"Civil protection exercises for volcanic risk management. The VUELCO experience at midway"
Civil Protection exercises: goals, types, organization, good practices

VUELCO project exercises

VUELCO Colima exercise: preparation, involved institutions, development, phases, debriefing, materials produced

VUELCO Campi Flegrei exercise: preparation, involved institutions, development, phases, debriefing, materials produced
EXERCISE GOALS

Exercises are fundamental for testing:

✓ Procedures
✓ Preparedness
✓ Emergency planes (already prepared)
✓ ..........

and TO MAINTAIN THE ATTENTION ON THE SPOT!
TYPES of EXERCISE

Table-top
• Involve the command and control chain of emergency response (at national, regional or municipality scale).
• Do not involve the population

Reduced exercise

Full-scale exercise
• Test the whole response system
• Involve the population

Unannounced
• No limitations

Announced
• Degraded mood
EXERCISE ORGANISATION
ROAD MAP

- **Clear objectives**: analyse procedures, means, timing, emergency plans (e.g. emergency areas, evacuation routes, operational centers, communication, displaying of forces etc etc)
- **Type of hazard**: ash, lava flow, lahar, etc...or multihazard
- **Scale**: national, regional or local
- **Players involved**
- **Budget**
- **Duration**
## Example of a Possible Form for Exercise

### Name of the Exercise

<table>
<thead>
<tr>
<th>Type of exercise:</th>
<th>Site address of exercise:</th>
<th>Scheduled date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Table-Top</td>
<td></td>
<td>Level of the players</td>
</tr>
<tr>
<td>2. Full scale</td>
<td></td>
<td>Time slot:</td>
</tr>
<tr>
<td>3. Reduced</td>
<td></td>
<td>1. Day/night</td>
</tr>
<tr>
<td>4. Announced</td>
<td></td>
<td>2. AM/PM</td>
</tr>
<tr>
<td>5. Unannounced</td>
<td></td>
<td>3. Begin of exercise:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. End of exercise</td>
</tr>
</tbody>
</table>

### Theme

#### Objectives

<table>
<thead>
<tr>
<th>General Objective:</th>
<th>Interim Objectives:</th>
<th>Specific Objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Players

<table>
<thead>
<tr>
<th>Lower Animation</th>
<th>High Animation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private company</td>
<td>CP of operators</td>
</tr>
<tr>
<td>Operators:</td>
<td>Railway company</td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Institutions:</td>
<td>e.g. Regional Civil P</td>
</tr>
<tr>
<td></td>
<td>e.g. Mayor</td>
</tr>
<tr>
<td>Private Company:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Students, Consultants, Scientists - Experts</td>
</tr>
</tbody>
</table>

### Kinetic

<table>
<thead>
<tr>
<th>Speed?</th>
<th>Slow?</th>
<th>Compressed time?</th>
</tr>
</thead>
</table>


http://miavita.brgm.fr
http://www.protezionecivile.it
<table>
<thead>
<tr>
<th>Weather</th>
<th>Real?</th>
<th>Fictitious?</th>
<th>If fictitious:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Direction of wind</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Hygrometry</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Speed wind</td>
</tr>
<tr>
<td>Communication</td>
<td>yes</td>
<td>no</td>
<td>If yes, who, where and when?</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>no</td>
<td>Who and since when.</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>no</td>
<td>In case roles and number of figurants should be planned</td>
</tr>
<tr>
<td>Scenario and timetable</td>
<td>Outline and cutting time:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phase 1: ....................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phase 2: ....................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phase 3: ....................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logistics</td>
<td>Drinks, meals, blankets, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluators</td>
<td>1..................., 2..................., 3....................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observers</td>
<td>1..................., 2....................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot feedback</td>
<td>What time, where and with whom? In general just after the end of the exercise or one day later.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold</td>
<td>What time, where and with whom? In general 30 days after the end of the exercise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


[http://miavita.brgm.fr](http://miavita.brgm.fr)
[http://www.protezionecivile.it](http://www.protezionecivile.it)
Exercises should be scheduled frequently and the frequency depends on several factors:

- behaviour of the volcano
- social-economic context and level of risk perception
- changes of political administration
- etc....

They become ineffective and NOT useful if they are limited to single events!
GOOD PRACTICES FOR EXERCISE

Organisation: based on regulations and laws of the country

Coordination: a steering group should be in charge of coordination and leadership

Scenario: a scientific group (volcano team) is needed to modify the scenarios in a timely manner (even reflecting the reactions of the participants)

Work plan: essential to clarify goals (overall, intermediate, specific), participants, command chain, strategy, agenda

Preparation time: 6 to 12 months are usually necessary to prepare a full-scale exercise. If the promoted exercises are repeated on a fixed schedule, 3 months can be sufficient.

Hot and cold debriefing: organize an on the spot debriefing straight after the exercise and another one 1 month later.

Communication: especially for full-scale exercises a communication plan is fundamental.

Players: exercise preparation should involve all players from the beginning.

Civil Protection exercises: goals, types, organization, good practices

VUELCO project exercises

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VUELCO Campi Flegrei exercise: preparation, involved institutions, development, phases, debriefing, materials produced
VUELCO EXERCISES

Work Package 9: Decision making and unrest management

Task 9.6: Simulation of unrest and decision making

TARGET VOLCANOES

- Colima (MEX) - Nov. 2012
- Cotopaxi (EC) - Nov. 2014
- Cotopaxi (EC) - Jul. 2015
- Soufrière Hills (UK)
- Morne aux Diables (WD) - Jul. 2015
- Campi Flegrei (ITA) - Feb. 2014
- Teide (E)
VUELCO EXERCISES GOAL:

- Explore the applicability and helpfulness of methods, models and procedures developed within the project (especially probabilistic models and communication protocols), to the decisional-operational chain in an unrest crisis;
Colima Volcano Exercise
17th – 24th November 2012

FULL-SCALE EXERCISE
FOCUSED ON MANY ASPECTS
PREPARATION

THE COLIMA VOLCANO
- Overview
- Eruptive history outlines
- Monitoring system
- Volcanic hazard and risk

THE EXERCISE
- Involved institutions
- Exercise goals
- Exercise development
- Exercise timetable

COLIMA VOLCANO EXERCISE PLAN

17th – 24th November 2012
INVOLVED INSTITUTIONS

Mexican involved institutions and committees:
2. State of Colima Civil Protection System (SCCPS).
5. Universidad Nacional Autónoma de México, Mexico (UNAM).
6. University of Colima (UC).
7. Colima Volcanic Observatory (CVO).
8. Scientific Committee for Colima Volcano (SCCV).

International involved institutions:
11. Agencia Estatal Consejo Superior de Investigaciones Científicas, Spain (CSIC).
12. Istituto Nazionale di Geofisica e Vulcanologia, Italy (INGV).
13. Dipartimento della Protezione Civile, Italy (DPC).
14. Ludwig-Maximilian University of Munich, Germany (LMU).
15. Centre National de la Recherche Scientifique, France (CNRS).
16. Seismic Research Centre- University of West Indies, Trinidad and Tobago (SRC-UWI).
17. Instituto Geofisico de Escuela Politécnica Nacional, Ecuador (IGEPN).
DEVELOPMENT

4 meetings (Sc+DM) simulating increasing of precursory signals

monitoring signals

COLIMA Scientific Committee

VUELCO scientists

differential diagnosis

Colima + Jalisco Civil Protection

decision making

mitigation measure

mitigation measure

evacuation

…focus posed on subsequent phases:
EXERCISE PHASES:

A. Analysis and interpretation of precursory signals.
B. Elaboration of scenarios and advice-giving.

Possible scenarios defined:
1. Effusive
2. Explosive (sub-Plinian, Plinian)
3. Mixed (dome growth and destruction)
4. Flank collapse
5. Eruption stop
C. Decision making.

final interview on how decision-makers felt with different form of advice-giving
D. People and media communication.

press conference
+
meeting with population at
La Becerrera village
E. Evacuation of an exposed village.

...more pictures on www.vuelco.net
F. Debriefing.

- Colima monitoring and surveillance system.
- Colima Civil Protection system.
- Scientific Advisory Committee management and advice-giving.
- Organization and development of the next exercises.
General considerations:

- Clarify the use of BET and elicitation as tools supporting (not replacing) local experts.
- The form of advice giving should be agreed with Civil Protection.
- Clarify how the scientific advice should be used by decision-makers (cost/benefit analyses?) and if they are comfortable with managing this kind of process.

Suggestions for Colima system:

- Improve the Colima monitoring and alert systems with infrasonic array and ash dispersal models.
- Clearer definition of role and responsibilities of the Scientific Committee.
- Encourage self-evacuation and autonomous accommodation.
- Maintain family unity during evacuation and at the shelters.
- Limit the presence of army and avoiding curfew.
- Use the shelters in ordinary time for other activities (social, cultural, educational).
Materials and documents produced:

- Colima volcano exercise plan.
- Colima volcano bibliography.
- For each scientific committee simulation meeting:
  - Monitoring rough data;
  - Monitoring signals synthetic presentations;
  - Advice released by Colima scientific committee;
  - Elicitation results and resume by VUELCO scientists.
- Mexican communication strategies check-list.
- Press and web review.
- Photograph collection.
- Debriefing report.
2\textsuperscript{ND} VUELCO EXERCISE

\textbf{CAMPI FLEGREI caldera}

Exercise: 9\textsuperscript{th} – 15\textsuperscript{th} Feb. 2014

\textbf{TABLE-TOP REDUCED SIMULATION FOCUSED ON SCIENTIFIC ISSUES}
PREPARATION

- Distribution of the «Summary report on Campi Flegrei volcanic hazard»

- Distribution of the Simulation plan including: organizations involved, simulation goals, agenda, actors and rules

- Field trip to Campi Flegrei with visit to Vesuvius observatory.

- One day briefing session.

- More than 100 participants from 10 Countries from Europe and Latin-America.

- Civil Protection representatives from Italy (national and regional), Dominica, Canary Island and Argentina.
DEVELOPMENT

2 full days, 4 phases simulating increasing of precursory signals

- Volcano team released volcano signals.

- INGV communicated what they can observe with monitoring networks (possible degraded mood) and delivered a bulletin.

- SAC evaluated the ongoing situation, on the basis of the bulletin delivered by the INGV-OV. After an initial examination of the report, they had a videoconference with INGV-OV in Naples, in order to ask for further details. After that they had the time (a couple of hours) to discuss and to elaborate a written report to DPC.

- Following the release of the advice from the SAC, an interaction phase occurred, during which DPC had the opportunity to ask the SAC more information and/or evaluation regarding the advice released.

- This process was repeated across 4 subsequent meetings, each time simulating increasing monitoring signals.

- [In the third phase, after releasing the advice, the DPC asked the SAC for further information. To answer some of these questions, the SAC decided to perform an elicitation].
To optimize the short time available, work-phases were shifted between Naples and Rome.
Questions for scientists:
- Completeness and adequateness of information and data to define possible scenarios.
- Usefulness of probabilistic forecasting models for scientific analysis and advice releasing?
- Effectiveness of Scientific Advisory Committee functioning and of advice releasing modalities?

Questions for civil protection representatives:
- Main differences between Italy and your Country, regarding the organization of support given by the scientific community to the civil protection.
- Communications flow among the different groups
- Usefulness of probabilistic hazard assessment into scientific advise?
### SUGGESTIONS FOR

- Structure, composition and activities of the Scientific Advisory Committee.
- Advice contents and releasing procedures.
- Better definition of alert levels.
- Organization and development of the next exercises.

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### LESSON LEARNED...
Suggestions:

- Need to improve scenarios (offshore eruptions, small volume mafic eruptions).
- Need to improve the knowledge of the geological-structural model of the caldera (e.g. role of faults) and of volcanic history.
- Advices released by SAC should be comprehensive of what can be expected in the medium-short period and provide probabilities and magnitude of expected earthquakes.
- Scientists should quantify information (terms like: “high”, “low”, “shallow”, “deep”, “rapid” need to be specified).
- INGV, SAC, CGR and DPC should seat at the same table.
- During the crises SAC meeting must be frequent and not after the occurrence of new events.
- Base level of activity needs to be defined, as well as thresholds for different parameters.
- Interaction with Civil Protection is essential to understand needs and expectations of Civil Protection. CP should be more precise in its request.
- The alert level system is too rigid: only 3 alert levels are few for the management of a crisis at Campi Flegrei.
Materials and documents produced/collected:

- Summary report on Campi Flegrei volcanic hazard.
- Campi Flegrei exercise plan.
- For almost each phase of the simulation:
  - Monitoring parameters outcomes from volcano group;
  - First rapid communication of event from INGV;
  - Surveillance bulletin from INGV including hazard evaluations;
  - Report on satellite data from IREA;
  - Report on satellite data from INGV;
  - Report on damage scenarios from Plinivs;
  - Report of probabilistic forecasting model from CSIC;
- Advice from SAC.
- Press release (only for the first phase).
- Photo collection.
- Debriefing report.
TOMORROW:

Cotopaxi unrest simulation exercise

Early preparation activities of Morne aux Diable exercise:
- participation of Dominica National Disaster Coordinator in the Campi Flegrei simulation
- meetings between UWI-SRC and Office of Disaster Management in Dominica (ODM)
Gracias de nuevo

stefano.ciolli@protezionecivile.it
chiara.cristiani@protezionecivile.it

www.protezionecivile.gov.it