Volcanic Alert warnings to the public; experience from volcanic eruptions in Iceland

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Tasks of the Icelandic Meteorological Office

Responsibilities:

- Monitoring, forecasting and issuance of warnings in the field of
  - Meteorology
  - Seismology and volcanic activities
  - Glaciology
  - Hydrology
  - Risk assessment of natural hazards, e.g. floods and avalanches, etc.

Athmosphere

Water, snow, glaciers

Earth

Ocean

Geophysical processes
Natural Hazards - Topics

- Severe weather
  - storms, heavy precipitation
  - lightning
- Avalanches and land slide
- Floodings
  - river floods, flash floods, ice jams, glacier outburst
- Storm surge
- Sea Ice
- Earth quakes
- Volcanic eruptions
  - ash cloud detection – threat to aviation
  - ash dispersion – threat to live stock and human health.
Meteorological monitoring and forecast

- IMO monitors and issues forecast for
  - land and sea
  - large airspace

- IMO is a State Volcano Observatory
  - Pre-eruption activity
  - Eruption monitoring
  - Airborne volcanic ash
Geophysical monitoring network

- 62 seismic stations
- ~70 GPS stations
  - ~25 ISGPS
  - ~45 other institutes
- 6 strainmeter stations
- ~160 water level gauges
- ~200 met stations
- other measurements
Volcanic eruptions main threat

- **Subglacial eruptions**
  - glacial outburst – jökulhlaup
  - can lead to loss of life and livestock
  - damage to road infrastructure, communication infrastructure, industry

- **Ash fall**
  - danger to livestock
  - fluorosis can lead to abnormal bone and theeth growt in animals → followed by death
  - intoxicated grass

- **Ash dispersion in the free atmosphere**
  - threat to aviation
Natural Hazards – IMO’s Domestic Collaboration
Natural Hazards – International Collaboration

- ICAO
- WMO
- EUMETNET
- Universities
- Nordic Meteorological and Hydrological Institutes
- Volcanic Ash Advisory Centers (UK met. Office, Meteo France, Canadian met. office)
IMO and CPD collaboration on seismology and volcanic activity

- Meetings twice per year
  - status of seismic unrest in Iceland
  - status of possible volcanic eruptions in Iceland
- During increased activity meetings are held regularly
- IMO’s contingency plans state that during increased seismic unrest that might lead to volcanic activity the CPD shall be contacted
  - CPD activates their contingency plan depending on the seriousness of the hazard, e.g.:
    - evacuation of areas
CPD – Color code and danger phase

- 3 phases
  - Uncertainty phase (óvissa)
  - Alert phase (hætta)
  - Distress phase (neyð)

- 4 priority phases used to activate rescue teams
  - F1 – Highest priority
  - F2 – High priority
  - F3 – Low priority
  - F4 – No priority

- Colour code identifies the seriousness of the event/accident and the need for coordination of resources
Flood areas during subglacial volcanic eruption and emergency information
Flood areas during subglacial volcanic eruption and emergency information
In 2002 a three year project started to investigate the threat of eruptions in Eyjafjallajökull and Katla and which consequences that could have – IMO and the University of Iceland

A report was issued in 2005 with information on

- historical events on volcanic activity and glacial outburst
- floods (glacial outburst) that had occurred and could occur (modelled events)
- flood channels/patterns → which areas are affected
- flood discharge
- speed of the flood → how fast do floods reach inhabited areas

Probabilities of volcanic eruptions in the area

- return period
- is there a correlation between the strength of the eruption and return period
Information from CPD

- Information on preparedness issued to residents in the area
- Information to tourists in different languages
- Information posters at touristic sites
  - Hekla ...
- Exercises held
  - 2006 a two day exercise in the area of Eyjafjallajökull and Mýrdalsjökull was held. All institutes that are involved during real events participated and inhabitants were evacuated
IMO – CPD collaboration

- IMO issues warnings and information on natural hazards to CPD
- CPD activates their contingency plan accordingly
- Information to public issued through
  - public radio and television
  - web
  - mobil web
  - text TV
  - Posters to residence
  - Posters at touristic sites
- Work ongoing on how to inform tourists at sites
  - popular walking path on Mt Hekla on the main eruption rift
  - pre eruption warning 1-2 hr!
Next steps

Risk analysis of volcanic activity in Iceland

- Re-analysis of volcanoes in Iceland – Cataloge
- Scenarios for each volcano
- Risk analysis for areas possibly affected by glacial outburst
- Risk analysis for volcanic eruptions close to populated areas and/or international airports
International Strategy for Disaster Reduction (www.unisdr.org)

- Terminology
  - www.unisdr.org/eng/terminology/terminology-2009-eng.html
A comprehensive risk assessment (WMO - model)

Observations
Inventory
Accounting
Thematic event maps

Hazard potential
Sector domain
Intensity or magnitude
Occurrence probability

Vulnerability
Value (material, people)
Injuries
Resiliency

Risk assessment
Risk = function (hazard, vulnerability, value)

Protection goals / Risk acceptance

Planning measures
Minimization of risk through best possible Management practices, mitigation/adaption measures Land use planning, structural measures (building codes) Early warning systems

Voluntary adaption/mitigation
Commercial/individual insurance

isdr has defined response and risk management in some detail
Knowledge building in the society
education, instructions, research, information distribution

Social commitment
clear role of institutions, law and regulations

Mitigation deployment
environmental assessment zoning infrastructure strengthening economical framework insurance, mitigation structures e.t.c.

Warning and forecasting
definition of response indicators, warnings, warning dissemination, definition of alert stages, scenarios e.t.c.
Thank you

Photo: P.M. Pétursson