

## APPENDIX A

### TERMS OF REFERENCE

#### Introduction

Since volcanic activity started on Montserrat in 1995, some £62 million of emergency aid, development assistance and budgetary aid has been committed by DFID. This has included the establishment of emergency air and sea links; the building of a new jetty, power and water supplies in the north of the island; housing for those displaced from the central and southern parts of the island; improvements to education and health facilities in the north; and the maintenance of essential services. In addition, assistance has been provided for people relocating from Montserrat to Britain and elsewhere in the Caribbean. Given this considerable level of support, and the important potential read across to other emergency situations, a study is to be commissioned to determine lessons to be learnt from the emergency response to the Montserrat crisis. The study will be undertaken by independent experts.

#### Purpose

The purpose of the study is to review HMG's preparations, organisation and delivery of emergency aid in response to the Montserrat crisis and identify findings and lessons learnt particularly with general application to aid responses to prolonged natural disasters. The study will take account of the Evaluation Synthesis of Emergency Aid, which was undertaken, for DFID in 1997.

#### Specific Objectives

In consultation with the GOM, DFID and the FCO, the evaluation team will review the emergency response to the Montserrat crisis against six key criteria:

- i. Appropriateness: the appropriateness and timeliness of the responses provided, including the balance between emergency aid, development assistance and budgetary aid.
- ii. Cost-effectiveness: effectiveness of the interventions in terms of the cost of particular activities or of the unit costs of the assistance. Assessment of value for money; benefits in relation to costs.
- iii. Impact: conclusions on the social and economic impact on Montserrat and its people, e.g. number of lives saved by the interventions, extent of alleviation of suffering, the provision of relief and benefits, which sectors of the population were positively (or negatively) affected by the emergency response and how this related to intended targeting.
- iv. Coverage: extent to which the effectiveness of interventions involved considered targeting of the affected population.

- v. Coherence: overall policy coherence and co-ordination between the key actors (DFID, FCO, GoM, OGDs) in planning and delivery of interventions. Effectiveness of co-ordination mechanisms and consultation processes.
- vi. Process: the degree of involvement of the affected population in planning and implementing overall responses and individual interventions.
- vii. Connectedness: consideration of relief-development linkages or the continuum, as appropriate. Connections between emergency and other forms of aid.

## **Outputs**

The evaluation team will produce an inception report following an initial visit by the Team Leader. A draft of the report of the evaluation will be produced by the beginning of February, for circulation within DFID, to the Government of Montserrat, and to relevant Whitehall departments. A final version of the report will be subsequently produced, reflecting, as far as is appropriate, comments on the draft received by the evaluation team. Guidance on the format of the report will be provided by Evaluation Department. Publication of the final report in DFID house style will be arranged by Evaluation Department.

## **Timing and Duration**

Work should begin in September 1998. It is envisaged that the final report will be available by April 1999.

## APPENDIX B

### KEY EVENTS OF THE MONTSERRAT VOLCANIC EMERGENCY AND A VOLCANOLOGICAL NOTE ON THE SOUFRIÈRE HILLS VOLCANO ERUPTION 1995-1999

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|--------------------------------|--|
| <b>18 Jul 95</b>               | <i>Volcanic activity begins (around 1800 hrs GMT) with steam venting, followed by explosions and ashfalls on Plymouth area.</i> Emergency Operations Centre (EOC) activated at 2230. |
| <b>25 Jul 95</b>               | FCO and ODA agree that overall responsibility for handling and coordinating HMG response will remain with West Indies and Atlantic Department.                                       |
| <b>28 July 95</b>              | British military team recommends the preparation of contingency plans for an evacuation centre in the north for 2500 people. Team also produces plan for full evacuation.            |
| <b>21 Aug 95</b>               | <i>First large phreatic eruption on Chance's Peak.</i> 5000 people evacuated from Plymouth and south.  |
| <b>7 Sep 95</b>                | Plymouth re-occupied.  |
| <b>25 Sep 95</b>               | <i>First signs of dome growth</i>  |
| <b>30 Nov 95/<br/>1 Dec 95</b> | <i>Confirmation of dome growth with incandescent lava seen for first time and first small pyroclastic flow.</i>  |
| <b>2 Dec 95</b>                | Plymouth evacuated for a second time, with 6000 people relocated to the North.   |
| <b>22 Dec 95</b>               | <i>First magmatic eruption.</i>  |
| <b>2 Jan 96</b>                | Plymouth reoccupied.   |
| <b>21 Mar 96</b>               | GoM confirm acceptance of budgetary aid conditions.  |
| <b>3 Apr 96</b>                | Third and final evacuation of Plymouth. Acting Governor declares state of public emergency.  |
| <b>23 Apr 96</b>               | Voluntary Evacuation Scheme: Montserradians admitted to UK for 2 years.  |

- 11 Jun 96** *Dome growth switches to West side* putting at risk any commercial activity in Plymouth.
- 22 Aug 96** FCO and ODA announce further £25m Emergency Investment Package.
- 17 Sep 96** *First magmatic explosive event occurs without warning;* houses destroyed at Long Ground.  
BGS(I) organises rotation of chief scientists from SRU and UK institutions.
- 11-13 Nov 96** Elections held. Bertrand Osborne sworn in as Chief Minister of first coalition government.
- 12 Dec 96** *Collapse of Galways Wall;* scientific prognosis is that the volcano now presents a threat to neighbouring islands, especially Guadeloupe, because of the possibility of a tsunami.
- Apr 97** ODA's Aid Management Office operational on-island.
- 1 May 97** UK General Election; DFID created as separate Government department.
- 15 May 97** *Large pyroclastic flow marks beginning of heightened activity.*
- 17-18 Jun 97** Baroness Symons (PUSS, FCO) visits island and hands over Emergency Jetty to GoM.
- 25 Jun 97** *Pyroclastic flows east towards airport; destroy villages of Harris, Trants, Farms.* Flow west reaches Belham River. Nineteen people killed in danger area. Airport closed.
- 4 Jul 97** *Main activity switches to explosive and semi-explosive ash eruptions.*  
Revised volcanic risk map puts more than half the island in the Exclusion Zone.
- 15 Aug 97** Governor orders evacuation of Salem, Old Towne and Frith; 1598 people in shelters.
- 19 Aug 97** Joint FCO/DFID announcement of Assisted Passage Scheme for evacuees to UK.
- 21 Aug 97** DFID announces Assisted Regional Voluntary Relocation Scheme.  
Chief Minister, Mr. Bertrand Osborne resigns.
- 22 Aug 97** Mr. David Brandt sworn in as Chief Minister.
- 23 Aug 97** Montserrat Building Society suspends operations.
- 26 Aug 97** Montserrat Action Group formed for Whitehall co-ordination.
- 12 –18 Sep 97** Chief Minister leads a team to London; meets British Prime Minister; joint FCO/DFID Statement on Action Plan including housing, Soft Mortgage Scheme, return fares for evacuees from UK to Montserrat, SDP and airstrip feasibility study.

## Appendix B: Key events of the Monserrat volcanic emergency

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- 17 Sep 97** New Governor, Mr. Anthony Abbott, is sworn in.
- 20-25 Sep 97** Sir Kenneth Calman (Chief Medical Officer) and team visit island.
- Nov 97** DFID, Montserrat Unit formally established.
- 10 Nov 97** Baroness Simons, PUSS, FCO, chairs MAG for first time.
- 27 Nov 97** International Development Committee's first report on Montserrat published.
- 2 –18 Dec 97** Scientists produce scientific and risk assessments, validated by UK Chief Scientific Adviser.
- 26 Dec 97** *Largest explosive event involving about 50 million cubic metres of material.*
- 10 Mar 98** *Significant reduction in volcanic activity; magma eruption ceases.*
- 21 May 98** Home Office announces offer of settlement to Montserratan evacuees.
- 11 Jun 98** Secretary of State for International Development announces pledge of £75 million over next three years. Draft Sustainable Development Plan published
- 13 Jul 98** Overseas Territories Department established within FCO.
- 14-16 Jul 98** Scientists confirm reduced volcanic activity and lower risk.
- 1 Oct 98** Reoccupation of Salem, Old Towne and Frith begins
- end-Nov 98** MAG terminated by FCO.
- 11 Jan 99** Inquest verdict on deaths of 25 June 1997; HMG and GoM criticised
- 13 Jan 99** HMG and GoM agree 3 year Country Policy Plan for period 1998/9-2000/1.
- 12 Mar 99** Scientific assessment indicates risk to populated areas has fallen to levels of other Caribbean islands with dormant volcanoes.
- 1 May 99** Assisted Return Passage Scheme begins.
- 27 Nov 99** *New lava dome observed, confirming that magma activity had resumed.*

## A volcanological note on the Soufrière Hills Volcano eruption 1995-1999:

The key events listed above and more fully in Annex 10 include the most important physical events in the eruption from a human perspective. In this note these events are summarised and explained for the benefit of non-scientific readers.

Montserrat is one of the Caribbean volcanic islands comprising the east-facing Lesser Antilles volcanic arc that extends from Grenada in the south to Saba in the north (Figure 1). Unlike the familiar eruptions of Hawaii, characterised by vigorous 'fire-fountaining' and rapid flow of 'runny' (low viscosity) basalt lavas, the Lesser Antilles volcanoes typically erupt relatively small volumes of highly viscous *andesite lava*, in the form of slowly growing *lava-domes* or spines, and/or explode violently to produce tall columns of *ash* that can extend into the stratosphere and are a hazard to aircraft. Particularly dangerous at these volcanoes are '*pyroclastic flows*', which are hot mixtures of rock and magma fragments with air that flow down slopes, commonly at velocities exceeding 30 metres per second (nearly 70 mph) and locally twice that. Their temperatures commonly exceed several hundreds of °C and they burn, sweep away or bury obstacles in their path. Pyroclastic flows are lethal; they killed some 29,000 persons in 1902 at St Pierre on Martinique and they accounted on Montserrat for the tragic deaths of 25 June 1997.

The Soufrière Hills in 1995-1998 came from a reservoir (technically a magma chamber) at a temperature of around 850°C, located roughly 6 kilometres below the volcano. *Phreatic explosions*, produced by the sudden release of heated groundwater that expands explosively as steam and blasts out old volcanic rock, characterized the opening phase of the eruption as magma approached the surface. Most of the eruption subsequently involved a relatively slow ascent of magma and extrusion of andesite lava to form a lava dome, with numerous collapses that produced devastating pyroclastic flows. On three occasions (17-18 September 1996 and two protracted intervals in August and September-October 1997) *magma explosions* erupted from deep in the conduit. During the explosive episodes, *andesite bombs*, tens of centimetres to metres in diameter rained down in areas extending up to 2 kilometres from the volcano summit, devastating affected property. Both explosive eruption columns and pyroclastic flows produced blanket-like deposits of fine gritty to flour-like *ash*, the immediate effects of which were more of a nuisance than directly hazardous, apart from the dangerous effects of reduced visibility during fallout and possible roof collapse owing to loading. However, the *fallout ash* from pyroclastic flows from dome collapse at Soufrière Hills Volcano contains the mineral *cristobalite* which is known to cause symptoms similar to silicosis developed in miners. Many hundreds of dome-collapse pyroclastic flows have occurred with associated fallout over inhabited parts of Montserrat (and there will be many more), and the long-term health implications of inhalation of cristobalite are imprecisely known.

Physically, the most catastrophic event of the eruption occurred on 26 December 1997 involved pyroclastic flows and violent, laterally directed blasts. Southern villages were destroyed, a substantial amount of debris entered the sea and a small *tsunami*, or tidal, wave was formed.

## **Appendix B: Key events of the Monserrat volcanic emergency**

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In all stages of the eruption major rainfall has caused lahars (sometimes referred to as mud-flows), which can be highly erosive on steep slopes and tend to build deposits along river beds and adjacent areas, especially where slopes diminish near the coast. Numerous lahars are progressively burying Plymouth.

The ascent of new magma and dome growth apparently ceased by 10 March 1998. Then, 20 months, later in November 1999 the appearance of a new dome and rising magma were confirmed. This was quickly recognised in the scientific assessment of December as making prediction of the future course of the eruption more uncertain. Even if little new magma is extruded, the dome of Soufrière Hills Volcano will take decades to cool. Thus significant potential hazard from hot pyroclastic flows will remain for a decade or more, depending on the course of the dome's degradation. Throughout the cooling processes the dome will tend to crumble and form avalanches until it has few steep slopes. Also for decades to come, ground water will circulate around and into the hot rocks at depth and may be violently released at the surface in phreatic explosions. Magmatic gases will continue to be released vigorously, if not explosively. The cooling will be associated with continued ground deformation and seismicity above background levels.





## APPENDIX C

### LIST OF PEOPLE CONTACTED <sup>10</sup>

#### **Governor's Office**

Anthony J. Abbot, Governor  
Robert Webb, Head of Governor's Office  
Richard Aspin, and Press and Public Affairs Officer

#### **Legislative Council Members**

Howard Fergus, Speaker of the House (and Acting Governor)  
David S. Brandt, Chief Minister, Finance, Trade and Economic Development  
P. Austin Bramble, Minister of Agriculture, Land, Housing and the Environment  
Adelina E. Tuitt, Minister of Health, Education and Community Services  
Rupert Weekes, Minister of Communication and Works  
Charles Ekins, Attorney General  
C.T. John, Financial Secretary  
Reuben Meade (Former Chief Minister)  
Bertrand Osborne (Former Chief Minister)  
D.V.R. Edwards, Deputy Speaker

#### **Government Departments**

##### *Emergency Dept.*

Franklyn Michael, PS (now retired)  
Horatio Tuitt, Assistant Secretary, Operations

##### *Ministry of Finance*

Oral Martin, Economic Adviser  
Cynthia Farrell  
Cecil Brown  
Kingsley Howe  
Florence Leigh  
Geraldine Cabey, Accountant General

##### *Development Unit*

Angela Greenaway, Director

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<sup>10</sup> Persons with whom members of the team had formal meetings or structured telephone discussions

*Ministry of Agriculture, Trade and Environment*

Sarita Francis, Director of Housing

Gerard Grey, Acting Director, Agriculture

Melissa O'Garro, Fisheries Officer

Easton Farrell, Agriculture Officer

Jim W Bass, Special Adviser

Cecil W Lake, Housing Inspector/Field Supervisor

Sylvia White, Administrative Officer, Land Development Authority

Jim W. Bass, Special Adviser

Cecil W. Lake, Housing Inspector/Field Supervisor

Sylvia White, Administrative Officer, Land Development Authority

*Ministry of Communication and Works*

Eugene Skerrit, PS

Michael Duberry, Acting Manager, Montserrat Water Authority

Franklyn Greenaway, Physical Planning Unit

*Ministry of Health and Education*

John Skerrit, PS (now on sabbatical leave in UK)

Ronnie Cooper, Director of Health Services and Chief Medical Officer (now in private practice)

Sister Donahughe, Psychiatric Nurse

Vernon Buffonge, Former PS

Trevor Howe, Environmental Health Officer

Oeslyn Jemmotte, Director of Education

Alris Taylor, Acting Director of Education (now PS, Health and Education)

Kathleen Greenaway, Principal, Montserrat Secondary School

Eudora Fergus, Deputy Principal, Montserrat Secondary School

Eliza O'Garro, Principal, Brades Primary School

*Community Services Dept.*

Darnley Estwick, Principal Community Development Officer (now retired)

B. Collins, Community Development Officer

Joseph Curwen, Community Development Officer

*Food Voucher Office*

Alma Meade

Annetta Blake

*Customs*

Roosevelt A. Jemotte, Port Manager, Montserrat Port Authority  
Stanford Ryan, Airport Manager (now retired)  
Raymond Cabey, Senior Airport Officer

*Statistics*

Teresina Bodkin, Chief Statistician

*Human Resources/Administration*

Claudia Roach, PS

*Royal Montserrat Constabulary*

Chris Burgess, Commissioner of Police  
Charles Greeney, Superintendant  
Stephen Foster, Inspector

**Montserrat Volcano Observatory**

William P. Aspinall, Chief Scientist  
Paul Cole, Scientist  
Tim Druitt, Scientist  
Susan Loughlin, Deputy Chief Scientist  
Angus Miller, Scientist  
Gill Norton, Deputy Chief Scientist  
Richard Robertson, Chief Scientist  
Keith Rowley, former Chief Scientist  
Stephen J. Sparks, Chief Scientist  
Simon Young, Chief Scientist and subsequently Director

**HMG**

*Department for International Development*

George Foulkes, Parliamentary Under Secretary of State  
Frank Black, Formerly Head, AMO  
Patricia Bridge, DFID Antigua  
Graeme Carrington, Formerly Health Field Manager  
Charles Clift, Formerly Economic Adviser, BDDC  
Janet Gardener, Social Development Adviser  
David Gillett, Engineering Adviser  
Paul Hailston, Desk Officer, Montserrat; Overseas Territories Unit  
Tony Hill, NR Adviser, AMO

Doug Houston, Head, AMO  
Alan Jenkinson, Engineer, AMO  
Mukesh Kapila, Head, Complex and Humanitarian Affairs Department  
William Kingsmill, Formerly Economic Adviser, BDDC  
Jim McCredie, Engineering Adviser on Hospital  
Tim Martineau, Health and Population Adviser  
John Milnes, DFID's Adviser in PWD Montserrat  
David Nabarro, Former Head, Health and Population Division  
Peter O'Neill, Engineering Adviser  
Melvyn Tebbutt, DFID Construction Manager on Hospital  
Richard Teuten, formerly Head, Overseas Territories Unit  
Mike Wood, Head, Overseas Territories Unit  
Ellen Wratten, Social Development Adviser, BDDC

*Foreign and Commonwealth Office*

Phil Ellis, Desk Officer, Overseas Territories Department  
David Hollamby, Deputy Head, Overseas Territories Department  
Alan Huckle, Formerly Head, DTRS  
Frank Savage, Former Governor (present Governor, BVI)

*Ministry of Defence*

Nicholas Gurr, Formerly Assistant Director, Overseas Secretariat (Western Hemisphere Division)  
Ian Hime (Rtd.), Former Defence Attache, Bridgetown  
Kevin Pollard, Desk Officer, Overseas Secretariat (Western Hemisphere Division)  
Lawrence Smallman, Desk Officer, Directorate of Overseas Military Activity  
Mark Spicer, Formerly Desk Officer, Directorate of Overseas Military Activity

*Treasury*

Marcello Casale, International Financial Services

*Financial Services Authority*

Jean Moorhouse

*Dept. of Social Security*

David Tottey

*Dept. of the Environment, Transport and the Regions*

Russell Netto

*Home Office*

Alan Lawrence, Emergency Planning Division  
Mark Porter, Emergency Planning Division  
Sally Titterington, Race Equality Unit

*Dept. for Education and Employment*

Beverly Grant  
Kevin McLean

*Dept. of Health*

Robert Maynard, Senior Medical Officer

*Office of Science and Technology*

Robert Clay, PS to Chief Scientific Adviser

*National Audit Office*

Cliff Kemball

**Others**

*Montserrat and the Caribbean*

Beatrice Allen, Librarian, Montserrat Public Library  
John Allen, NEMWIL Insurance Company  
Neville Bradshaw, Director, Montserrat Building Society  
Kenneth Cassell, Managing Director, Montserrat Stationary Centre  
Roselyn Cassell-Sealy, Executive Director, National Development Foundation  
Elveta Chalmers, Administrative Office, Montserrat Tourist Board  
Manu Chandirmirani, Owner/Manager, Rams Supermarket  
Mary Cooper, Old People's Welfare Association  
Gregory DeGannes, Manager, Bank of Montserrat  
Betty Dix, Tradewinds Real Estate  
Michael Dodd, Brown & Root's Project Manager in Montserrat  
Eddy Edgecombe, Chairman, Montserrat Tourist Board  
Susan Edgecombe, Tradewinds Real Estate  
Mike Emanuel, Tropix Traders  
Bruce Farara, President, Montserrat Chamber of Commerce and Industry  
Fr. Larry Finnegan  
James Hixon, Managing Director, Montserrat Building Society  
Blondina Howes, former Director of Community Services and DFID (Antigua)  
David Lea  
Barry McGonigal, Horizon

Lystra Osborne, Montserrat Red Cross  
Fr. Victor Peters, Montserrat Christian Council of Churches  
Vincent Placid, Secretary/Treasurer, Montserrat Building Society  
Bennette Roach, Editor, Montserrat Reporter  
Don Romeo, journalist  
Danny Rowland, Horizon  
Jacquie Ryan, Agents for United Insurance  
John Shepherd, Seismic Research Unit, Trinidad  
Camilla Watts, Director, Montserrat Red Cross  
Candia Williams

*UK and elsewhere*

John Adlam, Emergency Logistics Management Team  
Clarice Barnes, Birmingham University  
Peter Baxter, University of Cambridge Medical School  
John Bennett, formerly BGS  
Lucy Bonnerjea, LSE  
Peter Burton, Emergency Logistics Management Team  
Amanda Clarke, Penn. State University, USA  
Daniel Daley, MOPPA  
Peter N. Dunkley, BGS  
Jane Furlong, MOPPA  
Frank Hooper, former Commissioner of Police, RMPF  
Lazelle Howes, The Montserrat Community Support Trust  
Jasmine Huggins, Christian Aid  
Roland Lubett, Armidale, Australia  
Alan Matthews, Emergency Logistics Management Team  
Edwin Ono'Regie, The Montserrat Project  
Antony J. Reedman, Director, BGS(I)  
Geoff Robson, formerly Director, Seismic Research Unit, Trinidad  
Paul Sargeant, formerly Adviser, PWD and AMO Montserrat  
Amanda Sives, Nottingham Trent University  
Jonathon Skinner, Keele University  
David G.P. Taylor, Former Governor of Montserrat  
Barry Voight, Penn. State University, USA

## APPENDIX D

### THE EVALUATION TEAM: BIOGRAPHICAL NOTE

Dr Christine Barrow is a Senior Lecturer in Sociology at the University of the West Indies, Barbados, and Head, Department of Government, Sociology and Social Work. Her main research focus is on Social Development issues with a Caribbean and Third World focus, specialising in Family, Gender, Poverty Alleviation, Rural Development/Land Tenure/Agrarian Reform. She has completed several consultancies throughout the region.

Ms Charlotte Benson is a Senior Research Associate at the Overseas Development Institute, London. Since 1993, she has been undertaking research and also related consultancies for the World Bank and Asian Development Bank on the economic impacts of natural disasters including recent studies on Fiji, Philippines, Vietnam and Zimbabwe.

Dr Edward Clay is a Senior Research Associate at the Overseas Development Institute, London. He was formerly Director of the Relief and Development Institute, London, and a Fellow of the Institute of Development Studies at the University of Sussex. Recent activities include acting as Team Leader for both the Evaluation of ODA's Response to the Southern African Drought and for the Joint Evaluation of EU Programme Food Aid on behalf of the EU Working Group of Heads of Evaluation and a member of the international advisory panel for the Bangladesh Flood Action Plan.

Mr Jim Dempster is a Civil Engineer who started his career in the Sudan Irrigation Department then spent 32 years with Sir M. MacDonald & Partners, followed by assignments as an independent consultant for multi-national bi-lateral aid agencies. He specialised in land and water resource development and formulating policies and plans for combating flood disasters mainly in south and south-east Asia, but latterly in the Caribbean. He has been awarded a CMG and OBE for services to Civil engineering.

Dr Peter Kokelaar is Reader in Volcanology at the University of Liverpool. His research interests include physical volcanology and sedimentology. He has worked extensively on the island volcanoes of Surtsey (Iceland), Stromboli (Italy) and White Island (NZ). He has been a Visiting Professor at California Institute of Technology, a US Geological Survey Distinguished Visiting Scientist at Cascades Volcanic Observatory and the recipient of an award for outstanding research publication from the Lyell Fund of the Geological Society in 1997.

Dr Nita Pillai is a Food Policy Officer at Consumers International, formerly Research Officer with the Overseas Development Institute. She is a microbiologist and nutritionist and has worked on public policy issues relating to food aid and food security.

Dr John Seaman, is a medical doctor with extensive experience in the health aspects of international disaster relief and health service provision. He was a co-founder and first Editor of the journal, *Disasters*. He was formerly Head of Policy Development and is currently leading the group working on food security at the Save the Children Fund (UK). He was awarded an OBE in 1996 for his contribution to humanitarian relief.