considerations of cost will not be a major factor influencing decisions whether or not to organize and carry out mass evacuations. What then will be the significant factors? They will probably be the following:

(*a*) Perception of the degree of hazard and attendant risks, either directly by the decision-makers (individuals or collective) or through assessments based on scientific study and observation of the volcano;

(*b*) Awareness of the inconvenience, hardship and disruption of normal life that evacuation will necessarily entail; in other words, of its psychological, social and political costs and their possible consequences.

The social costs of large-scale evacuations include the demoralizing effects on individuals of being uprooted from their homes and deprived of their normal family and social life, only to return, when the emergency is over, to homes which have may been damaged or destroyed; there may also be permanent shifts of population from rural to urban areas. It is, however, extremely difficult to quantify such social costs.

6.3 The perception of risk

Experience of volcanic emergencies has shown that it is extremely difficult to maintain a balanced perception of volcanic risk, and that the level of perception will depend primarily on how recently a devastating eruption has occurred within the same region. For example, at Mt. Pelée in Martinique (West Indies) prior to the catastrophic eruption of 1902, there was practically no comprehension of the risks, because there had been no previous destructive eruption on the island in historical time, and because the most recent violent eruptions elsewhere in the West Indies had occurred 90 years or more before, with relatively small loss of life and only minor contemporary publicity. Consequently, even when the 1902 eruption of Mt. Pelée had escalated, within three weeks, to a point at which ash was being

carried some 10 km high and falling thickly enough to damage house roofs, the authorities discouraged evacuation of the town of St. Pierre in order to avoid having to postpone a forthcoming election. The very large loss of life (29,000) in this eruption and in the almost simultaneous eruption in St. Vincent (1,565 fatalities), resulted in a dramatically increased level of perception of volcanic risk in the West Indies, which persists to the present day: in all four significant eruptions since that date, including one non- explosive and one relatively minor steam blast event, there have been large- scale evacuations.

A factor which may influence the perception of risk is the extent to which the safety of the population becomes the responsibility of a single person. When a state of emergency is declared, this responsibility in many countries falls entirely on the local Chief Administrator and it is not uncommon for this official to take a very cautious view of what risk should be tolerated. To a political leader, the prospect that he may be held responsible for even a few deaths by not having ordered or organized an evacuation, may be more than he is prepared to face.

In view of the importance of subjective factors in the perception of risk by individuals, it is highly desirable that, when the safety and well-being of a whole community are at stake, the nature and degree of the risks be assessed as objectively as possible. This is, of course, the purpose of scientific study and observation, and the problems of hazard assessment have already been discussed at some length in chapter 3. With the progress of scientific knowledge and with the gradual extension and improvement of volcanic monitoring systems, it may be hoped that reliable assessments of volcanic hazard and risk will become more readily and frequently available to the decision-makers (individual and collective) in volcanic emergencies.

6.4 Decision-making in emergencies and the concept of acceptable risk

The basic rule of volcanic risk management may be formulated as follows:

> "Take appropriate action when the risk to a given area reaches a certain level."

When the major decision has to be made, whether or not to order (or organize) on behalf of a community the mass evacuation of a hazard zone, the question arises: "at what level of risk should this action be taken?". In other words, what is the maximum level of risk that will be accepted by individuals or by a community in preference to the inconvenience and hardship which will inevitably accompany evacuation?

The answer given to this question will be a matter for subjective judgement, even when the degree of risk has been assessed objectively by scientific study and observation of the volcano. When the answer has to be given by an individual on behalf of a community, the responsibility placed on him is extremely heavy, and in some cases this may affect the quality of his judgement. The weight of responsibility may be lightened if there has been prior discussion within the community of what level of risk can be accepted. If wide agreement is reached on this point, the responsibility for decision-making in an emergency is shared, partly at least, by the community as a whole. However, at present this is far from being the general practice.

The extent of the responsibility and powers of the civil authorities to order, on behalf of the community, compulsory evacuation of hazard zones in emergencies varies greatly from country to country. In some countries, the authorities have a duty to inform the population of the nature and degree of the risks, the decision whether or not to leave the threatened area being left to each individual or family. In others, all such decisions would be taken and universally enforced by the authorities. This is clearly a question that will be decided according to the social, cultural and political traditions of each country.

A more pragmatic approach to the problem of decision-making would be to base decisions on an estimate of what proportion of false alarms will be tolerated by the population without loss of confidence in the warning system and of readiness to carry out instructions. If, for instance, it were judged that two false alarms in every three warnings were the maximum tolerable proportion, then it would be logical to take a 33 per cent probability of destructive eruption as the limit of acceptable risk.

Enough has been said in this chapter to show how complex the problem is, and to demonstrate the need for more profound study of it than has hitherto been undertaken. It is clear that it is a problem which should be widely discussed in any community which is at risk from volcanic eruption, and that this discussion should take place and procedures should be established *before* any emergency arises.

Bibliography
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