

Volcanic island in crisis: investigating environmental uncertainty and the complexities it brings

Katharine Haynes explores the complex socio-political relations that have developed on this volcanically uncertain island and which continue to create difficult emergency management challenges

Abstract

Just as a volcanic eruption brings molten material to the surface, enabling volcanologists to glimpse the workings of the internal earth, an environmental crisis can expose underlying problems and weaknesses in emergency planning and governance; Montserrat is such an example. This paper explores the complex socio-political relations which developed on this volcanically uncertain island and which continue to create difficult emergency management challenges. Identifying the social and political barriers to effective implementation of emergency response efforts could be of help in developing Australia's response plans and the evaluation of humanitarian and emergency aid efforts on nearby islands.

Introduction

Many natural hazards pass through a crisis point into a process of recovery very rapidly. Earthquakes, floods and hurricanes involve one damaging event; the affected society and its people are forced to 'cope' with the impacts, entering a phase of crisis and then recovery (Clay *et al.* 1999; Gregg *et al.* 2004). In comparison, volcanoes may have a more prolonged impact with precursory and eruptive activity which can last from days to years and thus deserve special consideration.

The Emerald Isle of the Caribbean

At a superficial level, Montserrat's pre-crisis image of an easy going, friendly and charming island (*the way the Caribbean used to be!*) is an apt description for tourists who rarely stay long enough to delve deeper. However, this atmosphere can also provoke petty argument, the personalisation and easy corruption of politics and the undermining of authority (Pattullo, 2000). This paper will explore the complex socio-political relations

which were exacerbated by the volcanic crisis on this volcanically uncertain island and which continue to create new emergency management challenges.

Known as the Emerald Isle of the Caribbean – a reference to its Irish heritage and its lush vegetation – Montserrat (16.5 km north to south by 10 km east to west) lies in the Caribbean Sea (see Figure 1). The island's Soufrière Hills volcano, which lies in the south central portion of the island, awoke from approximately 350 years of dormancy in mid-1995 and volcanic activity shows no signs of abating.

Figure 1: Map of the island and location within the Caribbean. Reproduced with kind permission of the Montserrat Tourist Board (www.visitmontserrat.com p16).



Prior to the start of the eruption in 1995 health, education and living standards on Montserrat were among the highest in the Caribbean (Clay *et al.*, 1999). The population dropped dramatically during the crisis with the 2001 census identifying a population of 4491, a decrease of 42 per cent since the last census in 1991¹ which reported a population of 10,625. For more information on the history of the island see Fergus, (2001).

¹ Data from the 2001 population and housing census May, 2001, Statistics Department, Montserrat.



The Soufrière Hills volcano, taken in March 2003. Copyright Montserrat Volcano Observatory (www.mvo.ms)

Political structure

Montserrat is now one of six UK overseas territories² in the Caribbean and one of twelve worldwide. As a British Overseas Territory, Montserrat is administrated by a complex set of economic and political relationships (Pattullo, 2000). Power is triangular with the democratically elected local government, the British Governor (who is the representative of the Queen) and the British Government in Whitehall, London. The Governor is responsible for external affairs, defence, judiciary, security, administration of the public sector and the offshore financial sector.

Volcanic impacts³

During the latter half of 1994, seismic activity within the Soufrière Hills system began to escalate, physically manifesting itself in June 1995 as ash and steam began to vent from within the crater. Confirmation of volcanic dome growth on the 30th of November, 1995 led to the evacuation of the high risk settlements on the south east coast. Continued escalation of volcanic activity during early 1996 led to the permanent evacuation of the south of the island. Residents were relocated to the north, many living with friends or family or residing in emergency shelters. Voluntary evacuation schemes were also implemented to remove islanders from Montserrat as space and resources were stretched and conditions for evacuees in the north of the island quickly deteriorated⁴.

On the 25th of June, 1997, a dome collapse triggered a large pyroclastic flow. The resulting hot ash, gas and debris flow spilled out of the valley it was being channelled down, killing 19 and injuring 8 people⁵.

The majority of those caught in the path of the flow were farmers who had entered the evacuation zone, against advice, to tend to their crops and livestock (for more details see Loughlin *et al.*, (2002)).

By August 1997, the volcano was experiencing repetitive explosions with pyroclastic flows occurring in a radial direction, making warnings very difficult. A wider zone was evacuated, placing overwhelming pressure on the shelters and forcing many more residents to leave the island. A pause in activity in early 1998⁶ stimulated a period of re-habitation and reconstruction to begin. However, in November 1999 new dome growth began, heralding the start of a new eruptive phase of slow steady dome growth and collapse which continues at the time of writing. This more moderate growth rate allows the dome to grow larger in size, threatening a wider area than during previous phases.

Why the natural disaster became a human crisis

Montserrat has been an extreme example of the complexity involved in the management of a volcanic crisis; activity has slowly increased in severity becoming cyclic and uncertain. There have been points of extremely high risk but little visible cues and numerous crisis points with difficult decision-making conundrums. The management of this frustratingly uncertain natural phenomenon has been compounded by the complex socio-political factors often typical of a small colonial island. The small size of the island also made emergency management problematic; any smaller, and total evacuation would have been the only reasonable option, any bigger and there would have been an adequate buffer zone between safety and danger (Pattullo, 2000).

This paper will now go on to identify and discuss some examples of the management challenges faced amidst the complex social and political relations of the uncertain natural environment on Montserrat.

Pre-crisis planning – uncertain beginnings

The majority of the housing and key infrastructure on Montserrat was built on the gentler slopes of eroded pyroclastic flow and lahar deposits from previous eruptions of the Soufrière Hills volcano. Thus, the capital town, Plymouth (only 4km from the summit), the airport on the east coast (5km) and numerous communities on the northern slopes were in highly

2 Early in 1998 the term 'dependent' territory was abolished as it reflected dependence rather than partnership.

3 This précis is adapted from Kokelaar (2002); Pattullo, (2000); Clay, *et al.*, (1999); Possekel, (1999) and the Montserrat Volcano Observatory web page (www.mvo.ms).

4 The majority of evacuees went to nearby Caribbean Islands, the USA and the UK.

5 Previous pyroclastic flows generated had been smaller and remained within the river valleys.

6 New magma stopped moving in the conduit, however degradation of the dome and reworking of the volcanic material in the form of lahars continued.

vulnerable positions (Kokelaar, 2002). However, there was no long-term development or emergency response plan to reduce this vulnerability (Shepherd *et al.*, 2002). Opportunities for disaster management and increased volcanic resilience in the reconstruction and development following Hurricane Hugo⁷ in 1989 were not taken and the important infrastructure was replaced and renovated within easy striking distance of the volcano. When serious volcanic activity materialised in 1995, the relevant governmental authorities stated that they were ignorant of the island's volcanic status and the risks posed to the settlements in the southern third of the island (Shepherd *et al.*, 2002).

However, scientists as early as the mid 1930s had recognised that the volcano was in a pre-eruptive stage with seismic swarms occurring every 30 years. Increasingly obvious signs of impending volcanic unrest were noticed by a number of volcanologists who mapped the hazards and areas at risk (very accurately as it turned out) less than 9 years before the crisis. A report (Wadge and Isaacs, 1987) was submitted to the relevant emergency management and government authorities detailing the areas at risk from a range of eruption scenarios with reference to likelihoods, advice for emergency evacuations and longer-term development recommendations. However, the report apparently made no impression on those responsible for disaster preparedness (Clay *et al.*, 1999). Scientists involved in communications with officials prior to the crisis complained of a culture of denial and a dogmatic focus on the prosperity of the island (Shepherd *et al.*, 2002).

The lack of preparedness plans and volcanic risk reduction activities on Montserrat can be largely be attributed to the following causes:

- **Limited corporate learning.** The rotation of the Governor every 3–4 years with limited support staff reduced the capacity for retention of corporate knowledge of scientific activities and disaster preparedness. The Caribbean Disaster Preparedness and Prevention Project (CDPPP), which had originally funded the Wadge and Isaacs (1987) report, was found deficient in its handling of the aftermaths of hurricanes George and Hugo and was replaced by the Caribbean Disaster Emergency Response Agency (CDERA), again with no apparent corporate knowledge of volcanic risk being passed on (Kokelaar, 2002).
- **Difficulty in communicating a low probability high consequence event.** The British government's review into the handling of the crisis (Clay *et al.*, 1999) blamed the nonexistent volcanic preparedness on an inability or unwillingness to comprehend the disastrous potential of a volcanic eruption. However,

the report did not communicate well the short-term risks in a format accessible to emergency managers. Decision-makers who read the scientific reports would have seen likelihoods of between 1 and 2 per cent per century and were reassuringly told that it could be centuries before an eruption requiring mass evacuations would be necessary (Kokelaar, 2002). Also, no follow-up was carried out by those who had commissioned the report to investigate how the information had been interpreted or integrated into disaster preparedness. Even if volcanic risks were considered in the re-development phase following Hurricane Hugo, the conclusions would have been the same. A judgment to make economically unviable changes to the island's infrastructural layout based on a highly improbable and uncertain event would have been unpopular and unfeasible.

Volcano politics: Waiting for certainty

The slow and uncertain escalation of activity had allowed the British and Montserratian authorities to delay decision-making over the location of new infrastructural development on the island. The local Government wanted to promote a 'business as usual' atmosphere, a situation the British government were equally happy to maintain as significant spending on new infrastructure could become redundant if the volcano returned to dormancy. As a result of this 'wait and see' policy, conditions for those evacuated became increasingly squalid. The International Development Committee (1997), which had its first sitting in October 1997, was shocked at the condition of the shelters and the mismanagement of the crisis, criticising both Her Majesty's Government (HMG) for its complex bureaucracy and the Montserratian Government for its failure to seek long-term aid.

Even after the third and final evacuations of Plymouth in April, 1996, leading to terrible overcrowding in the make-shift shelters and limited properties in the



The volcano at night. Copyright Sun Smith (sunsand@candw.ms).

⁷ Hurricane Hugo devastated the Island on the evening of Saturday the 16th of September 1989 leaving 11 dead, 40 injured, and 3,000 homeless. (Possekel, 1999).

northern zones, the local authorities were still hopeful of a rapid return, thus causing a significant delay in their application for housing aid. It was not until the volcanic events on the 25th of June 1997 and those throughout August, which devastated the capital and much of the housing on the northern slopes, that a real change of impetus occurred (Possekel, 1999; Clay *et al.*, 1999).

Complex management

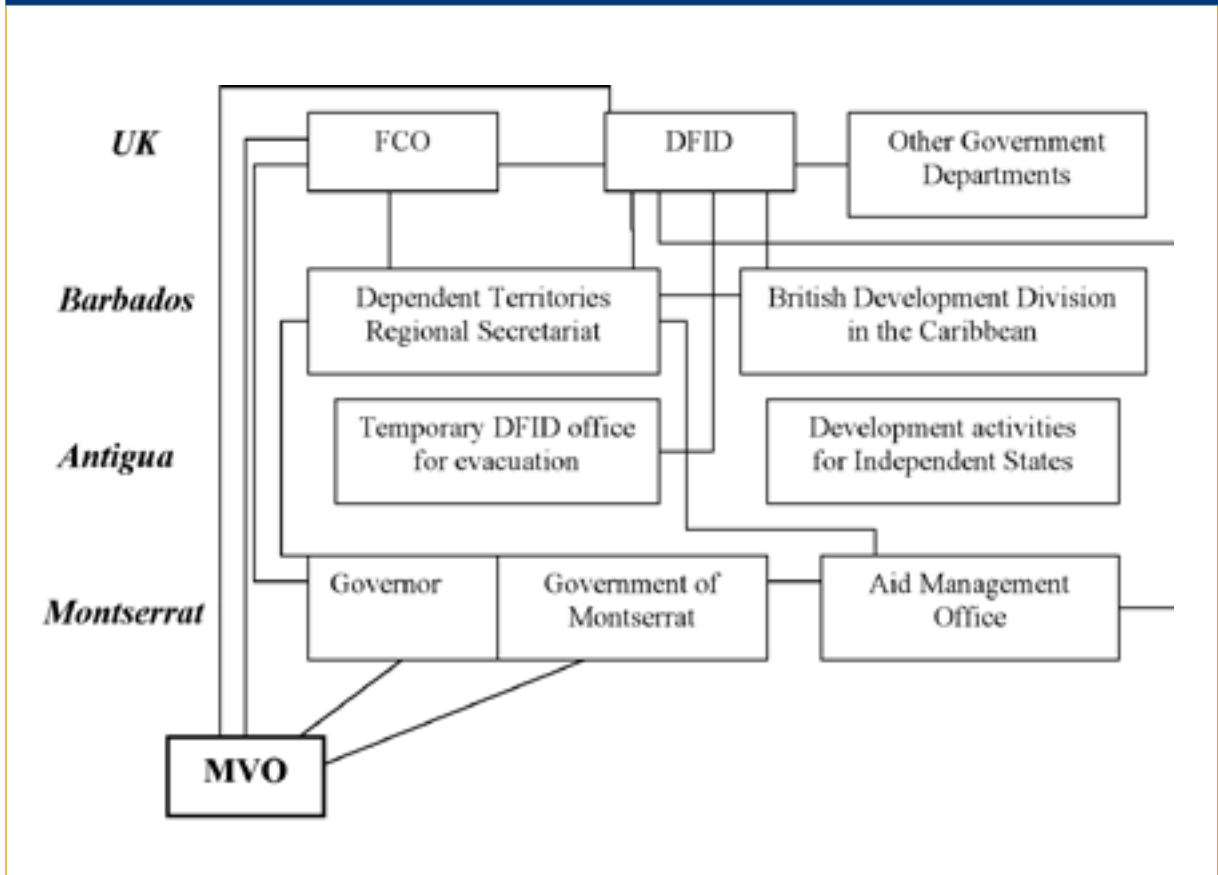
The crisis was originally managed within the many complex layers of normal colonial administration, causing immense communication problems between the decision-makers and delays in decision-making and financial matters (see Figure 2).

In London, at the top of the 'tortuous management hierarchy' (Pattullo, 2000, p136), sat the Foreign and Commonwealth Office (FCO) and the Department for International Development (DFID, formerly the Overseas Development Agency, ODA). Although the FCO held constitutional responsibility for Montserrat, DFID controlled spending. Thus, the logistical and financial responsibility for Montserrat during the crisis was transferred to DFID (Aspinall *et al.*, 2002). Furthermore, the responsibility for direct emergency aid lay with the Emergency Management of Aid Department (EMAD), an additional subdivision of DFID (Possekel, 1999).

The next layer, the Dependent Territories Regional Secretariat (DTRS), was a department of the British Development Division of the Caribbean (BDDC), based in Barbados. The DTRS managed the co-ordination of aid in the Caribbean dependencies, although emergency aid continued to be controlled from London. On Montserrat, the Aid Management Office (AMO) had very similar responsibilities to the BDDC. Also to be considered was the position of the British Governor. While critics questioned the experience and qualification of these distantly appointed and relatively short-term individuals, the FCO relied upon the Governor as the direct representative of the UK Government to ensure the welfare of the islanders (Pattullo, 2000). The officials in Whitehall and the Governor were also integral to working through the last layer of the island's internal political divisions. However, it was often felt by the Montserratian Government that there was not enough consultation between them and the British.

In August 1997 the management structure was simplified and the responsibilities of the AMO were moved back to London. The Montserrat Unit and Montserrat Action Group were established respectively at DFID and the FCO, cutting out the office on Barbados and enabling closer co-operation with the Governor and local Government on Montserrat (Possekel, 1999).

Figure 2. The complex management and communication structure



Adapted from Clay *et al.*, (1999, p18) and Possekel, (1999, p158).

Although by mid 1997 £45.8 million had been given in aid, the problems described above grossly delayed any use of this money to develop the north, especially the improvement of the housing situation or even the shelter accommodation, which was infamously described by CM Brandt in August 1997 as “not even fit for cattle” (Fergus, 2001, p27).

Communication issues – scientists and authorities

The complex hierarchy of command, ambiguous responsibilities of the ministries, departments and organisations and the multiple reporting procedure made communication between the scientists and the authorities – especially those off-island – very difficult (Aspinall *et al.*, 2002). Ministers and civil servants were often replaced with new personnel unfamiliar with the Montserrat situation and the British elections in the spring of 1997 reduced London’s focus further. Even after the events in June 1997, it was felt by the scientists and Governor that the politicians and civil servants in London still did not appreciate the situation (Kokelaar, 2002).

On-island communication between the scientists, Governor and the local authorities was more successful and largely unaffected by the complex hierarchy above (Aspinall *et al.*, 2002). However, in a similar fashion to the off-island British authorities, interactions deteriorated slightly when the local ministers and respective Governors changed over in 1997 and again in 2001 (Possekkel, 1999 & Haynes 2005). The rapid change-over of elected officials and civil servants necessitated repeated cycles of adjustment and learning and was felt to be prohibitive to volcanic comprehension and the management of the situation. Subsequently, even eight years into the crisis, scientists considered the level of volcanic knowledge grasped by the local authorities to be at a low level (Haynes, 2005).

The main compounding issue, however, was that of communicating the risk and associated uncertainties, especially during the initial two years of the crisis when the volcanic pattern was one of intense activity followed by quieter phases and much uncertainty. In August 1997, communications between the scientists and ministers in London over the risk to the central and northern zones became confused, with ministers publicly misinterpreting the Montserrat Volcano Observatory’s (MVO) report as suggesting a much higher risk than was intended (Possekkel, 1999).

Differing attitudes towards the risks considered tolerable and attitudes towards the management of the crisis can be explained by cultural, institutional, political and economic backgrounds and pressures. During the most recent years of the crisis the western extent of the exclusion zone boundary has drifted back and forth (depending on dome growth and the level of activity of



Plymouth destroyed. Copyright Author.

the volcano) over a small central portion of the Island which sits on the margins of safety and danger. This area has some considerable housing and infrastructure and was for a period considered a replacement for the capital Plymouth. The British authorities (motivated by their responsibility for overall safety), were considered by the Montserratian authorities (under considerable political and economic pressure) to be too risk adverse. They were seen as unsympathetic to the needs of the Montserratian public who, in turn, were perceived to be more willing to accept risk than ‘typical Londoners’ to maintain the prosperity of their Island.

Interviews and participant observations conducted on island in 2003 (Haynes, 2005) identified that many of the authorities and public held an inflated belief in the predictive powers of the scientists to provide accurate and timely warnings and reduce the uncertainty. At the time, an exclusion zone boundary had been extended and was being strictly controlled – to the vociferous consternation of those who were evacuated and some local politicians. The authorities were thought to have interpreted the scientific advice with too much precision. In turn the authorities felt that the uncertainties and implications had not been well deliberated or explained by the scientists who were trying to distance themselves from an emergency management role and any associated liability.

With hindsight it is easy to see that the crisis could have been handled much more effectively if there had been:

- **A shift from short-term disaster management to longer-term development planning earlier in the crisis**, with better shelter provision and the earlier development of accommodation in the north (Kokelaar, 2002; Clay *et al.*, 1999; Possekkel, 1999).
- **The establishment earlier in the crisis of an inter-departmental crisis team** with the authority to fast-track decisions and finances (Kokelaar, 2002; Clay *et al.*, 1999).
- **More responsibility for decision-making on island.** Long distance communication of uncertain but high consequence risks can be very problematic. Sensitive decision making is difficult for those who do not understand the situation intimately.
- **A more qualitative or 'blurred' element to the communication and implementation of uncertain science**, especially in terms of delineating marginal exclusion zone boundaries.

Uncertain roles and public communication

The emergency management and, most specifically, communication role that scientists should play during a volcanic crisis is not well defined. Whilst some scientists maintain that during a volcanic crisis they become an important link in the chain of risk management; others feel that outreach and management activities take place at the detriment of the monitoring and are a litigious nightmare to be avoided at all costs (Peterson, 1988, 1996; Peterson and Tilling, 1993). In 1999, the International Association of Volcanology and Chemistry of the Earths Interior (IAVCEI) produced a publication of professional conduct guidelines for volcanologists during a crisis (Newhall *et al.*, 1999). It examines past problems and makes suggestions for future crises under the premise that: "During volcanic crisis, volcanologists' highest duty is to public safety and welfare" (*ibid*, p324). The requirements to achieve this aim include efficient teamwork among the scientists and public and a balance of science research and communication. The scientists on Montserrat are the most trusted source for risk communication as they are the most knowledgeable, impartial group. The public and authorities expect that the scientists will take on this role and the majority of the scientists agree that on Montserrat their role as chief communicators is paramount (Haynes, 2005).

The predominantly British scientists deployed to Montserrat interpreted their role as advisory. However, the exceptionality of the volcanic crisis created occasions when they had to become more involved with emergency management (Aspinall *et al.*, 2002; Kokelaar, 2002; Clay *et al.*, 1999). In Voight, (1998) a scientist closely involved with monitoring on the island describes how these roles had to be flexible and the scientists worked above and beyond their usual roles in order to mitigate risk and the continued viability of the island.



Montserrat Masqueraders. Copyright Sun Smith (sunsand@candw.ms).

Throughout the crisis there has been considerable pressure from the on-island authorities for the scientists to take on further emergency management roles such as initiating emergency evacuations and taking the public lead on longer term evacuation policy. This was partly due to the inexperience of the authorities and a need for their scientific expertise but also considerable political manoeuvring by the authorities to distance themselves from difficult and unpleasant decision making (Haynes, 2005).

The information below comes from detailed fieldwork involving in-depth interviews, participant observations and a questionnaire-based survey carried out on the Island in 2003 and 2004. For more information see Haynes (2005).

Empirical evidence suggests that preferred channels or styles of communication will vary within a community or population (Sorensen and Mileti, 1991). This was true of Montserrat as some interested individuals relied heavily upon the one-way communication style of daily radio reports, whilst others preferred the more interactive approaches of radio phone-ins and formal and informal meetings. A small minority chose not to listen to the official communications, placing a greater trust in unofficial sources. The interactive formal and informal methods of communication were considered by the scientists and authorities as the most effective and trusted. These, however, have declined during the latter half of the crisis; mainly because public meetings and phone-inns became too politicised and were considered too difficult in the 'emotional' climate of the most recent 2002–2003 evacuations. Early on in the crisis, certain individuals, including radio presenters, local personalities and community leaders had been used by the scientists and authorities as 'translators'. These individuals were thought to be trusted and influential among large sections of the Montserratian population, often bridging cultural and technical gaps in the volcanic communication, particularly during difficult periods. However, the use of this method has declined in the latter years of the crisis. In some ways, the scientists believed that their educational role was complete,

having engaged the public in meetings, school visits and seminars from the early stages of activity. Many now considered the public's knowledge to be sufficient to allow them to comprehend the scientific information. The importance of feedback and deliberation was recognised among many of the scientists, authorities and public on the island, however, little had been done to enhance the capacity for gathering and acting upon public feedback.

The survey results and qualitative interview data highlighted a division amongst the public relating to the adequacy and need for increased public deliberation from the scientists and authorities. The split appears to correlate with cultural divisions on the island with some groups more likely to be happy with the level of interaction and information detail, perceiving the scientists to be doing as much as they could. In contrast, the research identified that others (predominantly those born in the USA, Europe and some highly educated more affluent Montserratians) felt they should be more involved with the risk management preferring to make their own decisions on what actions to take.

The differences in the perceived need for deliberation and interactive decision-making among groups presents a challenge for those aiming to improve risk communication. While contemporary empirical evidence and theoretical literature point towards the advantages of deliberation and community involvement in risk preparedness, a prerequisite for such involvement is recognition among individuals and groups that involvement is necessary. In addition, the authorities walk a fine line between arousal and reassurance with some members of the authorities stating that proactive communication could alter the status quo by amplifying the risks (through the deliberation of potential scenarios) in the eyes of a majority who were, in general, happy to receive commands. The authorities also felt that deliberating with certain groups of the public could lead to a relaxation in control and a pressure to tolerate greater risks, thus pushing them towards a situation in which false alarms⁸ are less frequent but the risks of death and injury are increased.

The identification of variations in the communication needs of certain groups on the island highlights important cultural differences in attitudes towards the management of risk. The researcher noted that the small group making complaints about the level of interaction were, in fact, not among those most likely to be placed at risk. Instead, those most likely to quietly enter the exclusion zone illegally did not feel they had the power to fight the authorities' decisions. Thus, different attitudes towards feedback and interaction were observed among identifiable groups, the outcomes

of which could not have been easily predicted based upon the signs and signals received by the scientists and authorities. For example, many of the scientists and authorities interviewed stated that the expatriates or wealthier Montserratian community were more vociferous and opinionated and less likely to do as they were told. However, these opinions are very much based on the unofficial feedback received from this more confident group. These individuals are in the same social groups as the scientists and many members of the authorities and are much more likely to contact the observatory. This reflects a cultural difference in the power and ability of these groups to complain, fight authority and admit to dissatisfaction.

Lessons learnt

- ***Volcanologists need to be equipped for the social demands they may encounter in a volcanic crisis and be prepared to adapt their role.*** For example, on Montserrat the scientists are the most trusted source and thus should take the primary responsibility for communication. However, governments and emergency managers also need to be aware of the more defined scientific role that volcanologists will play in a crisis.
- ***During a long-running crisis it is important to continually update and renew education and outreach activities with innovative techniques.*** A change or reduction in communication activities will send a signal to the population of reduced risk and/or culpability.
- ***Risk communicators need to mix and match communication methods to suit the audience and must have confidence to relinquish some responsibility for decision-making to those at risk.*** With the use of appropriate methods (e.g. Citizen Jurys) input into the risk management decision making can be made by a balanced and representative sample of the population.

The Montserratian crisis has been a frustrating and drawn-out eruption with multiple layers of natural and social uncertainty amplified by tensions inherent in the governance of a small colonial outpost. Lessons can be learned from the lack of preparedness, limited corporate learning, uncertain roles, bureaucratic delay and the lack of long-term disaster planning with the foresight to plan for multiple risks and future changes. The majority of these issues occurred despite the best efforts of all those involved and are examples of institutional relations which exist in all social systems. The difference here, however, is that the situation was exacerbated by the introduction of a highly unpredictable natural hazard.

Learning lessons from the analysis of previous crises is very important if we are to promote resilience and respond to emergencies effectively. Many of the

⁸ The use of the term 'false alarm' is not intended to indicate a negative consequence but rather precautionary steps taken in the face of uncertainty.

problems which occurred on Montserrat are issues that Australian emergency managers and bureaucrats are highly likely to come across in their dealings both at home and abroad. Perhaps the most important lesson from Montserrat is that science cannot be relied upon to provide all of the answers. In highly uncertain situations a mutual understanding of acceptable risk is required by both the community and the authorities. Resilience can be encouraged by tackling the root cause of vulnerability. Thus, emergency managers should consider the 'nuts and bolts' of people's day to day survival; helping to promote diverse and sustainable livelihoods rather than only reducing exposure to hazards.

Glossary

Phreatic explosions: When ground water becomes heated by rising magma the rapid change from liquid to steam can cause explosions.

Dome: These volcanoes erupt viscous or semi-solid magma. As it cannot flow away it piles up thickly around the vent forming a dome.

Dome collapse: The steep-sided dome can easily become unstable and collapse producing pyroclastic flows.

Pyroclastic flow: A highly mobile avalanche of high-temperature volcanic debris (ash to large rocks) and superheated volcanic gases. They have high temperatures between 100-800 degrees and can travel up to 150 km/h.

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