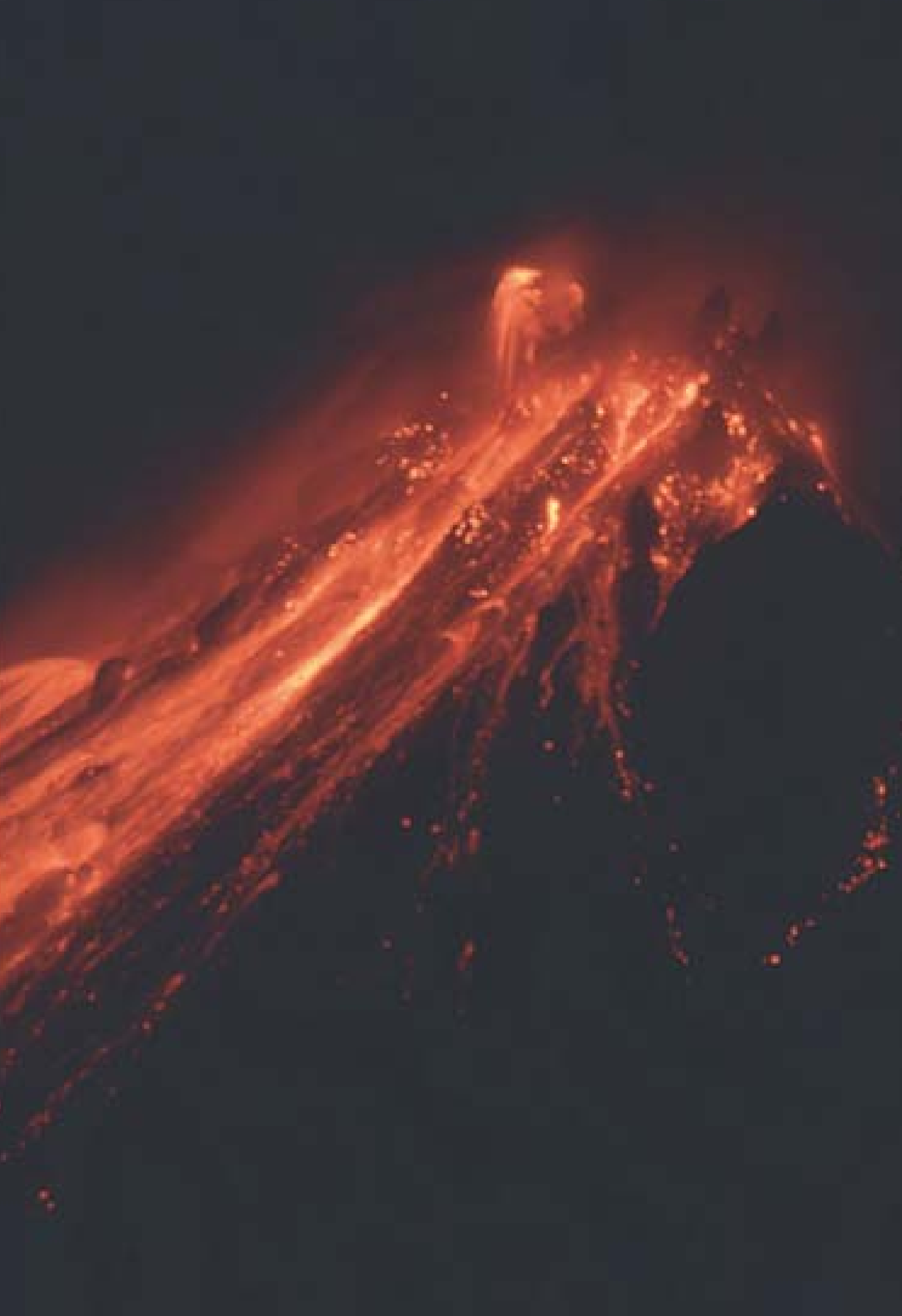
COMMUNICATION DURING VOLCANIC EMERGENCIES



AN OPERATIONS MANUAL FOR THE CARIBBEAN

COMMUNICATION DURING VOLCANIC EMERGENCIES

AN OPERATIONS MANUAL FOR THE CARIBBEAN

BENFIELD GREIG HAZARD RESEARCH CENTRE

UCL

CDERA
The Caribbean Disaster Emergency Response Agency
Managing Disasters with Preparedness

DFID Department for International Development

A DFID funded project

Also available in electronic version at:

http://www.bghrc.com

DFID Project R7406: *Protecting small islands by improving forecasting and warning*

Project originator	David Sanderson (CARE UK, London)
Project director	Professor Bill McGuire (BGHRC, UCL)
Project manager	Dr. M. Carmen Solana (BGHRC, UCL)
Project staff	Nichola Brichieri-Colombi (Cambridge Arcitechtural Research, UK) Dr. Christopher Kilburn (BGHRC, UCL) Myriam Lubino-Bissante (BIS Man. PRiNTVEC, Guadeloupe, France) Charles van Oppen (BGHRC, UCL)
Collaborators	Jeremy Collymore (CDERA, Barbados) Noemi D'Ozouville (BGHRC, UCL) Eviann Inniss (CDERA, Barbados)
Handbook design & photo selection	Olly Willetts (BGHRC, UCL)

IMAGE CREDITS

FIGURES

Front cover	R. Scott Ireland	Lava spines & glowing blocks - Soufriere Hills
Fig 1.	Olly Willetts, 2002	Map of Carribbean active volcanoes
Fig 2.	R. Scott Ireland	Soufriere Hills volcano by moonlight
Fig 3.	A. Lacroix, 1902	Nuée ardente
Fig 4.	R. P. Hoblitt, USGS	Structural damage due to volcanic ash
Fig 5.	B. McGuire	Bomb/block damage
Fig 6.	M. Carmen Solana	Lahar deposits
Fig 7.	D.A.Swanson	Phreatic explosion
Fig 8.	B. McGuire	Fumarole activity
Fig 9.	B. McGuire	GPS Monitoring
Fig 10.	M. Carmen Solana	Microgravity monitoring
Fig 11.	OVSG - IPGP, 2002	Guadeloupe volcano observatory

FRAME INSETS

P.4	B. McGuire	Pyroclastic flow entering sea
P.7-12	R. Scott Ireland	Lava spines & glowing blocks - Soufriere Hills
P.13-17	B. McGuire	Seismometer
P.18-25	B. McGuire	Pyroclastic flow damage
P.26-29	B. McGuire	Phonebox in Plymouth
P.30-37	R. Scott Ireland	Southern Cross/Soufriere Hills volcano

CONTENTS

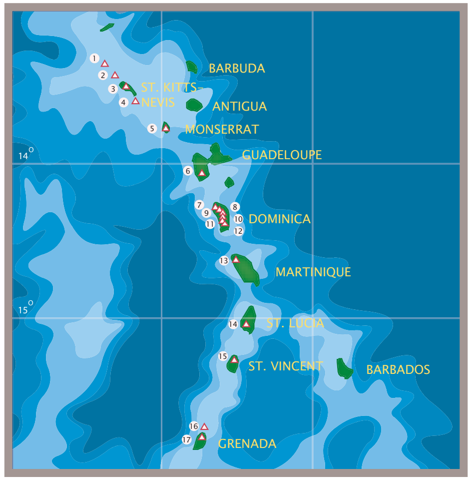
INTRODUCTION

This manual has been produced with the specific objective of providing clear and straightforward guidelines to ensure the effective communication of critical information during a volcanic crisis. The primary aim is to assist the key players - monitoring scientists, the Emergency Management Committee (or its equivalent), and the media, in improving mutual interaction through better understanding and appreciation of their respective agendas, expectations and limits.

Volcanic activity is a real threat in the Caribbean region, with an eruption or unrest occurring, on average, once every 12 years during the 20th century, and with the Soufriere Hills eruption (Montserrat) continuing into its ninth year. While some volcanoes, such as Guadeloupe's La Soufrière, erupt every several decades, others are characterized by repose intervals of a century or more, providing a false sense of security to communities living on their slopes. Even if a volcano has been quiet for many centuries, it can become active and enter an eruptive phase within a few months, making it essential that a well thought out response is already in place.

The reawakening of Montserrat's Soufriere Hills volcano after 350 years of repose, highlighted many problems and raised concern in the volcanic islands of the Caribbean about the most effective way to deal with a volcanic crisis. Much attention has been paid to improving methods of volcano monitoring and forecasting their behaviour. Noticeably less effort has been devoted to ensuring that the effectiveness of communication between key players involved in responding to an emergency is maximized.

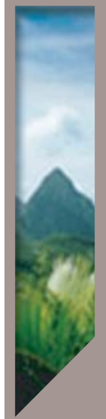
In addition to the continuing crisis on Montserrat, further lessons involving emergency management during a volcanic event were learnt following activity at Guadeloupe's La Soufrière in 1976-77, and on the Soufriere of St. Vincent in 1971 and 1979. It is a reflection of human nature, however, that most affected individuals soon forget the resultant fear and misery, often comforting themselves with the thought that another similar event is unlikely in their lifetime. To help counteract such complacency, it is vital that we combine lessons learnt during the crises of the 1970s with recent experiences from Montserrat, so that future volcanic emergencies can be confronted with greater confidence. Based upon extensive consultation in the region, the guidelines presented here reflect the thoughts, experiences, and recommendations of monitoring scientists, emergency managers and media representatives involved with the St. Vincent, Guadeloupe and Montserrat eruptions. It is important that the strategies, procedures, and examples of good practice recommended in the manual are taken as starting points that may be modified or taken further according to circumstances. What may suit one island may be less fitting for another. The over-arching message to take from the experiences that the manual incorporates and develops, is that successful crisis management is built upon a foundation of trust and cooperation between emergency managers, monitoring scientists and the media.



KEY

1. Saba
2. Quill
3. Liamuga
4. Nevis Peak
5. Soufriere Hills
6. La Soufrière Guadeloupe
7. Diable
8. Diablotins
9. Trois Pitons
10. Micotrin
11. Patates
12. Anglais
13. Pelée
14. Qualibou
15. Soufriere
16. Kick'em Jenny
17. St Catherine

Fig 1. *Volcanoes in the East Caribbean*



MANUAL STRUCTURE

The manual is divided into four parts. Part 1 provides a short introduction to volcanic behaviour. It is designed to familiarize non-specialists with the nature of volcanic hazards in the Caribbean, with how volcanoes are monitored, and with the principal technical terms they will encounter during a volcanic crisis.

Parts 2 to 4 are dedicated to communication, following the path of information flow during a crisis:

- *The monitoring scientists*, who interpret the signals from the volcano and provide forecasts about future activity, hazard and risk.

- *The Emergency Management Committee*, which transforms the scientists recommendations into instructions for emergency response.

- *The media*, who have a vital role to play in the dissemination of emergency response information and warnings.

Each part is structured so as to specifically address its target group, but key players are encouraged to familiarize themselves with the content of all three parts.

Appendices provide additional practical information including: examples of alert systems, a glossary of specialist terms, tips for interviewees and for issuing press releases, and resource guides relating to Caribbean volcanism and hazard preparedness.

METHODOLOGY & PRESENTATION

The information and responses upon which the manual is based were gathered through formal and informal interviews with representatives of the target groups, as well as with members of the public, on the islands of Montserrat, Guadeloupe, and St. Vincent. The guidelines and recommendations, however, are equally applicable to all volcanic islands in the Caribbean region. Regarding output, the key challenge has been in putting together a concise manual providing easily accessible information and examples of good practice in a non-technical, 'user-friendly' format. We hope that we have succeeded, at least to some extent, but we welcome comments and suggestions for further improvement.

THE NATURE OF THE HAZARD 1.1

To provide a context for understanding the problems caused by volcanic crises, this part of the manual offers a brief guide to what volcanoes are and how they behave. More detailed information can be found in the publications and online sources listed in Appendix 5.3.

An eruption occurs when molten rock (*magma*), reaches the Earth's surface through fractures in the crust. An accumulation of solidified magma around a fracture constitutes a volcano. Gases are trapped in magma and, close to the surface, they form bubbles. How easily the bubbles escape controls the style of eruption. If the bubbles are able to escape effortlessly, the magma oozes out as a lava flow, resulting in an *effusive* eruption. If the bubbles remain trapped, pressure builds in the magma, which then explodes at the surface. Trapped bubbles have a similar effect when opening a shaken bottle of fizzy drink.

The Lesser Antilles are an arc of islands, most of which are volcanic. The most common type of volcanism in the region involves the extrusion of almost solid, hot magma, which accumulates to form a *lava dome*. As a dome grows, it often becomes unstable and collapses. Bubbles still trapped inside may trigger explosions that hurl out large fragments of magma, known as *ballistic ejecta* or *bombs*. The collapsing part of the dome may also disintegrate to form *pyroclastic flows* or *surges* and *ash falls*. These and other hazardous volcanic phenomena are described below, while the various signs detected before an eruption are summarized in section 1.2.

LAVA DOMES

Lava domes are masses of almost solid magma that accumulate at the surface. They are very common in the Eastern Caribbean. All the active volcanoes of the Lesser Antilles have recently extruded lava domes, while most of the hills surrounding them are ancient domes produced by now extinct volcanoes. Lava domes are dangerous because they can collapse or explode to produce pyroclastic flows and surges and extensive ash fall.

- Dome temperatures are typically between 700 and 1000 °C (1300 - 1850 °F).

- Although dome growth is normally slow and quiet, the build up of gas pressure in bubbles can cause periodic explosions.

- Lava domes can be kilometres across and several hundred metres high.

Fig 2. *Soufriere Hills lava dome*

PYROCLASTIC FLOWS

Associated terms:
Block & ash flows
Nuées ardentes
Glowing avalanches
Ash flows

Pyroclastic flows consist of dense mixtures of gases, volcanic ash and - on many occasions - blocks and boulders of different sizes. In the Lesser Antilles they occur either when a dome collapses or during an explosive eruption. They are deadly. The most recent were generated on Montserrat in June 1997, killing 19 people. In 1902, Pyroclastic flows erupted from Martinique's Mont Pelée volcano obliterated the town of St. Pierre and killed up to 29,000 of its inhabitants. Pyroclastic flows appear as tall, turbulent, grey clouds moving rapidly down slope, and may glow at night. A pyroclastic flow will destroy or burn everything its path.

- Typical temperatures are 300 - 650°C (570 - 1200 °F).

- Pyroclastic flows normally travel very rapidly, with velocities in the range 50 - 150 km/h (30 - 90 mph).

- They can travel tens of kilometers.

- They can move over the sea.

- Accompanying clouds of ash can reach altitudes exceeding 10 km (33,000 ft), often trigger lightning strikes, and may disrupt air traffic.

- Pyroclastic flows tend to move along valleys and into depressions, but they can also overflow valley sides.

- They are often silent.

Fig 3. *Pyroclastic flow - St. Pierre 1902*

PYROCLASTIC SURGES

Pyroclastic surges are pyroclastic flows that consist mostly of gas. They may form at the volcanic vent or as the dilute outer parts of a pyroclastic flows break away from their more dense bases.

- Surges can travel tens of kilometers at velocities of 50 - 150 km/h (30 - 90 mph).

- They can move over topographic highs and across the sea.

- They are silent.

- Hot surges contain volcanic gases and may reach temperatures in the range 300 - 650°C (570 - 1200 °F).

- Cold surges contain mostly water vapour and have temperatures lower than 100°C (212°F). These normally occur when the gas is dominated by heated groundwater, and are associated with phreatic and phreato-magmatic eruptions (see pages 9 & 10).

ASH FALL

Associated terms:
Ash
Ash cloud
Tephra

Fig 4. *Ash damage*

Tephra is the term used to describe all volcanic debris expelled into the atmosphere from a volcano. The fine fraction is known as ash, which is formed either by explosions or when lava domes disintegrate into pyroclastic flows. Ash fall accumulating on structures can add sufficient weight - especially when wet - to cause collapse. Ash mixes easily with water to form mud, making surface travel difficult and providing the source material for *lahars* (see page 9). Ash may stay in the atmosphere for months, causing long term health problems. In large quantities, it can also contaminate water supplies, destroy crops and, if ingested, kill grazing animals.

- Ash can accumulate at rates of up to tens of centimetres an hour.

- 30 cm of wet ash is sufficient to cause collapse of unreinforced, flat roofs.

- It can bring down power and telephone lines.

- Gritty ash may cause vehicles to lose traction, while reduced visibility may contribute to preventing road travel.

- The long-term presence of ash in the atmosphere may exacerbate respiratory problems and cause illnesses such as asthma and silicosis.

BOMBS & BLOCKS

Volcanic bombs are fragments of new magma ejected from a volcano during an explosive eruption. Blocks are chunks of pre-existing rock torn from the interior of the volcano during eruptions. Together they constitute ballistic ejecta. Both are locally destructive and can kill.

- Bombs and blocks can travel with velocities of hundreds of kilometres an hour.

- They can reach heights of several kilometres above the volcano.

- Bombs and blocks 1 - 2 m (3 - 6 ft) across can be thrown 3 - 5 km (2 -3 miles) from the vent.

- They can carry sufficient energy to penetrate most structures

- They may be hot enough to start fires

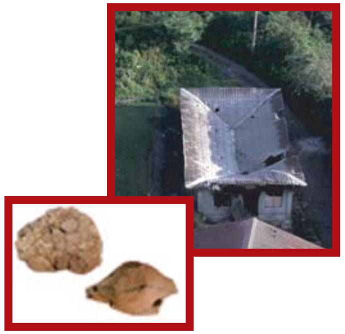


Fig 5. *Volcanic bombs & associated damage*

LAHARS

Associated terms:
Debris flows
Mudflows

Lahars are dense flows of water mixed with volcanic ash and boulders. On erupting Caribbean volcanoes, they typically occur after periods of intense rainfall. Although they look like mud, they often behave like floods of water. They can be deadly and severely damaging to property and lifelines. They can also clog river channels leading to serious flooding.

- Lahars are topographically controlled and follow valleys and depressions.

- Velocities vary according to density, but can reach 100 km/h (60 mph).

- They can travel for several kilometres and, even on the larger volcanic islands of the Caribbean, may reach the sea.

- They may be hot or cold, according to the proportion of hot volcanic material they contain.

Fig 6. *Lahar deposits (Montserrat)*

PHREATO-MAGMATIC ERUPTIONS

Associated terms:
Hydromagmatic eruptions/explosions
Vulcanian eruptions/explosions

Phreato-magmatic eruptions are violent explosions involving both magma and water. Ash and blocks can be hurled long distances from the volcano. The boulders can be lethal and damaging over a wide area.

- Blocks may be either fragments of new magma (bombs) or chunks of older rock torn from within the volcano.

- Velocities may reach hundreds of kilometres an hour.

- Blocks of lethal size (5 cm or 2 inches) can reach distances of 20 km (12 miles).

- Most serious damage occurs within 5 km (3 miles) of the vent.

- Eruptions are loud and may be accompanied by thunder and lightning.

- The resulting large ash clouds can reach altitudes of several kilometres

PHREATIC ERUPTIONS

Associated terms:
Hydrovolcanic eruptions

Phreatic eruptions are violent explosions triggered by steam. The steam is produced as rising magma heats groundwater already in the volcano. The explosions blast out fragments of cold, old rock, which may travel several kilometers and may also generate cold pyroclastic surges. Phreatic eruptions commonly occur in the period shortly before new magma breaches the surface, but may also occur at later stages in the eruptive cycle.

Fig 7. *Phreatic explosion*

FUMAROLIC ACTIVITY

Associated terms:
Fumarole
Gases
Soufrière

Fumaroles are vents where volcanic gases and vapourised groundwater (heated by magma) escape from the ground. The most common emissions are steam, carbon dioxide (CO_2) and sulphur dioxide (SO_2). Gases such as carbon dioxide may also leak invisibly out of the soil on the flanks of a volcano. Dense gases such as carbon dioxide may accumulate in depressions and can be lethal to humans and livestock. Volcanic gases may also damage crops, sterilize soils and lead to acid rain even at considerable distances from the volcano

- Volcanic gases are virtually colourless and difficult for the human eye to detect.

- Some gases sting (e.g. the acidic SO_2) or have distinctive smells (e.g. hydrogen sulphide, H_2S, which smells of rotten eggs). Others, such as CO_2 are odourless.

- All are dangerous if sufficiently concentrated.

- The presence of fumaroles does not necessarily mean that a volcano is about to erupt.

- Established fumaroles may become more active and new ones may appear before an eruption.

- Fumarolic activity is likely to continue long after an eruption ceases.

Fig 8. *Fumarole activity*

MONITORING & FORECASTING 1.2

During a volcanic crisis, scientists use several methods to monitor a volcano and attempt to determine if and when it will erupt. No volcano erupts without warning signs. Magma must open a pathway for itself before it can reach the surface. This it does by cracking open the rock as it rises, a process that triggers earthquakes. As it accumulates beneath the surface prior to eruption, the magma causes the surface to bulge, and also produces tiny changes in the Earth's gravity field and in the electrical and magnetic properties of the rock. The proximity of magma may also cause changes in the temperature and composition of fumaroles and in their compositions.

Methods for forecasting volcanic eruptions are largely based upon measuring how rising magma changes the rates of earthquake generation, ground swelling, and gas release as well as variations in the local pull of gravity and other physical properties. Systematic accelerations in the rates of such precursory behaviour may allow scientists to define predictive windows that allow the timing of a forthcoming eruption to be constrained. Brief explanations of four of the principal monitoring methods are provided below.

EARTHQUAKES

Associated terms:
Seismicity
Seismic crises
Tectonic earthquake
Magmatic earthquake
Tremor
Ground shaking
Seismometer
Seismogram

The cracking caused by rising magma triggers earthquakes more frequently than is normal when a volcano is quiet. Such periods of elevated earthquake activity are called *seismic crises*. In the build-up to an eruption, most earthquakes can only be detected by instruments, but some may be strong enough to be felt by animals or humans. Earthquake activity is monitored using a *seismometer*, which records the resulting ground shaking electronically or as a printed record on a *seismogram*.

- Seismic crises occur before and during eruptions. They can also, however, occur without a following eruption. Swarms of earthquakes occurred on Montserrat during the 1930s and 1960s but no eruptions followed.

- Monitoring scientists can distinguish different types of earthquake by their signatures. For example, *tectonic earthquakes* are caused by magma fracturing rock, while *magmatic quakes* and *tremor* result from the vibration of fractures as magma and gas pass through them.

- Although generally weak, volcanic earthquakes may sometimes be strong enough to damage buildings and open cracks in the ground.

- Sometimes the terms seismicity and seismic crises are used in relation to events detected by instruments, while earthquake is reserved for ground movements strong enough to be felt by humans.

GROUND DEFORMATION

Associated terms:
Ground swelling
Surface deformation
Tiltmeter
Extensiometer
EDM
GPS
SAR

As magma approaches the surface it has to make space for itself. This has the effect of causing the surface to bulge upwards, although usually the swelling is so small that it can only be detected by instruments. Typically, the degree of swelling will range from a few centimetres to tens of centimetres, covering an area of several to several hundred square kilometers. Occasionally, swelling may be great enough, close to the volcano, to cause damage to buildings.

Several instruments are available for monitoring the various aspects of ground swelling. Some are ground based or airborne, while others are housed in orbiting satellites. These include:

- *Tiltmeters*, typically lodged in a borehole, measure tilting of the ground surface.

- *Electronic Distance Meters* (EDM) record changes in the distances between known positions on the volcano.

- *Global Positioning System* (GPS) uses receivers that detect radio signals from satellites to measure the relative positions of known points on the ground.

- *Extensiometers* measure directly any stretching of the ground surface.

- *Synthetic Aperture Radar* (SAR) reveals patterns of surface deformation by comparing sequences of aerial or satellite radar images of the volcano.

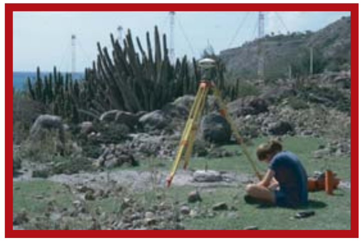


Fig 9. *GPS monitoring (Montserrat)*

GAS & WATER CHEMISTRY

Associated terms:
COSPEC
FTIR

The escape of magmatic gases from beneath the surface is monitored by measuring changes in the amount and composition of gases being released at fumaroles and seeping into the atmosphere from the soil. The rise of magma may be reflected in greater concentrations of sulphur dioxide (SO_2) in fumaroles, or radon and helium in soil gases. Once a volcano is active, the SO_2 concentration in any gas plume from the vent can be determined using a Correlation Spectrometer (COSPEC). Other gases may be detected using a newer method known as Fourier Transform Infrared Spectroscopy (FTIR). Magmatic gases may also be detected in water from springs and wells.

GRAVITY

Associated terms:
Microgravity
Gravimetry
Gravity meter
Gravimeter

The movement of magma below and into a volcano changes the distribution of mass and density beneath the surface, which in turn modifies the local pull of gravity. The magnitude of the change is tiny - a few tens of millionths of the average strength of the Earth's gravity - and can only be detected by very sensitive instruments called *gravimeters* or *gravity meters*. The local pull of gravity is also affected by ground swelling, so to be meaningfull gravity measurements must be combined with techniques capable of accurately measuring surface deformation.

Fig 10. *Microgravity monitoring*

INTRODUCTION 2.1

This chapter contains advice to help monitoring scientists communicate with the civil authorities and the media, but it is also recommended that other stakeholders familiarize themselves with the material to better understand the problems that scientists face. The scientists are responsible for assessing the probable behaviour of a volcano and the impact of an eruption. This information is fundamental for deciding how to respond during an emergency, and provides the first step in the information chain during a crisis. It is thus crucial for scientists to explain their forecasts in plain and unambiguous language. It is also important that scientists adhere to their remit of informing only about the state of the volcano. It is often tempting for them also to become involved in issuing warnings directly to the public. This second step, however, has implicit political overtones. To maintain credibility as impartial advisors, therefore, scientists should avoid issuing warnings and making public statements that are more properly the responsibility of the civil authorities. If they are, however, required to talk to the media or to make statements or comments related to the crisis, this must be with the full agreement of the Emergency Management Committee and following discussion with its science liaison officer.

During previous volcanic episodes in the Caribbean and elsewhere, states of crisis have been worsened by misunderstanding of scientific advice and apparent disagreement and conflict between the scientists themselves. To avoid similar problems, an ethical protocol has evolved among the volcanological community to constrain the role and responsibility of scientists during a crisis. Although details of the protocol may have to be adjusted on a case-by-case basis, its key features remain unchanged and form the basis for these guidelines.

EXAMPLE OF GOOD PRACTICE - GUADELOUPE VOLCANO OBSERVATORY

Procedures at the Guadeloupe Volcano Observatory have been praised at all levels as a good example of how to disseminate information. The Observatory sends a monthly report of volcanic activity to several institutions, including regional and local councils, the civil protection, police and emergency services, environmental offices, local and regional media and other volcano observatories and institutes in France and the Caribbean. The reports comprise three parts:

- Activity at La Soufrière volcano (e.g. seismicity and fumarolic behaviour) and the current level of alert (together with an explanation of different alert levels)
- Regional seismicity
- Activity on the neighbouring island of Montserrat.

Reports will be issued more frequently during sustained increases in activity.

Fig 11. *Guadeloupe Volcano Observatory*

ISSUING FORECASTS 2.2

Most scientists spend their careers communicating with their peers, so that it is natural to use specialised terms when discussing ideas. In times of volcanic emergency, it is important also to express forecasts in plain language. A trade-off is thus often needed between technical precision and general accessibility. Qualitative, non-technical statements yield more positive reactions among non-scientists - but they must always be based on precise technical analysis. During a crisis, it is important for the scientific team to be clear, to be patient, and to learn from previous mistakes. If a message is not understood, it should be repeated in alternative terms, and as often as necessary, until its meaning has been made clear.

UNDERSTANDING FORECASTS

Confusion with terminology is one of the main reasons why non-scientists misunderstand a forecast. Three problems are especially common:

- The inability to distinguish between terms used in common language that have a different meaning for scientists: especially the difference between *hazard* (the probability of a natural event occurring), *risk* (the probability of a loss caused by the hazard) and *danger* (a situation that can cause damage, injury and/or loss of life). It is important to explain and familiarise the audience with these terms before an emergency.

- A limited public understanding of scientific jargon (e.g., technical terms for volcanic processes, such as "pyroclastic flow") and concepts such as probabilities in the forecasts.

- A false understanding of scientific jargon. On Montserrat, for example, terms such as "pyroclastic flow" soon entered the public vocabulary, giving the impression that their significance had also been understood. Many times, however, the terms had been learned through repetition by the media, while the true nature and scale of the associated hazards had not been appreciated. Indeed, a false familiarity with the terms may even have lowered the public's perception of danger by inducing an unrealistic sense of security.

It is therefore essential for scientists to explain key technical terms at the start of an emergency (or, if possible, beforehand) and to ensure that non-scientists have properly understood the associated hazard implications. These requirements cannot be understated - a misunderstood message may be more dangerous than no message at all.

CONVEYING INFORMATION EFFECTIVELY

Whether dealing with the Emergency Management Committee and its science liaison officer, the media, or addressing public meetings:

GOOD PRACTICE

- Use simple, short messages. Speak slowly and clearly.

- Stick to essential information. Too much unnecessary scientific data may confuse the audience and hide the basic message. For example, "Earthquakes tell us that..." is more effective than "The 200 VT earthquakes and 50 long period tremors mean that …".

- Use jargon only if it is essential, and then explain it in simple terms.

- Wherever possible, use pictures, drawings or graphics to explain concepts.

- Compare any new concept with a more familiar example. For instance, use the analogy of weather forecasts to explain uncertainties in eruption forecasts.

- Use numbers, percentages or proportions carefully and explain the context (e.g. "The probability of Y happening is X %. This means that Y is very likely/unlikely to occur.")

- Avoid using units not in common public use (e.g., Joules or Atmospheres).

- Always confirm that the message has been fully understood. Repeat the message as often as necessary until such confirmation is apparent.

BAD PRACTICE

- **DO NOT** cultivate a superior attitude when dealing with groups whom you perceive are less knowledgeable about volcanoes than yourselves.

- **NEVER** be condescending to members of the EMC. This can rapidly result in the breakdown of working relationships and the potentially fatal collapse of communication and information flow.

- **NEVER** be unnecessarily obtuse or evasive. This promotes misunderstanding and leads to fears that you may be hiding something.

FORECAST TO WARNING TRANSITION

The critical step of transforming a forecast (to advise how a volcano may behave) into a public warning (to advise how a vulnerable community should react) is the responsibility of the authorities. However, as producers of the forecast who are in close and continuous contact with the Emergency Management Committee, monitoring scientists are inevitably involved in the transformation process. During the current emergency on Montserrat, for example, the close link between scientists and the EMC raised public confidence and improved the response of the population. Importantly, however, the warnings and instructions were issued by the civil authorities: the scientists acted only in an advisory role.

SCIENTISTS & THE EMC 2.3

Scientists provide the information that guides the entire emergency response. This information is then presented to the EMC or its equivalent, which will decide on the appropriate emergency strategy. A clear focus on assessing the volcano's behaviour is therefore crucial. Distractions in deciding emergency management procedures are normally counter-productive, and so it is recommended that a single scientist is given responsibility to liaise with the EMC. This individual should sit on the EMC and work particularly closely with the EMC's science liaison officer. From the monitoring team's point of view, such an arrangement will allow the core of the scientific team to concentrate on monitoring the volcano.

GOOD PRACTICE

- Decide which scientist will liaise with the Emergency Management Committee and ensure that a good working relationship is established.

- Agree responsibilities with the civil authorities. Remember that your role is to provide advice and not to take decisions about emergency responses.

- Clarify with the EMC the format in which you will provide them with information.

- Ensure that the EMC is familiar with possible eruption scenarios and their impact.

- Offer aid in designing basic plans that can be activated rapidly once a crisis starts to develop.

- Work with the EMC to develop hazard and risk zonation maps and an effective system of alert levels.

- Offer to play an active role in helping to educate the public about the volcanic threat. Provide individuals to talk at public meetings, to schools and other institutions, and on radio and television. Offer your expertise in preparing and disseminating literature and encourage and take a full part in regular exercises and simulations.

DURING A CRISIS

- Ensure that effective and reliable means of communication are established and maintained with the EMC. Bear in mind that eruptive activity may make travel difficult and damage exposed phone lines and ensure that alternative methods - pagers and VHF radios - are available and used.

- Draw up a timetable for regular meetings with the EMC science liaison officer. These should be at least daily and more frequently during periods of elevated activity or eruption.

- Offer to the EMC, the services of your dedicated media spokesperson for press conferences and announcements, for drawing up information releases to the media and the public, and for making presentations to stakeholders such as aid agencies and chambers of commerce. Remember that your representative is charged with explaining the scientific basis for an emergency response and must avoid taking on any responsibility for emergency management decisions from the civil authorities.

- Always listen to the concerns of the Emergency Management Committee

BAD PRACTICE

- **NEVER** with-hold information from the Emergency Management Committee.

- **DO NOT** make decisions that might affect the welfare of the local population without the agreement of the EMC.

- **NEVER** show your anger or frustration with the EMC. Remember they are required to make crucial, life-or-death decisions under conditions of extreme pressure.

SCIENTISTS & THE MEDIA 2.4

Media attention is commonly a major distraction for the scientific monitoring team, so it is vital that a member of the team is given sole responsibility for liaising with the media. This individual should have good communication skills and previous experience of involvement with the media. Even so, it is likely that individual journalists and broadcasters will still attempt to approach and interview other members of the monitoring team, in part to obtain extra information, but also to find new and different 'angles' or to tease out an 'exclusive' story. In the latter cases, careless comments can be exaggerated to form the basis of a 'scoop', the gist of which is almost always negative and unhelpful, and sometimes dangerous. For example, comments about a population being threatened, even if only theoretically, may be published under the banner headline *Population doomed*? Or an apparent lack of consistency about the scientific analysis of the situation may provoke a story with the headline *Eruption crisis: what the scientists don't want you to know*. Once such stories have been published, not even later retractions will prevent public doubt about how well a crisis is being managed.

REDUCING OPPORTUNITIES FOR DISSEMINATION OF MISINFORMATION

GOOD PRACTICE

- Ensure that only your dedicated spokesperson talks to the media. Repeated contact with the same scientist encourages media trust and allows the core team to focus on monitoring the volcano.

- Help the EMC to put together a media pack. This should contain information about the history of the volcano, its activity and its style of eruption. Additionally, the pack should address monitoring methods, contingency plans and appropriate contacts.

- Always agree with the EMC about form and content, before making any statements of announcements to the media.

- In collaboration with the EMC, issue regular press releases about the activity - even if conditions have not changed since the previous release.

- If the authorities have asked you not to speak with the media, explain the position to them openly and redirect enquiries to the EMC's appointed media liaison officer.

- Ask, in advance of an interview, about the type of information required, so that you can prepare a general context for your answers (see also the tips in Appendix 5.2).

- Keep to the point and give simple, short and direct answers that cannot be misinterpreted.

- The local media are usually the most effective at informing the population at risk. Do not give priority to more glamorous foreign agencies.

- Ensure that the same information is released to local and foreign media. Remember that local populations are likely to have friends and relations living abroad with whom they may be in touch during the emergency. It is important that the vulnerable community feel that they are being as well - or better - informed than foreign groups.

- Be approachable. This will stop the media seeking alternative sources or making independent evaluations about the state of the volcano.

- Remember that all announcements and written statements should be well-thought out and the content carefully considered before they are issued.

BAD PRACTICE

- **DO NOT** simply refuse to reply to journalist enquiries Such evasive behaviour is likely to raise suspicions.

- **NEVER** make any comments 'off the record'.

- **AVOID** making spontaneous 'off-the-cuff' remarks that might be open to misinterpretation - deliberate or otherwise.

- **NEVER** underestimate or patronize the media.

SCIENTISTS & OTHER SCIENTISTS 2.5

In a crisis situation, scientists should never be seen to disagree in public. Whatever the merits of an argument, open disagreement feeds public distrust and diminishes the authority of the scientific team as a whole. Any contrary points of view should be resolved internally.

INTERACTION AMONGST SCIENTISTS

GOOD PRACTICE

- Meet colleagues in advance of any crisis, to establish mutually preferred working conditions and to agree a protocol for dealing with different opinions within the team.

- Rehearse well in advance procedures to be adopted once an emergency starts.

- Be open to views from external scientists during a crisis. Ignoring external opinions could lead to adverse publicity.

- Establish a protocol for visiting scientists, defining their tasks and ensuring that they comply with agreed measures for communication with the EMC, the media and the public.

VISITING SCIENTISTS

- Always be aware that - even if officially invited - you may be regarded as an interloper by some. Minimise this attitude by deferring to the monitoring team and the EMC and its science liaison officer, and being supportive rather than obstructive at all times.

- Do not engage in tasks or issue statements without the express agreement of the monitoring scientists and the EMC.

- Ensure that you never make announcements that contradict those of the monitoring team, even if the messages are directed to a foreign audience. Any disagreements should be resolved internally and in advance.

- Remember that the monitoring team is likely to have a better feel for the level of public understanding of the volcano's behaviour.

ESSENTIAL CHECKLIST 2.6

To maximize its contribution to the successful handling of the crisis, the monitoring team must ensure that relationships with key players and stakeholders are established, and essential protocols and procedures in place, before the onset of the emergency. These measures should be sufficiently rigorous to operate effectively and with little or no modification as the crisis develops. To this end:

- Allocate individuals on the monitoring team to liaise with the Emergency Management Committee and the media.

- Build and foster strong and supportive working relationships with the EMC and media representatives.

- Ensure that the EMC is familiar with possible eruption scenarios.

- Develop hazard and risk zonation maps based upon the aforementioned scenarios.

- Work with the EMC and other stakeholders to develop a volcanic emergency plan and ensure that it is regularly and appropriately updated and revised.

- In advance of the crisis, put together a checklist of tasks and key personnel to contact.

- In cooperation with the EMC, plan the means and format of information releases and announcements.

- Take a pro-active role in helping to educate the public and the media about the volcanic threat.

INTRODUCTION 3.1

This chapter is targeted at the group with responsibility for managing a volcanic crisis. In most - if not all circumstance - this will be the Emergency Management Committee whose brief is likely to include the full range of potential technological and natural disasters. Given this broad remit and bearing in mind that volcanic action may not have occurred within living memory, the first step on the road to effective management of a future volcanic crisis must involve the EMC developing a more detailed understanding of the volcanic threat. The obvious place to start is by developing improved links with the scientific team responsible for volcano monitoring (see section 3.2).

While every state has its own strategy in place to deal with major emergencies, lessons learned from recent and ongoing volcanic crises (Guadeloupe 1976; St. Vincent 1979; Montserrat 1995 - present) can help to improve plans for communication and response. Based to a large extent on the experiences of these islands, this section contains advice on how to handle information during a volcanic emergency and how liaison between the primary stakeholders can be made more effective. It is assumed here that the body responsible for management of the crisis and - thereby - for information handling, will be the EMC. In most Caribbean countries, this is made up of representatives of key advisory and decision-making bodies, and typically comprises the Prime Minister or Chief Minister, other ministers (as appropriate), the Heads of Police and Civil Defence, a representative of the scientific monitoring team and a spokesperson. This group has ultimate responsibility for decisions impinging upon the welfare of the affected population, including those relating to declaration, changes and cessation of states of alert and/or emergency, evacuation, prohibition of movement and resettlement. Inevitably, an EMC is required to assimilate large amounts of information upon which it is required to act, often rapidly and under considerable pressure. The recommendations that follow are designed - under these difficult circumstances - to make information handling and communication with other stakeholder groups more effective.

EXAMPLE OF GOOD PRACTICE - MONTSERRAT EOC

Created in 1995 in response to the onset of the ongoing Soufriere Hills eruption, the Montserrat Emergency Operations Committee is an example of an effective coordinating body that has proved itself capable of making rapid decisions in response to swift and unexpected changes in circumstances. The EOC is staffed by the heads of all departments involved in crisis management together with a media centre representative. EOC staff are seconded for the duration of the crisis, leaving deputies in charge of their respective departments. When not physically present at the EOC centre, staff are in 24-hour contact via internal or cellular phone,

INFORMATION MANAGEMENT DURING A VOLCANIC CRISIS

Volcanic eruptions in the Caribbean are not sudden events, and typically take months to reach the critical stage when they become a serious threat to life, property and general infrastructure. Such a long build-up must be used by the EMC to activate pre-determined action plans, to ensure that effective links with the scientists and the media are in place, and that the mechanisms for communication of alert levels and warnings are operational. During this build-up phase, the EMC will also have a duty to provide information on the developing crisis to other affected groups such as chambers of commerce, port and airport authorities, airlines, ferries and other transport bodies, and other NGOs.

In the months of escalation prior to an eruption, some signals of volcanic unrest (e.g. felt earthquakes or steam outbursts) will - inevitably - become apparent to the population. These are likely to promote some public unease and raise pressure on the EMC to provide more information on the volcano's behaviour. To establish and maintain the public's trust it is imperative that the EMC responds quickly, positively and openly to such requests. Even so, opinion and rumour will feed confusing and conflicting messages, many of which - in the absence of appropriate measures (see section 3.3) - may be taken up and widely disseminated by the media. Once an eruption starts, there will be little or no time to organise how information is released and communicated or to establish necessary contacts among key stakeholders. It is therefore essential for the EMC to have prepared in advance an effective plan for managing the flow of information during a volcanic crisis.

The names, contact details (telephone, fax and e-mail - at home and at work) and individual responsibilities of the EMC should be known by all committee members. The EMC should meet regularly, even at times of no emergency, to establish close working relations and a shared appreciation of group tasks during a crisis.

VOLCANIC CRISIS INFORMATION PLAN

Disseminating emergency information is a full-time occupation. During a crisis, the EMC itself will be too busy to pursue this task directly. Through an information liaison officer, the EMC should delegate responsibility for disseminating information to a dedicated information team. Ideally, this team will consist of people that understand how the government works and are respected and trusted by the public and the media. Candidates with good communication skills are frequently found amongst those with experience as teachers, journalists and media presenters, religious leaders and senior members of government departments. The information team should provide dedicated liaison officers to work closely with the scientists and the media.

Experience shows that a 'cascade' structure provides for the most effective flow of information. Within this structure, the information team informs a small number of key contacts who, in turn pass information to their colleagues and other contacts. In this way, information spreads rapidly, even though the information team spends only a small amount of time alerting their key contacts. Accordingly, a crisis information plan must incorporate a database of the key contacts to alert in case of emergency. This should include reserve names in case the primary contacts are unavailable. The information team should be based at a safe distance from the volcano and within range of the EMC. To avoid unwanted media intrusion at the EMC, it is probably best that the two are lodged in separate buildings. The location of the information team should be public knowledge.

DISSEMINATING WARNING MESSAGES

Warning messages need to be related to a pre-established system of alert levels and should describe both the level of alarm and the required response (see Appendix 5.6 for example). Messages must be clear and unambiguous and phrased so as to avoid causing panic or engendering a false sense of security. Be simple, be colloquial, but don't be patronizing. It is crucial to use the style of language appropriate to the group being addressed.

GOOD PRACTICE

- Make use of locally respected leaders, such as mayors, teachers and religious representatives, to spread and reinforce warning messages. Relief agencies may also prove to be useful allies in ensuring effective communication with the public.

- Keep the text of messages short, simple, and straightforward. Include the level of alarm, a description of the expected hazard(s) and instructions about how to respond. Use of graphics (e.g. to show evacuation routes) can be particularly effective.

- Release information regularly - even if no change in alert level is to be flagged. A paucity of information can promote unease while frequent updates present an image of awareness, understanding and control.

- Ensure the consistency of warning issued via different media (radio, the press, disseminated literature etc.).

- Make arrangements to ensure that warnings also reach expatriate communities abroad, who are likely to have friends and family under threat.

- To maximize impact and avoid over-exposure, reserve scientists and politicians of senior status for the delivery of warnings only when a major response is required.

- Use e-mail and dedicated websites as well as traditional methods of communication.

BAD PRACTICE

- **AVOID** difficult concepts and jargon.

- **DO NOT** ignore public concerns.

- **DO NOT** exclude minorities. Disseminate the message in all appropriate languages and dialects, with consideration for those with poor literacy or who are visually or aurally impaired.

EMERGENCY MANAGERS

INVEST IN PREPAREDNESS

A major complaint of inhabitants living in the danger zones around active and potentially-active volcanoes is that they do not know what is going on, particularly when the volcano is inactive. Keeping the local population fully informed before an emergency improves its response during a crisis.

School programmes are a particularly effective way of raising hazard awareness among children and their families. Ensure that teaching about the volcanic threat remains a part of school curricula throughout the year.

Conduct periodic exercises to acquaint the public with procedures and to test and refine emergency measures.

Many organizations (for example the United States Geological Survey and the Montserrat Volcano Observatory) have produced educational materials about volcanoes and volcanic hazards that are ready to use.

Preparedness means investing in ways to minimize the impact of disaster. Preparing today will save lives tomorrow.

THE EMC & THE SCIENTISTS 3.2

The scientists' main task during an emergency is to monitor the volcano, to forecast its behaviour, and to deliver information to the Emergency Management Committee. The information will then be used by the EMC to issue warnings to the general public. Remember that eruption forecasting is not a precise science, so that the monitoring team will be under pressure not only to issue timely information, but also to interpret reliably the signals obtained from the volcano. It is therefore important to create conditions that allow scientists to focus on their tasks without distraction from other groups, especially from the media, who may use leaks and incomplete information to create an 'exclusive' story. It is equally important, however, not to isolate the scientists from the public, as this can engender a degree of frustration and a feeling that the 'true facts' are being with-held as part of a perceived hidden agenda.

FORECASTING A VOLCANO'S BEHAVIOUR - FACTORS TO BE AWARE OF

Even using the most sophisticated methods, scientists cannot provide perfect forecasts. They can, however, estimate the relative probabilities of whether or not an eruption is imminent and of the type or style of eruption. This means that their forecasts will always contain some uncertainty. The case is similar to forecasting the weather. For instance, when tracking a hurricane across the Atlantic, forecasts can change by the hour as to when a hurricane will reach the Caribbean and whether or not it will strike a particular island. Normally, the monitoring scientists will present a forecast as a probability. For example: *there is a ten percent chance of lava dome collapse and associated moderate explosive eruption during the next seven days*. The scientists should also provide supporting information - on the basis of hazard and risk maps that they have compiled - about the resulting eruptive phenomena and the area likely to be affected (see below). Armed with this information, it will then become the EMC's responsibility - and not that of the scientists - to decide how to react to an eruption forecast. It is therefore crucial that you understand and appreciate the limits to forecasting techniques.

WHAT CAN SCIENTISTS FORECAST?

ADVICE BEFORE AN ERUPTION

Before an eruption, scientists can advise on:

- The probability of an eruption in the medium-to-long term (10-100 years). This is based on the frequency with which your volcano is known to have erupted in the past. Remember that records are usually incomplete, so that the probabilities can only be used as general guidelines for planning development and the design of escape routes during a crisis.

- Whether or not a volcano is becoming active. This is based on unusual signs of unrest, such as local, small earthquakes or ground uplift. Such signs do not mean that a volcano will erupt, only that new processes are occurring beneath the surface and that these might lead to an eruption. When such unrest does lead to an eruption, it is commonly detected several weeks or months before the eruption occurs. Enough time is thus normally available to increase the efficiency of the network of instruments monitoring the volcano's behaviour.

- The probable style of eruption (e.g., an explosive eruption or the extrusion of a lava dome) and its impact, especially the location and size of the area most likely to be affected. The assessments are made by studying the products from previous eruptions from your volcano and, also, using experience gained from similar types of volcano around the world. The results will normally be presented as a *hazard zonation map* that shows the areas likely to be affected by a particular style of eruption.

- The preparation of a *risk zonation map,* based upon the hazard map. This will define the absolute and relative threat to population centres on and around the volcano and will form a critical element in the operation of an effective system of alert levels, and in the development of evacuation and resettlement plans.

- The construction and form of a system of alert levels requiring specific actions by the EMC and the public in response to the escalation of activity through a series of pre-defined criteria based upon changes in the volcano's behaviour (e.g. Montserrat alert level system - appendix 5.6)

- If more than one style of eruption is expected, the relative probability of the different styles taking place (e.g., "Extrusion of a lava dome, X%. Explosive eruption, Y%")

ADVICE DURING AN ERUPTION

During an eruption, scientists can advise on :

- Short-term changes in the level of activity. For example, by monitoring the numbers and types of earthquake, or the rate of swelling of the ground surface, estimates can be made as to whether an eruption may be accelerating towards stronger activity or, conversely, coming to an end.

- Changes in the areas under threat. These may occur because the eruption itself alters the shape of the volcano. For example, a growing lava dome may cause an old crater wall to collapse, so allowing pyroclastic flows from the dome to travel in directions not previously possible. Changes will also occur if the eruption becomes stronger or decays. These are likely to necessitate modifications to hazard and risk maps as the eruption develops, perhaps also entailing changes to the system of alert levels.

- Specific, appropriate measures for mitigating risk. Such measures may include - for example - the dredging of rivers filling with ash and volcanic mud in order to reduce the risk of over-spilling and flooding, or the removal of accumulating ash from roofs to prevent structural collapse.

GUIDE TO GOOD PRACTICE

BEFORE A CRISIS DEVELOPS

- Allocate a science liaison officer from the information team (ideally an individual with some scientific background or knowledge) and ensure that a stable and good relationship is built up with the monitoring scientists, even if nothing is happening at your volcano. Publicise the fact that regular contact is being maintained. This will help reduce media pressure on the scientists and also strengthen public confidence that preparations for future volcanic emergencies are being taken seriously.

- Discuss possible eruption scenarios and their impact. Design a series of basic plans that can be implemented rapidly at the start of an emergency (although these may have to be modified later to account for specific conditions during a crisis).

- Work with the scientists to develop hazard and risk zonation maps and an effective system of alert levels. Use this information to plan emergency evacuation and resettlement measures.

- Establish with the scientific team the sort of information that will be most useful to you in preparing an emergency plan, and in what form this information will be provided. Make sure that you are familiar with key scientific terminology and understand the limits to the type of scientific information that will be available during a crisis. Do not hesitate to ask for as many explanations and clarifications as you might need: it is better to learn before a crisis develops.

- Utilise the scientists to help to educate the public about the volcanic threat. This can be done via public meetings, radio interviews, giving talks to schools and other institutions, exercises and simulations, and by seeking their involvement in the preparation and dissemination of literature.

EMERGENCY MANAGERS

DURING A CRISIS

- Establish effective and reliable physical means of communication with the monitoring scientists. Bearing in mind that a serious eruption may make travel difficult and may damage exposed telephone lines, the use of pagers and VHF radios is strongly recommended.

- Consider basing your science liaison officer at the volcano observatory.

- Institute a regular timetable of liaison meetings with the scientists - at least once a day, and more frequently at times of elevated activity or during eruptions.

- Involve the scientists through their nominated spokesperson, in ALL press conferences, press releases, and announcements to the public.

- To ensure coherence of message, agree with the nominated science spokesperson about the nature of the information to be released.

- Always take account of scientific advice about the changing behaviour of the volcano and be ready and willing to modify risk maps, the system of alert levels, evacuation and resettlement plans.

BAD PRACTICE

- **NEVER** ignore the advice of the monitoring scientists.

- **NEVER** take decisions that may impinge upon the welfare of the local population without consulting the scientific team.

- **DO NOT** expect or require the scientists themselves to produce and/or issue warnings to the public. They will advise the Emergency Management Committee and help in collective decision making, but it is your responsibility to take the message to the public.

- **DO NOT** seek, or take, the advice of external scientists. Any contact with external scientists should be conducted through, and with the support of, the monitoring team.

- **DO NOT** pressurise the scientists to provide forecasts of the exact time of an eruption, its style, or its duration. Current understanding of volcanoes and how they function simply does not allow for this.

- **DO NOT** become frustrated that scientists cannot guarantee whether or not signs of unrest will lead to an eruption. This is a notoriously difficult problem in volcanology.

THE EMC & THE MEDIA 3.3

During a crisis, the maintenance of good relations with the media is critical. Without this messages can quickly become confused or misrepresented. Considerable effort may have to be expended to ensure that conflicts of interest do not create barriers between you and the media, which may hinder effective communication and ultimately result in increased risk to the public. Effective collaboration with the media depends upon you - prior to the development of a crisis situation - appreciating how the media operates, understanding the methods it uses to extract and process information, and identifying potential causes of friction. It is not unreasonable to liken the media - as an entity - to a hungry animal. Keep it well fed and watered and you keep it content.

THE MEDIA AGENDA

- The ultimate object of any journalist during a crisis situation is to find a 'good' story. Typically this will focus upon an 'angle' so as to distinguish it from other stories relating to the same event.

- Journalists are instinctively wary and suspicious, and are constantly in search of a 'cover-up' that they can address, highlight and attempt to unravel.

- Journalists are notoriously competitive and often attempt to out-do one another. In a crisis situation this can result in increasingly speculative stories based upon ever-more unreliable evidence.

- In seeking the personal touch, journalists will consult individuals within the affected population, asking their opinions and extracting information about their experiences. Inevitably, the end-product is often a mish-mash of poorly informed comment and criticism that may reflect badly on you.

- To validate information, conscientious journalists will cross-check with a number of sources. While increasing accuracy, this also has the potential to highlight differences of opinion and inconsistency of message.

- A dramatic story is sought after as it captures greater audience interest. Inevitably, something going wrong will be highlighted at the expense of an otherwise flawless operation.

- Journalists often find it difficult to appreciate levels of scientific (un)certainty, and try and present stories in black and white, thereby highlighting extreme scenarios.

- In any crisis, some journalists will look for scapegoats to blame and heroes to praise. In either case this may be entirely unjustified, but it may colour the manner in which the authorities are viewed.

COMMON MEDIA COMPLAINTS ABOUT EMERGENCY MANAGERS

- Journalists frequently suspect that they are not being kept 'in the picture', even when this is not the case.

- In keeping with their naturally suspicious natures and competitive spirits, journalists suppose - with regard to information dissemination - that others in their profession are being favoured at their expense.

- With deadlines to hit, journalists persistently complain about the speed of the decision-making process and the paucity of press releases.

GUIDE TO GOOD PRACTICE

BEFORE A CRISIS DEVELOPS

- Allocate a media liaison officer from the information team and ensure that a stable and good relationship is built up with the local media. Periodic press releases about the state of the volcano - even if nothing is happening - can help maintain links with the media in quieter times. Regular media events, such as visits to the volcano observatory or launches for new monitoring systems or receptions for the arrival of new staff, can all help to build trust and a good working relationship.

- Make contact with appropriate journalists (typically science or environmental correspondents) in the regional media and in the major global players such as CNN and the BBC. These are likely to be the first external journalists on the scene when a crisis begins to develop.

- Construct a database of relevant journalists to aid information dissemination during a future crisis. Update as contacts move on and are replaced.

- Put together and circulate a media pack. This should include information on the history of the volcano, its activity, and its style of eruptions. A terminology section would also be particularly well received (that included in part 1 of this manual could be used for this purpose). The pack should, in addition, contain information on monitoring, contingency plans for a future eruption, and appropriate contacts.

DURING A CRISIS

- Ensure that a single individual is responsible for all contacts with the media. It is infinitely preferable that this should be the aforementioned media liaison officer. In order to ensure consistency of message, make it clear that no-one else should speak to the media under any circumstances.

- Contact all journalists on the database, updating them with regard to the situation and promising regular press releases. Determine which journalists intend to visit and make a polite request for travel plans.

- Update and distribute the media pack to take account of the changed state of affairs - incorporating information on the volcano's activity, modifications to the monitoring situation, science staff changes, and other relevant circumstances.

- Establish a press pass system for journalists who wish to attend press conferences and avail themselves of other official sources of information. This will allow the number and affiliations of visiting journalists to be effectively tracked and recorded.

- Set up suitable facilities for the media - ideally a room with internet facilities and sufficient e-mail and phone links to allow them to file their stories.

- Issue regular press releases and hold frequent press conferences. The timing of releases and conferences should be determined at an early stage in the crisis and widely circulated. Under normal circumstances, press releases should be issued at the start and end of the day, with a daily press conference - perhaps during the middle of the day - to allow journalists time to formulate their questions in response to the morning release. Provision of material early in the day is particularly important as it will provide the media with items for their 'news of the day' and place journalists under less pressure to hunt for material from unofficial and less informed sources. During periods of elevated activity, after an actual eruption, or following an unusual event, such as a series of notable earth tremors, additional releases and conferences should be arranged.

- Even if nothing has happened in the preceding 24 hours, maintain the timetabled programme of releases and conferences. With respect to the latter, such circumstances could be used to provide opportunities for thematic press conferences, providing journalists with additional information on certain aspects of the crisis - such as the mechanics of the alert system or the state-of-the-art with regard to eruption forecasting. Scientists and other appropriate experts should be utilized at such times.

- Meet regularly with the monitoring scientists in order to ensure that your message is concordant with their view. Always have a representative from the monitoring team at press conferences. This allows journalists to acquire first-hand information and reduces suspicion of with-holding of information.

- Organise visits for registered media representatives to the volcano observatory and into any exclusion zone - when conditions are deemed safe by the monitoring scientists. Stress to journalists that unaccompanied visits into an exclusion zone are prohibited.

- Monitor the media output as much as is feasible. Do not ignore inaccurate or malicious reporting, but insist on clarifying the situation as soon as possible. This is critical if rumour and innuendo are to be cut short.

- Use press conferences - or specially arranged discussion meetings - to ask journalists for their opinions on how the crisis is being managed and their impressions about public reaction. Having probably interviewed many individuals across the social range, journalists may be able to provide valuable insights into the public's perception of the crisis and how it is being managed.

BAD PRACTICE

- **NEVER** say 'no comment' or 'we have nothing to say'. If a situation has not changed since the previous press conference, then say this clearly. If the crisis is escalating, explain how the situation has changed and the course of action being taken to address the change.

- **NEVER** make any comment 'off the record'.

- **NEVER** selectively give out information.

- **NEVER** give out contradictory messages.

- **NEVER** with-hold information 'in the public interest'. Experience has shown that: (a) such a policy rarely is in the public interest, and (b) the relevant information is almost always leaked, thereby engendering immediate alienation of the press corps.

- **NEVER** underestimate or patronize the media.

ESSENTIAL CHECKLIST 3.4

Effective management of a volcanic crisis depends crucially upon accurate foresight and adequate preparedness. To this end:

- Ensure that a comprehensive disaster management structure forms part of development planning.

- Compile a comprehensive checklist of all the steps to be taken as a crisis develops.

- Clearly define the duties and responsibilities of key actors and groups.

- Earmark a single physical base for the management of a future crisis and build an inventory of the equipment, facilities, and services that will be required, including adequate phone lines and other means of communication.

- Make sure that a volcanic emergency plan is developed and regularly updated, and made available to all decision makers and stakeholders (e.g. school teachers, local councils, hospitals, chambers of commerce, port and airport authorities, airlines).

- Build and foster strong and supportive links with the monitoring scientists and the media.

- Update your contact list regularly and meet frequently and face-to-face with key personnel before a crisis situation arises.

- In collaboration with the security authorities, clearly define evacuation protocols and procedures. Be aware that self-evacuation may be a problem once volcanic activity becomes obvious and seek to counter this through pre-emptive announcements.

- Conduct periodic exercises to test and refine emergency procedures.

- If the volcanic threat is forecast to impinge upon other states (for example, ash clouds affecting adjacent islands), coordinate information strategies - in advance - with the EMCs of those countries.

- Once a crisis has ended, use the experience gained to improve capacity for coping with the next one. Compile and share the lessons learnt, review problems encountered and draw up solutions for the future.

EMERGENCY MANAGERS

INTRODUCTION 4.1

This chapter contains advice to help the media maintain good working relations with the Emergency Management Committee, or its equivalent, and with the monitoring scientists - the two key sources of information during a volcanic crisis. The media has a critical role to play during an emergency situation when the unimpeded and effective flow and management of information can literally mean the difference between life and death. In this context, the media's task is to provide a conduit for the transmission of warnings from the EMC to the public, without confusing, complicating, or changing the message. Accurate and responsible reporting is vital if rumour and hearsay are not to lead to unwarranted fear and panic. In the heat of a volcanic crisis, the media's priority must be to fully support emergency managers and monitoring scientists in seeking to successfully handle the situation.

HOW OTHERS SEE THE MEDIA

Particularly if no effort has been made to develop a working relationship prior to the crisis, it is likely that emergency managers and monitoring scientists will lack trust in the media and its representatives and have reservations about its reliability as a conduit for information dissemination. Much of this will arise from a general perception of a conflict of interest between the media and other key players in managing a crisis situation, but probably also as a result of previous unsatisfactory contacts with elements of the media.

Whether justified or not, journalists are commonly viewed as being wary and suspicious and always on the look out for a 'good' story, whatever the cost and collateral damage. They are perceived - as a group - as having little regard for accuracy, and for highlighting the theatrical and speculative at the expense of the hard - if less dramatic - facts. Expectations are such that involvement of the media in a crisis situation is widely held to result in antagonism to managers and scientists, with the hunt for stories leading to unwelcome pressures on other key players and the filing of material based upon rumour, innuendo, and unreliable information.

It is never going to be easy to overcome this widespread, negative image, but if the media is to play a useful and effective role in the management of a volcanic crisis it must work to build trust with other key stakeholders. Ideally, this should begin prior to the development of a crisis situation, although for regional or global players this is unlikely to be a realistic option.

GOOD PRACTICE IN WARNING DISSEMINATION

Inevitably, the media will play a critical role in warning dissemination during a volcanic crisis - via the press, radio and television and (ideally) the internet. The responsibility of the media can be thought of as being two-fold. First, raising general awareness of the volcanic threat, both prior to and during the crisis, and second, transmission of specific warnings issued by the EMC in response to changes in the behaviour of the volcano and in alert level status. The first of these will be of most relevance to the local media, but all media stakeholders should be involved in the latter.

BEFORE A CRISIS DEVELOPS

- Work with the EMC and the monitoring scientists to regularly publish or transmit information about the volcano and its status, even when nothing is happening.

- Publish frequent articles about the volcano observatory and its work, including new staff arrivals, the applications of new monitoring equipment, open days and public lectures

- Regularly disseminate information about the alert system, how warnings will be issued at time of crisis, and how the public should respond.

- Decide with the EMC and the monitoring scientists the style that warnings will take. Focus on a simple and straightforward style, the use of pictorial material, and the need to reach all sections of the community.

- Perfect effective and rapid lines of communication with the EMC and monitoring scientists - via their media liaison representatives - to be utilized at time of crisis.

- Develop and update web pages focusing on the volcano and its activity, the warning systems, and how information will be disseminated during a crisis.

DURING A CRISIS

- Maintain constant communication links with the EMC via the media liaison officer and with the monitoring scientists' spokesperson, using both telephone and radio.

- Allocate sufficient airtime and column space to incorporate new information about the developing crisis.

- Make provision to break into scheduled programmes for urgent announcements.

- On radio and television - to attract the listeners' attention - use an immediately recognizable jingle or 'intro' for all announcements related to the crisis.

- In the press, the same space should always be used for information about the volcano - preferably on the front page. Use an instantly recognisable logo.

- Update web pages developed at the pre-crisis stage (local media) or establish new ones from scratch (regional and global media).

- Ensure that the same message is disseminated off island as well as on.

- For multi-media corporations, make sure that the message is consistent across all channels.

- Be cooperative. Be willing to offer constructive advice if you feel it might help.

BAD PRACTICE

- **DO NOT** issue any announcements related to the volcano's behaviour or to alert levels or warnings without the express agreement of the EMC.

- **DO NOT** embellish messages with unnecessary information.

- **DO NOT** transmit or print information or opinion from unofficial sources.

- **DO NOT** stall. Issue warning messages as soon as they are received. Delay could, literally, mean the difference between life and death.

MEDIA & EMC 4.2

During a volcanic crisis, the EMC - or its equivalent - will have one priority, to limit injury, loss of life, and damage to property and infrastructure. All else will be secondary. Once a crisis begins to develop the EMC and its individual members will be under extreme pressure. To avoid being intrusive and distracting, limit day-to-day contact with the EMC to the media liaison officer. As appropriate, he or she may be able to arrange interviews with other members of the EMC.

COMMON COMPLAINTS REGARDING THE MEDIA

Politicians and senior administrators, who are likely to be key players during the emergency, and some of whom will undoubtedly sit on the EMC, are likely to have misgivings about liaising with the media. Typical concerns voiced include the following:

- Their answers will be misinterpreted or twisted.

- Vital parts of the message they are trying to present will be omitted, modified or confused.

- The message will be made incoherent and inconsistent.

- False information will be released to the public.

- The situation will be over-dramatised.

ESTABLISHING GOOD RELATIONS WITH THE EMC - GOOD PRACTICE GUIDE

No matter how great the temptation, avoid seeking intrigue during an emergency. The first and foremost goal in a crisis is to save lives. Your contribution towards keeping the public fully informed is crucial to the successful achievement of this goal.

- If at all possible (i.e. for local media), establish a protocol with the Emergency Management Committee for receiving information from the sources you may wish to consult before a crisis develops.

- Local media should endeavor to work with the EMC prior to a crisis developing to design a plan for the dissemination of warning messages, and to clearly define the role of the media in this critical aspect of emergency management.

- Develop a good working relationship with the EMC media liaison officer.

- Read the media packs provided and digest and use the information therein.

- Regional and global players arriving on the scene once a crisis has already started to develop should inform the EMC of their arrival and proceed via formal channels and with the knowledge and agreement of the EMC and its media liaison officer.

- Attend official press conferences and join organised events such as visits to the monitoring observatory or into exclusions zones.

BAD PRACTICE

- **DO NOT** arrive on the scene unannounced.

- **DO NOT** 'go-your-own-way' or avoid contact with the EMC and its media liaison officer.

- **DO NOT** short-circuit official routes of information. This can sow bad feeling and mistrust and confuse or damage warning messages. It may also distract scientists and emergency managers from their primary tasks.

- **DO NOT** look for hidden agendas that are not there or invent scapegoats that may hinder the effectiveness of crisis management.

- **DO NOT** invent, encourage or spread, rumour or innuendo. Always cross-check unofficial views with official sources.

THE MEDIA & THE SCIENTISTS 4.3

The monitoring scientists have a key role to play during any volcanic crisis. Based upon geophysical data they will determine the nature, extent and impact of hazards associated with eruptive activity, and use this to assess risk. Such assessments will be passed on to the EMC - usually in the form of probabilities - with recommendations or suggestions of how to respond. Members of the monitoring team are likely to be fully occupied and under considerable pressure. Consequently most will rarely be able to spare the time for lengthy interviews. It is likely, however, that - in order to limit interference with the work of the team as a whole - an individual will have been given the role of liaising with the media.

WORKING WITH MONITORING SCIENTISTS - GOOD PRACTICE GUIDE

- Seek out the monitoring team's media spokesperson for information and comment.

- Be aware that the scientist's spokesperson must first clear his statements and announcements with the EMC. Do not pressurise for comment in advance of this.

- In the light of the above, it would be helpful if you could submit the gist of a proposed interview in advance.

- In order to ask sensible and valid questions, and to comprehend the answers, familiarise yourself with the local volcano, its behaviour and history.

- If you don't understand something that a scientist has said or written, ask for clarification. Misinterpretation could have serious implications for management of the crisis.

- Be straightforward and open with the scientists. Do not try and trick them into revealing information that could harm the management of the crisis.

BAD PRACTICE

- **DO NOT** harass members of the monitoring team who are not cleared to talk to the media.

- **DO NOT** actively pursue disagreement or foment dissent amongst the scientific community.

- **NEVER** encourage 'off the record' comments or statements

- **NEVER** deliberately misinterpret, modify or embellish the message provided by a member of the monitoring team.

- **DO NOT** promote the views of scientists who are not part of the monitoring team and who may hold maverick views.

RELATIONS WITHIN THE MEDIA 4.4

The jockeying for competitive advantage that characterizes interaction between media players has no part to play in an emergency situation. Impeding the functioning of rivals, attempting to with-hold significant information and spreading misleading messages to put other media players off 'the scent', may compromise the effective dissemination of warnings and thereby increase the threat to the local population.

A potential problem lies in the possibility for contradictory information to be issued by different media sources, leading to confusion, doubt and even fear amongst the public. To minimize this it is vital that all media players focus on the core message as presented to them via the Emergency Management Committee, without embellishment, modification or interpretation.

ESSENTIAL CHECKLIST 4.5

- Become familiar with the volcano in question and the country, community or communities likely to be affected.

- Ensure that trustworthy working relationships are developed with the EMC and the monitoring scientists before a crisis develops, or as soon as feasible during its early stages.

- Using all available means (press, television and radio and the internet) work pro-actively to promote the work of the monitoring team and the EMC contingency plans amongst the affected population.

- Together with the EMC and the monitoring team decide on the form and style of the warnings to be issued during a crisis situation.

- Make certain that provision is made for effective and unbreakable lines of communication with the EMC science liaison officer and monitoring team spokesperson.

- Devise protocols to ensure consistency of message.

- Ensure that pride of place - in terms of both airtime and column space - is devoted to information about the crisis and associated warnings.

- Formulate and use an instantly recognisable 'brand image' for crisis information dissemination (a logo or 'theme' tune).

- Promote vigorously, the warnings provided by the EMC, without embellishment, modification or dramatisation.

- Do not 'go-your-own-way' or short-circuit official routes of information.

- Work with the emergency managers and the monitoring team - be a help not a hindrance.

VOLCANIC TERMINOLOGY 5.1

ANDESITE - A type of pale volcanic rock, very common in the Caribbean.

ASH - Particles of magma less than 2 mm across. Volcanic ash is produced during explosive eruptions. It may be formed either from a disrupted spray of liquid magma ejected from a volcanic vent, or from the pulverisation of pre-existing rock that may have blocked the vent during a period of quiescence.

BOMB - Rounded volcanic fragment larger than 64 mm across ejected from a volcano during an explosion. During flight through the air, bombs may develop distinctive torpedo or spindle shapes.

BOULDER - Generic term for rounded rock fragments, not necessarily volcanic, more than 256 mm across.

CALDERA - A giant volcanic crater (notionally larger than 1 km across) formed by collapse or explosion, collapse being more important among larger calderas. The name comes from the Caldera Taburiente on La Palma in the Canary Islands.

CINDER - Generic term for coarse volcanic ash and lapilli.

COLUMN COLLAPSE - During moderate to large explosive eruptions an enormous amount of ash and coarser debris is ejected from the vent to form an eruption column that can rise to tens of kilometres. When the mass of the debris is too heavy it begins to fall back to Earth - a condition known as column collapse. Commonly the collapsed material pours off down the flanks in the form of pyroclastic flows.

CONE - Conical constructs built up by the accumulation of material around a vent. They may consist of tephra or a mixture of tephra and lava flows. Cones may be the result of a single eruption or the product of many eruptive episodes.

CRATER - A pit or depression, typically located around a vent. Craters may be formed during construction of an enclosing cone, by the excavation of rock during volcanic explosions, or by the collapse of ground left without support after magma has been erupted. Craters wider than about 1 km are normally termed calderas.

DACITE - Type of volcanic rock, typical of volcanic domes like those of Monserrat. Very common throughout the Caribbean.

DYKE - Vertical fractures filled with solidified magma. When magma stops flowing through a fissure on the ground it solidifies to form a 'wall' of volcanic rock that may be exposed by future erosion. Similar features lying almost horizontally are termed sills.

ELECTRONIC DISTANCE METER (EDM) - A surveying instrument that is used in volcanology to measure very precisely the distances between benchmarks in a ground deformation monitoring network. A beam of infrared, laser, or microwave radiation generated by the instrument - mounted on a tripod positioned over one benchmark - is bounced back by a reflector mounted on a second tripod mounted above another benchmark, and the distance determined to within a centimetre or two over distances of several kilometres.

ERUPTION COLUMN - During explosive eruptions, ash and debris ejected from the vent forms a vertical jet that may reach tens of kilometres in height. Because it is hotter than the surrounding atmosphere, an eruption column rises due to buoyancy.

FISSURE - A surface fracture. Often the surface expressions of dykes, fssures may also open near the rims of unstable slopes, including craters.

FORECAST - A statement describing the expected behaviour of a volcano

FUMAROLE - Fissure or vent in the surface formed by the escape of volcanic gases and heated groundwater.

FUMAROLE FIELD - Fumarole fields are formed in active volcanic areas where the crust is hot at very shallow depths and where there is a ready supply of water in the form of precipitation. Rainwater or groundwater, is heated underground and changed to steam by the hot rock beneath, and makes its way back to the surface through cracks and fissures. This process give the name to many of the volcanoes of the Antilles as fumarole fields are called "soufriere" in french.

GLOBAL POSITIONING SYSTEM (GPS) - A constellation of twenty-four satellites orbiting around the earth that constantly beam radio signals back. By locking onto at least four satellites, a receiver on the Earth's surface can locate itself to only a centimetre or two. In volcanology, the positions of survey benchmarks in a geodetic network are precisely located in this way, allowing distance and height changes between benchmarks to be determined with a high degree of accuracy and precision. The relative movements over time of the benchmarks provide volcanologists with information on the position, movement, and volume of subsurface magma.

HYDROMAGMATIC ERUPTION - An eruption whose explosivity is significantly enhanced by steam from non-volcanic water (e.g., groundwater, lakewater and seawater) that has come into contact with magma. Also termed phreatomagmatic.

IGNIMBRITE - A pumice-rich pyroclastic flow, normally associated with, but not exclusive to, large-volume explosive eruptions.

LAPILLI - Magmatic fragments between 2 and 64 mm across. Accretionary lapilli or pisolites are produced in eruption clouds when coatings of ash form concentric layers around a tiny nucleus.

LAHAR - An Indonesian term describing mudflows of volcanic material, normally slurries of ash with varying amounts of larger debris.

LAVA - Magma that has breached the surface.

LAVA DOME - When viscous lava is extruded onto a near-horizontal surface, it tends to pile-up around the vent building a dome. The dome may grow by intrusion of new lava into its interior (endogenous growth) or by the ovelapping of numerous small lava tongues or flows that escape through breaches in the dome's surface (exogenous growth).

LITHIC MATERIAL - Fragments, usually angular, of rock stripped from conduit walls during eruption. Lithic fragments may also include magma from the current eruption that has been chilled against the conduit walls and later torn away.

MAGMA - Generic term describing all molten rock. For common rock compositions, eruption temperatures are between 900 °C and 1200 °C, lower temperatures occuring among more-evolved magmas.

NUÉE ARDENTE - Strictly a pyroclastic flow of poorly vesiculated magma (from the French for a "glowing cloud"), although the term is often used loosely as an alternative to all types of pyroclastic flow.

PHREATIC ERUPTION - An eruption driven by non-volcanic water that has been vaporised to steam by the heat from ascending magma. The products are fragments of pre-existing rock alone. If new magma is also expelled, the eruption is termed phreatomagmatic or hydromagmatic. Phreatic activity is often the first sign that a volcano is becoming active, as rising magma comes into contact with ground water resulting in cold explosions that may clear the blocked vents and ease the passage of the magma towards the surface.

PHREATOMAGMATIC - See hydromagmatic.

PLINIAN ERUPTION - A style of explosive eruption producing an ascending cloud of ash and hot gas that may rise tens of kilometres into the atmosphere before spreading outwards. The column entrains cold surrounding air during ascent. Cooling increases the density of the cloud, especially its outer margins. If the cloud becomes too heavy, it collapses and falls back to earth (column collapse) often producing pyroclastic flows. The style of activity is named after Pliny the Younger who described such behaviour during the AD 79 eruption of Somma - Vesuvius.

PUMICE - Highly vesicular magma normally produced during plinian eruptions. The high vesicularity gives pumice its low diagnostic density of 1,000 kgm^{-3} or less, so that it can float on water. Normally associated with viscous magmas of intermediate and evolved compositions.

PYROCLASTIC - Generic term describing volcanic rock broken during eruption (from the Greek for fire(pyro)-broken(clast)).

PYROCLASTIC FLOW - Cloud of hot gas and incandescent ash that, at temperatures of several hundred degrees Celsius, hugs the ground and races downslope at velocities that exceed

APPENDICES

100 km per hour. Pyroclastic flows are commonly formed either by the collapse of the cooler outer parts of an eruption column, or by the disintegration of a lava dome.

PYROCLASTIC SURGE - A pyroclastic flow consisting mostly of hot gas. Surges may occur as the dilute outer parts of a flow or they may be generated directly at the vent, especially during hydromagmatic eruptions when non-volcanic steam increases the gas available for expelling the magma.

TEPHRA - Generic term for all volcanic fragments that are explosively ejected and fall back to Earth (from the Greek for "ashes").

TUFF - Consolidated pumice and ash deposit, usually associated with ash fall or pyroclastic flows. Consolidation occurs as minerals deposited by circulating groundwater cement the volcanic fragments.

VESICLES - Gas bubbles within magma.

VOLCANIC GASES - All magmas contain gases, the commonest of which are water, sulphur dioxide, hydrogen sulphide, carbon dioxide, carbon monoxide, and chlorine. Other species include fluorine, radon, and helium. The gas content is an important factor in determining the explosivity of an eruption, and the accumulation of gas in high viscosity magmas is the main cause of moderate to large explosive eruptions.

TIPS FOR INTERVIEWEES 5.2

Some people, such as politicians, have considerable experience in dealing with the media and little problem providing interviews and briefings. Most groups that will be approached during times of crisis (e.g. scientists, NGO representatives, the police, health officers and members of the emergency services) may not be as experienced with the media and may find being interviewed difficult and intimidating.

Here are some tips to help you cope better with an interview:

YOUR MESSAGE

Always have your basic message prepared beforehand. Practice it aloud if necessary, so that it is delivered in a confident manner.

- Make it short and interesting, using words that will show confidence and control over the situation (such as "definitely", "absolutely" and "certainly").
- Present your message sympathetically.
- Whatever you are asked, move the question towards your basic message (e.g. "This is important, but the main point to remember is not to enter the evacuated zone").
- Repeat if necessary, so you are sure it gets through (e.g. "This zone is definately unsafe. It is really dangerous. People should not enter it under any circumatances").
- If your interview is pre-recorded, your message may later be edited into a short "sound-bite" (usually 10 - 15 seconds) for news items. Try, therfore, to keep answers short and concise.
- Avoid chains of reasoning. Go directly to the point and ensure your basic message is communicated effectively.

GENERAL TIPS

- If possible, choose a familiar location for the interview.
- If you have to go to a studio, arrive some 10 - 15 minutes before the interview. This will give you time to settle down.
- Wear clothes you feel comfortable in.
- Nervousness can cause perspiration, so use light and airy clothes and pale shirt colours.
- Take deep breaths before the interview and try to relax
- Try not to fiddle with accessories (e.g. necklace, watch or pen) and control your breathing.
- Avoid extended vocals ("aahm" or "eeehh" because these can suggest doubt.
- Avoid tea or coffee before an interview because these can make your eyes red and unsettle your stomach.

- Sweets to suck on (e.g. boiled sweets or mints) can help to settle your stomach and prevent coughing.
- If you have a cold or sinus problems, avoid milk and diary products shortly before an interview.

TV TIPS

- Look at the interviewer, not at the camera and maintain eye contact.
- Transmit a message with your clothes: Dress formally to communicate concern and a sense of urgency. Dress more casually as the emergency recedes.
- In front of a camera, try not to move about too much (even if you are only moving your legs and feet). Movement implies nervousness and you may also shift out of focus. If you are sitting in a studio, ask for a stable, non rotating chair.
- Avoid clothes with lined patterns (e.g. bold checks or stripes), the colour blue and other bright colours. All of these can interfere with the transmitted picture.

RESOURCE GUIDE 5.3

NATURAL DISASTER REPRESENTATIVES IN THE VOLCANIC ANTILLES

CARIBBEAN DISASTER EMERGENCY RESPONSE AGENCY (CDERA)

Jeremy Collymore
The Garrison,
St Michael,
Barbados

Tel: +1 (246) 436 9651
Fax: +1 (246) 437 7649
EMail: CDERA@Caribsurf.com
URL: http://www.cdera.org

BRITISH VIRGIN ISLANDS

Ms. Sharleen DaBreo
Office of Disaster Preparedness,
3 Wailing Road,
MacNamara,
Road Town,
Tortola,
British Virgin Islands

Tel: +1 (248) 494 4499
Fax: +1 (248) 494 2024
EMail: bviddm@surfbvi.com
URL: http://www.bviodp.vg

DOMINICA

Cecil Shillingford
Office of Disaster Management,
Ministry of Communications, Works & Housing,
Government Headquarters,
Roseau,
Dominica,

Tel: +1 (809) 448 2401 (ext 296)
Fax: +1 (809) 448 2883
EMail: mincomwh@tod.dm

GRENADA

Joyce Thomas
National Emergency Relief Organisation,
Fort Frederick,
St Georges,
Grenada

Tel: +1 (473) 440 8390
Tel: +1 (473) 440 0838
Fax: +1 (473) 440 6674
EMail: nero@caribsurf.com

GUADELOUOE

Mme. Belfort
Prefecture de la Region Guadeloupe,
Rue Lardenoy
97-100 Basse Terre,
Guadeloupe

Tel: +1 (590) 993 940
Fax: +1 (590) 993 949

MARTINIQUE

C. Jean Theodore
Ermitage,
Ex-Hôpital Civil,
Immeuble de la Caisse des Ecoles,

97200 Fort de France,
Martinique,

Tel: +1 (596) 631 861
Tel: +1 (596) 703 325
Fax: +1 (596) 716 326
Telex: (596) 912 650

MONTSERRAT

Horatio Tuitt
Emergency Department,
Montserrat

Tel: +1 (664) 491 7166
Tel: +1 (664) 491 2465
Fax: +1 (664) 491 2465
EMail: eoc@candw.ag

ST KITTS - NEVIS

Carl Herbert
National Emergency Management Agency,
Taylor's,
P.O. Box 186
Basseterre,
Saint Kitts - Nevis

Tel: +1 (869) 466 5100
Fax: +1 (869) 466 5310
EMail: nemaskb@caribsurf.com

SAINT LUCIA

Dawn French
National Emergency Management Office,
P.O. Box 1517,
Red Cross Building,
Vigie,
Saint Lucia

Tel: +1 (758) 452 3802
Tel: +1 (758) 468 2126
Fax: +1 (758) 453 2152
EMail: eoc@candw.lc
URL: http://www.geocities.com/slunemo

SAINT VINCENT & THE GRENADINES

Alwyn Cupid
National Emergency Organisation,
Ministry of Housing,
Local Government & Community Development,
Saint Vincent & the Grenadines

Tel: +1 (784) 456 2856
Fax: +1 (784) 457 2476

VOLCANO OBSERVATORIES & DIRECTORS

COMMONWEALTH ISLANDS IN THE CARIBBEAN

DIRECTOR: John B. Shepherd
Seismic Research Unit,
Department of Physics,
University of the West Indies,
St. Augustine,
Trinidad,
West Indies

Tel: +1 (809) 662 4659
Fax: +1 (809) 663 9293
EMail: sru@wow.net

REGIONAL SERVICE

DIRECTOR: Alan L. Smith
Seismic Unit,
Department of Geology,
University of Puerto Rico,
Box 9017,
Mayaguez,
Puerto Rico

Tel: +1 (787) 265 3845
Fax: +1 (787) 265 3845
URL: http://www.upr.edu

GUADELOUPE

DIRECTOR: Dr. François Beauducel
Observatoire Volcanologique et Sismologique de Guadeloupe,
Le Houelmont,
97113 Gourbeyre,
Guadeloupe,
French West Indies

Tel: +590 (0) 590 99 11 33
Fax: +590 (0) 590 99 11 34
EMail: Info@ovsg.univ-ag.fr
URL: http://volcano.ipgp.jussieu.fr:8080/

MARTINIQUE

DIRECTOR: Jean - Pierre Viode
Observatoire Volcanologique, de la Montagne Pelée,
Morne des Cadets,
Fonds St Denis,
97250 St Pierre,
Martinique,
France

Tel: +1 (596) 78 41 41
Fax: +1 (596) 55 80 80
URL: http://www.upr.edu

MONTSERRAT

DIRECTOR: Dr. Peter Dunkley
Montserrat Volcano Observatory,
Mongo Hill,
Montserrat,
West Indies

Tel: +1 (664) 491 5647
Fax: +1 (664) 491 2423
EMail: mvo@mvomail.mvo.ms
URL: http://www.mvo.ms

SAINT VINCENT & THE GRENADINES

DIRECTOR: Maxwell Porter
Belmont Observatory,
Seismic Unit,
Ministry of Agriculture,
St Vincent & the Grenadines
West Indies

Tel: +1 (784) 458 2252
Fax: +1 (664) 491 2423
EMail: seismo@caribsurf.com

RELATED READING 5.4

CARIBBEAN VOLCANIC HAZARDS

- Aspinall, W.P., Sigurdsson, H., Shepherd, J.B. *Eruption of Soufriere volcano on St Vincent Island, 1971-1972*, Science, Vol. 181, pp. 117-124, 1973.
- Cheminee, J.L., Boudon, G., Dagain, J., Rancon, J.P., Semet, M.P., Traineau, H. *Volcanic hazards in the French Antilles. In, Natural risk and civil protection* (edited by Horlick-Jones, T., Amendola, A., Casale, R.). pp. 96- 115, E&FN Spon, 1995.
- Druitt, T.H. and Kokelar, B.P (editors)., *The Eruption of Soufriere Hills Volcano, Montserrat, from 1995 to 1999*. Special Society Memoir No.21. Geological Society of London. 2002.
- Geophysical Research Letters (Special volume in Montserrat), Vol. 25, Nos 18-19, 1998.
- Latter, J.H. (editor) *Volcanic hazards. Assessment and monitoring* (Three chapters by different authors on pp 57-85, 86-109, 293-311), Springer-Verlag, 1989.
- Newhall, C.G. and Hoblitt, R.P., *Constructing event trees for volcanic crises*. Bull Volcanol 64: 3-20. 2002.
- Préfecture de la Région de Guadeloupe. *Les risques majeurs*, pp 1-48, Feb. 1999.
- Robertson, R. *An assessment of the risk from future eruptions of the Soufrière volcano of St. Vincent, West Indies*. Natural Hazards, Vol. 11, pp. 163-191, 1995.
- Tomblin, J. *West Indian Volcanic Eruptions and the hazard to human population*. Fifth Caribbean Geological conference, Geological Bulletin, No. 5, Queens College Press, pp. 147-150, 1971.
- Wadge, G., Isaacs, M.C. *Mapping the volcanic hazards from Soufrière Hills volcano, Montserrat, West Indies, using an image processor.* Journal of the Geological Society of London, Vol. 145, pp. 541-551, 1988.
- Wadge, G., Woods, A., Jackson, P.; Bower, S.; Williams, C.; Hulsemann, F. *A Hazard Evaluation System for Montserrat*. Appendix 3 In, IDNDR Flagship Programme: forecasts and warnings, pp 1-32, Thomas Telford, 1998.

PROFESSIONAL CONDUCT OF SCIENTISTS DURING VOLCANIC CRISES

- IAVCEI Subcommittee for Crisis Protocols 1999. Bulletin of Volcanology, 60: 323- 334.

ANALYSES OF PROBLEMS BETWEEN GROUPS DURING VOLCANIC EMERGENCIES

- Chester, D.K. *Volcanoes and society*, pp 1-351, Edward Arnold, 1993.

- Fiske, R. *Volcanologists, journalists and the concerned local public: a tale of two crises in the Eastern Caribbean*. In, Explosive volcanism: inception, evolution and hazards, pp 170-176, National Academy Press, 1984.

- McGuire, W.J. and Kilburn, C.R.J., Forecasting volcanic events: some contemporary issues. Geol Rundsch. 86, 439-445. 1997.

- Masood, E. *Montserrat residents "lost faith" in volcanologists' warnings*. Nature, Vol. 392, pp 743-744, 1998.

- Tomblin, J. *Managing volcanic emergencies*. UNDRO News, pp. 4-10, July 1982.

INTERNET RESOURCES 5.5

GENERAL SITES

- http://www.cdera.org
- http://www.geo.mtu.edu/volcanoes/west.indies/soufriere/govt/miscdocs/assess12
- http://rmsismo.uprm.edu/English/index.html
- http://vulcan.wr.usgs.gov/Volcanoes/WestIndies/KickEmJenny/framework.html
- http://volcano.und.nodak.edu/vwdocs/volc_images/north_america/west_indies.html
- http://www.bghrc.com
- http://ucl.geolsci.ac.uk

DOMINICA

- http://dominicapsn.freeyellow.com/page1.html

GUADELOUPE

- http://volcano.ipgp.jussieu.fr:8080

MARTINIQUE

- http://volcano.ipgp.jussieu.fr:8080/martinique/stationmar.html

MONTSERRAT

- http://www.mvomrat.com
- http://www.synapses.co.uk/science/mvolcano.html

VOLCANO ALERT LEVELS 5.6

Alert level system in operation during the Soufriere Hills eruption on Montserrat.

WHITE - No new activity. All zones may be occupied.

YELLOW - Some activity. Local evacuations may be neccessary.

AMBER - Dome formation, eruption in progress. High level of alert.

ORANGE - Change in style of activity. Heightened alert; prepare for evacuation. All schools closed

RED - Dome collapse underway. Pyroclastic flows in valleys. Rapid evacuation may be required in the next four hours. Prepare for gravel, pumice and ash fall. Schools remain closed.

EXAMPLE PRESS RELEASE 5.7

CONTACT:
TEL: *Your details here*
FAX: *(include national & emergency codes)*
EMAIL:

NAME OF YOUR ORGANISATION

PRESS RELEASE

MAIN TITLE
(e.g. Name & location of volcano)

HEADLINE STATEMENT
(Keep it short & concise)

YOUR LOCATION & DATE OF MESSAGE

Here you describe the problem. Explain the events and where & when they occurred

Describe the action that has been taken and who are the decision makers.

Give instructions on what to do next.

REMEMBER

- Refer to the contact person of the organisation for further information.
- Include the expected arrival time of the next press release.
- Offer other sources of information *(e.g. "you can find more information on our web page (address here)/last publication (title here)/ from Organisation (e.g. CDERA)*

STATEMENT RELEASED ON *(Give time & date here)*