EUROVOLC

European Network of Observatories and Research Infrastructure for Volcanology

Deliverable Report

D3.4 Outcome from the local focus groups activity

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Contents

1. Summary

This report presents results from the second of the three steps (subtasks) within Task 3.2 Outreach, where the second step focusses on the assessment of volcanological outreach resources, many of which were presented in the preceding deliverable *D.3.3 Survey of outreach tools*. Seven EUROVOLC partners contributed to this subtask of evaluating the suitability of a selection of outreach material intended to inform the general public and school children.

The evaluation, which was performed by three types of focus groups, including school teachers, civil protection officials and staff members of nature preserves and protected areas, was carried out in three countries: Iceland, Azores islands in Portugal, and Italy. In Iceland two separate focus groups were formed, one consisting of school teachers, the other including people, working in national parks or protected areas, who were actively involved in science communication. In Azores a focus group of school teachers was formed, while in Italy the focus group included both school teachers and civil protection representatives. In Iceland and Azores, the evaluation focused on a selection of existing outreach material (web pages/resources, videos, posters/pamphlets and presentations), while in Italy the focus was on evaluating an educational role-playing activity for school children on Vulcano island. To assist with the evaluations, specific evaluation forms were developed and sent to the participating EUROVOLC partners to use as a guideline in the focus groups' assessment of the various volcanological information or hands on exercises.

A number of ideas came out of the focus group evaluations. These ideas will serve as guidelines for the final deliverable from Task 3.2, the "EUROVOLC outreach box", as well as for possible future outreach activities and projects. The evaluations revealed that some of the material was not well suited for the general public or for children and highlighted the importance of strengthening the co-operation between the scientific community and science communicators working with different stakeholders (i.e. children, tourists, general public), in order to produce more suitable and effective outreach material. Hands on experience was deemed more likely to result in a thorough understanding of volcanic hazard and risk, as was demonstrated by the role-playing activity carried out on Vulcano island. Through this interactive training, teachers, school children, their parents, as well as scientists and representatives from Civil Protection, became involved and experienced what type of activity was best suited to inform the public about volcanic hazard.

2. Introduction

Involvement of Earth scientists/volcanologists in volcanic outreach activities is crucial for improving public knowledge and awareness about volcanoes and their related risks, as well as to promote the public's active role as citizens living in a volcanic area. EUROVOLC's **Task 3.2 Outreach** is focused on contributing to the improvement of public knowledge about volcanic hazards and risks through activities involving three steps/subtasks:

1) gathering information from the partners of Task 3.2 about existing outreach material for the general public and for educational activities,
2) evaluating this outreach material and
3) using the knowledge gained from the first two steps to develop improved outreach material about volcanoes and volcanic hazard to be presented as the "EUROVOLC Outreach Box".

The results from the first step (Subtask 3.2.1) were summarized in a previous deliverable report, ***D3.3 Survey of Outreach Tools***, which listed websites, youtube channels, videos, seminars, science days, posters, presentations, experimental exercises, leaflets, reports etc. The work presented in the present deliverable (*D3.4*) constitutes **Subtask 3.2.2 Assessment of outreach resources through local focus groups** and represents the second step, which utilizes local focus groups made up of different stakeholders to review and evaluate a selection of outreach material mainly from deliverable *D3.3*.

The **objective** of Task 3.2 is **(a)** to **improve** the **efficacy of outreach material** and activities through their evaluation and testing by local teachers and key people involved in communicating volcanological topics, and **(b)** to **disseminate the results of the activities**, i.e. the milestones and deliverables of the project, making them visible, tangible and accessible for the public and other stakeholders.

Each partner of Task 3.2 was asked to choose the appropriate material from the list in the *D3.3* report for evaluation by a focus group. The idea was to use at least one of the listed outreach tools/material for evaluation by their focus group. However, because the amount and type of informative material varies considerably between the participating partners and countries, each partner was given the freedom to carry out a general evaluation of all the material published in the *D3.3* report. Partners could also give a general feedback on the suitable audience for the outreach material or the outreach approach.

Seven EUROVOLC partners contributed to this subtask: The Icelandic Meteorological Office (**IMO**), University of Iceland (**UI**), Department of Civil Protection and Emergency Management Iceland at the National Commissioner of the Icelandic Police (**NCIP**), University of Geneva Switzerland (**UNIGE**), Instituto Nazionale di Geofisica e Vulcanologia Osservatorio Vesuviano, Italy (**INGV**), Italian Civil Protection (**ICP**), and Centro de Informação e Vigilância Sismovulcânica dos Açores, at the University of Azores, Portugal (**CIVISA**). The partners represent 3 Volcano Observatories, 2 Universities and 2 Civil Protection agencies.

During a WP3 meeting in the Azores in February 2019, a workplan and road map for the development of *D3.4* was defined. This entailed fixing deadlines for the appointment of the focus groups, the composition of the survey or evaluation form, the collection of feedback from the various groups, the delivery of the first draft of the report and finally the dates for the report to be completed. In April, a new representative (Hrafnhildur Hannesdóttir) took over the IMO's responsibilities and was introduced to other key partners of WP3 via skype meetings in the following weeks.

In Iceland, the three Icelandic partners, IMO, UI and NCIP selected two main local focus groups, **(a)** elementary school teachers, teaching 1st – 10th grade, and **(b)** staff members of protected areas in Iceland´s volcanic zones (Vatnajökull National Park, Katla Geopark and rangers working in South Iceland protected areas (https://ust.is/nattura/natturuverndarsvaedi/fridlyst-svaedi/sudurland/). The outreach material evaluated, consisted of a selection of material from *D3.3*, together with some additional web sites and videos.

In the Azores islands a local focus group of elementary and secondary level school teachers, teaching 7th and 10th – 11th grade, was formed and the outreach material evaluated consisted of presentations given to school visits to the CIVISA data acquisition and volcano monitoring centre.

In Italy, an educational, role-playing exercise with children from the 3rd – 5th grade of the primary school on Vulcano island was carried out by UNIGE and INGV Osservatorio Vesuviano, in collaboration with University of Azores. The exercise was developed by UNIGE by combining an educational volcano emergency exercise carried out since 2011, with some of the material from the *D3.3* report. The focus group evaluating the activity was composed of teachers from the elementary school of the island and observers from the Italian Civil Protection. The exercise directly involved the students and some of the team researchers,

In this report, *D3.4* the focus groups in Iceland, Azores and Italy are introduced, the outreach material and questionnaires which were sent to the focus groups for evaluation are summarized, and details of the role-playing exercise on Vulcano island are described. The feedback and comments received from the focus groups in each of the three countries are summarized, followed by some general discussion about possible next steps.

3. Definition of evaluation methodologies

3.1 Definition of focus groups

To evaluate the outreach material presented in this report, focus groups needed to be defined and constructed. There was a consensus among the partners involved in Task 3.2, including the IMO (Hrafnhildur Hannesdóttir, responsible subtask leader and Kristín Vogfjörd), the NCIP (Ágúst Gylfason and Guðrún Jóhannesdóttir), the University of Iceland (Magnús Guðmundsson), as well as the INGV (Rosella Nave, responsible Activity leader) and UNIGE (Costanza Bonadonna) to include people from the following categories in the local focus groups:

- School teachers
- Tour operators and people working within the tourism industry
- Civil protection officials

Within these categories, the participating partners were then encouraged to adjust the composition of their focus groups according to their possibilities for outreach. The focus groups constructed, included two in Iceland and one each, in Italy and Azores islands.

3.2 Evaluation forms

To record the responses and evaluations of the focus groups the following standardized questionnaire forms were created for the partners to send out to their focus group members,

where the forms representing the tourism industry and civil protection were combined in to one. The focus group members were also advised to make recommendations on what type of outreach activities they thought were most likely to reach the public and have the strongest impact.

TOURIST GUIDES (TOURISM INDUSTRY) & CIVIL PROTECTION AGENCIES

1. Does the available material increase your knowledge about the volcanoes in the area?
2. Does the available material provide you with enough information about the volcanic risk in the area?
3. Does the material provide you with information which is relevant for you audience?
4. Where do you seek/gather information for your tours?
5. Who is responsible for the tourists in areas effected by volcanic risk?
6. Do you know if warnings are given in case of hazard/emergency?
7. Who is your audience?
8. Is the outreach material appropriate for the audience?
9. What strengths do you see in the outreach material?
10. What weaknesses do you see in the outreach material?
11. What communication links are present between guides, scientists, civil protection representatives?

SCHOOL TEACHERS

1. Can the outreach material be used in your teaching/education program?
2. Does the material motivate and inspire *students*?
3. Does the material motivate and inspire *teachers*?
4. Does the material create linkage to other scientific educational programs?
5. Does the material raise the *students´* awareness about geological hazards in the country?
6. Does the material raise *teachers´* awareness about geological hazards in the country?
7. Is the outreach material appropriate for the audience?
8. What strengths do you see in the educational material?
9. What weaknesses do you see in the outreach material?
10. What type of material works best for educational purposes in teaching geology or environmental science?

These forms were used in Iceland and the Azores islands, Portugal but in Italy, where the outreach activity was different the questionnaires were slightly modified to:

CIVIL PROTECTION AGENCY, ITALY:

1. Do you think that this activity has raised awareness towards volcanic risk in their territory in the students that have participated?
2. Do you think that this activity has raised awareness towards volcanic risk in their territory in the students that have assisted?
3. Do you think this activity well integrates within the training initiatives of the Italian Civil Protection?
4. Which do you think are the strong points of this activity?
5. Which do you think are the weak points of this activity?
6. Do you think this activity could also be extended to other classes, schools and people?
7. Do you have other suggestions?

SCHOOL TEACHERS, ITALY

1. Do you think that this activity has raised awareness towards volcanic risk in their territory in the students that have participated?
2. Do you think that this activity has raised awareness towards volcanic risk in their territory in the students that have assisted?
3. Do you think this activity well integrates within your educational program?
4. Which do you think are the strong points of this activity?
5. Which do you think are the weak points of this activity?
6. Do you think this activity could also be extended to other classes, schools and people?
7. Do you have other suggestions?

3.3 Focus groups evaluating the Icelandic outreach material

Two focus groups were constructed in Iceland representing the tourist sector and school teachers, respectively. Their participation centred around responding to outreach material selected from the *D3.3* deliverable, with some additional web sites and videos added and using the standard questionnaire forms above. Positive responses were received during the first round of invitations to possible focus group members. However, the timing of the project (April/May) was not ideal for school teachers, or for people working within the tourism industry (park rangers, tour operators, etc.); teachers have a tight schedule at the end of the school year in May and the latter group is busy preparing for the high season. Nevertheless, it was possible to form two groups including the following participants:

Staff members of protected areas:

Stefanía Ragnarsdóttir, public relations representative, Vatnajökull National Park
Daníel Freyr Jónsson, geologist, Fjallabak Nature Reserve South Iceland, The Environment Agency of Iceland
Berglind Sigmundsdóttir, geologist, Katla Geopark

and

School teachers

Guðlaug Úlfarsdóttir, natural science teachers in 8th-10th grade, elementary school Hornafjörður, southeast Iceland
Rósa Á Valdimarsdóttir, social studies teacher in 7th grade, elementary school of Hornafjörður
Svanfríður Ingjaldsdóttir, teacher 1-3rd grade, elementary school Reykjavík (Langholtsskóli)
Helga Björt Möller, teacher, elementary school of Ísafjörður, northwest Iceland

From the initial responses received, it was obvious that there is great interest within these groups to participate in producing suitable outreach material about volcanoes and volcanic hazard. Possibly some other teachers could be included in the third and final Outreach subtask of EUROVOLC, for example teachers in the elementary schools in Vík, Hvolsvöllur and Vestmannaeyjar townships in South Iceland. Similarly, staff members at the Eldheimar volcano museum in Vestmannaeyjar, as well as the LAVA centre in Hvolsvöllur indicated willingness to provide feedback.

3.4 Focus group evaluating the outreach material in Azores islands, Portugal

In Azores islands a focus group representing school teachers was formed. The standard evaluation form was used, and the outreach material evaluated consisted of presentations given to groups of primary, secondary and university students visiting the CIVISA Data Acquisition and Monitoring Centre. The focus group was made up of the following three teachers who had visited CIVISA with their classes:

School teachers
Ana Machado, ES Laranjeiras elementary school, 7th grade
Elsa Reis, ES Conde Monsaraz secondary school, 10th grade
Joana Pedrosa, Real Colégio de Portugal secondary school, 11th grade.

3.5 Focus group evaluating the outreach activity in Italy

In Italy the evaluation focused on the effectiveness of a role-playing outreach activity involving school children in a small community on Vulcan island. The purpose of the exercise was to teach the children appropriate behaviour to be adopted in volcanic areas and through the theatrical activities, to educate them about volcanic hazards and risk. To make the exercise more effective and increase its international exposure, it was also integrated with participants of the *Specialization Certificate in Geological and Climate-related Risk* (CERG-C) program of the University of Geneva.

The activity included participation by a team of Earth scientists from UNIGE, INGV, CIVISA/IVAR (Institute for Volcanological Research and Risk Assessment, of the University of Azores) and an external partner from the University of Pisa:

Team members
Prof. Costanza Bonadonna (UNIGE),Dr Eduardo Rossi (UNIGE), Ms Lucia Dominguez (UNIGE), Dr Rosella Nave (INGV), Dr Tullio Ricci (INGV), Prof. Fatima Viveiros (University of Azores), Prof. Mauro Rosi (University of Pisa)

One focus group was constructed to evaluate the activity. The group included both school teachers and civil protection officials:

Focus Group
Four teachers of the Vulcano Primary school and two observers from Italian Civil Protection, Dr Chiara Cristiani and Dr Antonio Ricciardi.

To record the focus group members' opinion on the educational approach of the exercise, the modified evaluation forms were used.

4. Evaluation of outreach material in Iceland

The Icelandic outreach material listed in the *D3.3* report and intended for use by the focus groups, is very diverse and some of the material was deemed not quite suitable for the general public or at the elementary school level. However, one of the best data sources to be evaluated, was the *Catalogue of Icelandic Volcanoes*, for which there are plans to launch an Icelandic version in 2019. For elementary school teachers this comprehensive website has great potential, but the English version is largely too complicated for students and the general public. The following five categories of outreach material were selected for evaluation, mostly from deliverable *D3.3*:

1. The *Catalogue of Icelandic Volcanoes* (CIV),
2. popular questions about volcanoes and volcanologists,
3. short videos about the Holuhraun eruption and scientists at work,
4. simulation of the flow of the Holuhraun lava from any location in the world,
5. pamphlets from the National Commissioner of the Icelandic Police about precautions to take in case of an eruption,

while the video in category 4 and some of the material in categories 2 and 3, from the Cambridge volcanology group, were added.

(1) The Catalogue of Icelandic Volcanoes (CIV)

The CIV (www.icelandicvolcanoes.is) is an interactive, web-based tool (see Fig. 1), containing information on the 32 volcanic systems that belong to the active volcanic zones of Iceland. The catalogue is a collaboration of the Icelandic Meteorological Office, the Institute of Earth Sciences at the University of Iceland, and the Civil Protection Department of the National Commissioner of the Iceland Police, with contributions from a large number of specialists in Iceland and elsewhere. The Catalogue is an official publication intended to serve as an accurate and up-to-date source of information about active volcanoes in Iceland and their characteristics. The Catalogue (largely funded by the International Civil Aviation Organization) forms a part of a government funded integrated volcanic risk-assessment project in Iceland Gosvá (commenced in 2012), as well as being part of the effort of the EC FP7 project FUTUREVOLC (2012-2016) on establishing an Icelandic volcano supersite.

Figure 1. *A screenshot of the website icelandicvolcanos.is. The Bárðarbunga "box" provides links to i)-v) (see text).*

An introduction to the website was given to the focus groups, explaining the different map layers that the viewer can choose to see, for example the locations of GPS, seismic, gas and infrasound stations, as well as radar installations etc. When selecting a specific volcano, the viewer can choose from a list, whether to show on the map the fissure swarm, the caldera, lava fields or tephra distribution from previous eruptions of the volcano. The viewer can retrieve various information about each volcano. For example, when clicking on "Askja" a quick overview opens up, detailing the volcano´s i) aviation colour code, ii) the activity level, iii) last eruption, iv) detailed catalogue information, v) photos, and vi) activity status (see Fig.1). For each volcanic system, more detailed descriptions are found under the headings shown in Figure 2.

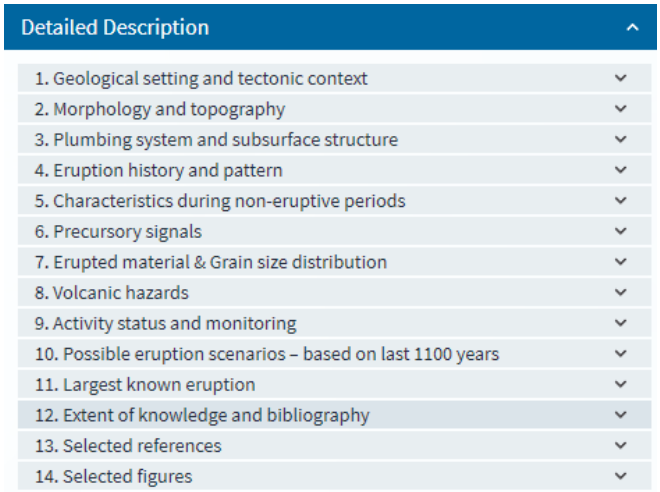

Figure 2. Overview of the detailed information available for each volcano in the Catalogue. *http://icelandicvolcanos.is/* .

In EUROVOLC's WP11 a corresponding *European Catalogue of Volcanoes* (***ECV***) is being constructed (in English) for several European volcanoes: including Italy, Portugal, Spain, Greece and French overseas territories. The ***ECV's*** use for outreach in these countries will undoubtedly be equally valuable as that of the ***CIV*** in Iceland.

(2) Popular questions and facts about volcanoes in Iceland

Following the eruptions of Eyjafjallajökull, Bárðarbunga (Holuhraun episode) and the unrest of Öræfajökull volcano, scientists at the IMO, UI and other institutions and universities participating in monitoring of the volcanic activity gathered interesting facts and questions about these specific eruptions, as well as about the volcanoes in general to inform the public. Following are links to these lists of questions and facts:

- Öræfajökull volcano:
  https://www.vedur.is/skjalftar-og-eldgos/eldgos/oraefajokull/spurningar-og-svor/
- Eyjafjallajökull volcano:
  https://www.vedur.is/skjalftar-og-eldgos/frodleikur/greinar/nr/1876
- Fascinating Facts about the Holuhraun-Bárðarbunga eruption, volcanoes in general and commonly asked questions:
  https://www.esc.cam.ac.uk/research/research-groups/cambridge-volcano-seismology/all-about-earthquakes-and-volcanoes#fascinating-facts

(3) Videos of geoscientists at work during the Holuhraun 2014-2015 eruption in Iceland

Short videos about the Holuhraun eruption and geoscientists from the FUTUREVOLC project at work, which inspires students and provides a fascinating window into the monitoring of active volcanoes.

- Volcano Super-Team Studies Iceland eruptions – National Geographic https://www.youtube.com/watch?v=vefoR9L2WmQ
- Summer Science Exhibition 2016: Explosive Earth 2016 https://royalsociety.org/science-events-and-lectures/2016/summer-science-exhibition/exhibits/explosive-earth/

(4) Computer simulation of the Holuhraun lava flow

A simulation of the Holuhraun lava flow was designed for outreach purposes by a group at the University of Cambridge, showing the expansion and final size of the Holuhraun lava field. A webpage opens, with the possibility to enter the postal code of any place on Earth to visualize how the lava flow extends to the northeast, as it did during the eruption, and putting its size in to a local perspective familiar to the viewer. http://holuhraun-lavaflowextent.co.uk/mainpage.html

(5) Pamphlets from the National Commissioner of the Icelandic Police (NCIP)

The NCIP publishes pamphlets and booklets on specific natural hazards including eruptions. This material is available on-line on their official web page, in printed version and at specific locations by the main ring road. These pamphlets provide information for the general public about precautions to take in case of a volcanic eruption and possible floods (due to subglacial eruptions). Most of this material is in Icelandic, some available in English and other languages.

- Katla poster/pamphlet in 6 languages https://www.almannavarnir.is/utgefid-efni/eruption-emergency-guidelines-katla-in-myrdalsjokull/
- Hekla poster (in Icelandic and English) to warn of volcanic eruption hazard https://www.almannavarnir.is/utgefid-efni/hekla-hekluskilti/?wpdmdl=22273

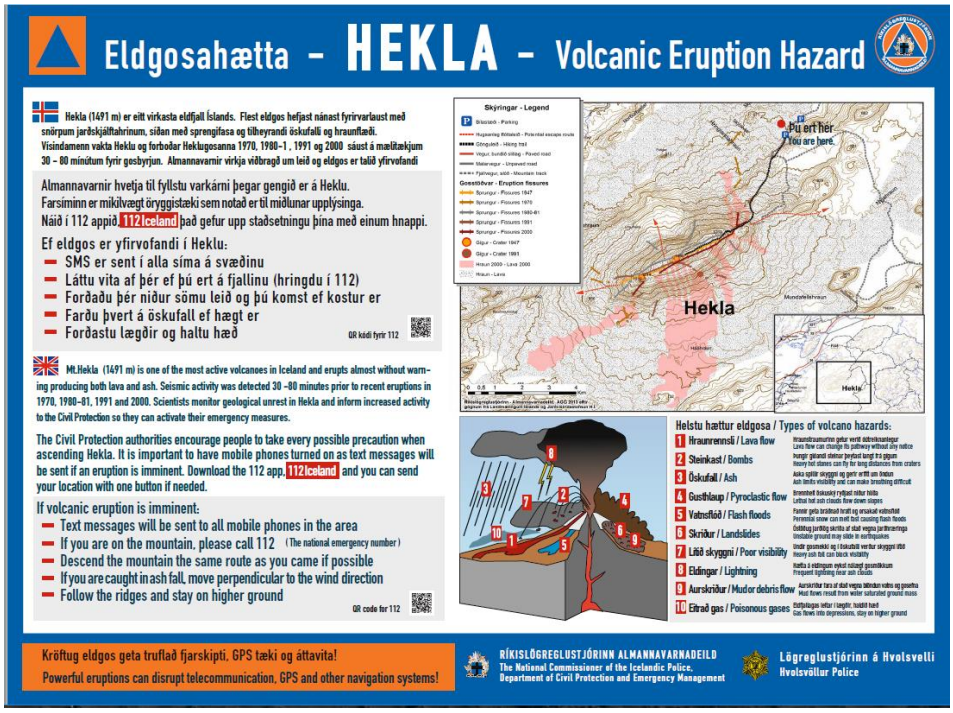

Figure 3*. The Hekla poster, warning of possible hazards from volcanic eruptions in the volcano.*

4.1 Tourism sector evaluation

Selected outreach material

All five categories of outreach material were selected for evaluation by the representatives of nature preserves and tourism sector in Iceland.

Results from the focus group

The **CIV** is **easily understandable for those with a geological background**, but **too complicated for the public**. The interface of the website could be more user-friendly, and some of the information is too detailed and complicated for the public. There is a long way to find the options to draw the outline of the volcanic system (calderas, fissure swarms, etc.). However, the amount of available information is one of the strengths of the website according to evaluators. The **catalogue provides a good overview of Icelandic volcanoes** and **works well for rangers** of the national park **to use in** their **science communication** as well as to give them information about the scientific work carried out within the park boundaries. The park rangers see opportunities for using some of the material on their own website or Facebook site.

Staff members of the parks had suggestions on how to improve the **Pamphlets of the NCIP**, which inform the public about the areas of volcanic risk. Not every visitor has read the pamphlets and the visitors are often unaware that they are in a volcanic zone or in the paths of possible oncoming floods (jökulhlaups). Additionally, the gathering points for people in case of a natural hazard should be better advertised. The staff members also mentioned that when informing visitors about the volcanic risk in a certain area, it is important not to cause fear and they stressed the importance of informing and not scaring the visitors. There should be information pamphlets about Skaftá glacial river and Öræfajökull volcano (as well as other volcanoes), similar to what is available for Katla and Hekla volcanoes. One idea mentioned, on how to reach visitors more easily, was that the visitors could receive text messages as soon as they entered a zone of possible hazard and then be directed to a website with further information via the message.

The **pamphlets of Katla and Hekla** were also review by the **Italian Civil Protection** members. They considered the pamphlets well made, and though it important to have information in many languages. However, the maps and accompanying text they thought could be simplified for better understanding by the public.

Comments on **Natural hazard**: If a volcanic eruption is imminent or has started, warning text-messages are sent by the NCIP to visitors within the hazard area. Sound signals will supposedly be sent from the mountain huts, but rangers or hut wardens have not had proper training using these, and they are not found in every hut. Staff members of the parks pointed out, that the telecommunication network does not have full coverage everywhere, and hikers, in order to save the batteries, do not always have their phones turned on.

General conclusions and suggestions from the tourism sector in Iceland

- In communicating information about volcanoes in general, there seems to be a missing link between those who have a thorough background in geology and the general public. Staff members of the parks had some general suggestions on how to prepare scientific information that can reach the audience more effectively. This included relating the information to: daily life, the experience of others, historical data, descriptions of those who have experienced eruptions or jökulhlaups (floods related to subglacial eruptions).

- The IMO website www.vedur.is (in Icelandic and partly in English) is visited frequently by rangers within protected areas and national parks, and suggestions were put forward to channel all information about volcanoes through that website.
- Much of the selected material is well suited for incorporation in science communication and information about the volcanoes is given to visitors, as well as information directing interested people who seek more data.
- There could be better communication pathways between NCIP and scientists on one hand, and the rangers and staff members of national parks and protected areas and tour operators on the other, in order to inform the latter group about hazard assessments. This could for example be done by short courses or printed/online tutorials.
- Information about volcanoes and volcanic risks needs to be available in more languages than Icelandic and English.
- Suitable material about volcanoes for children is missing.
- More options for information-dissemination for smartphones are needed.

4.2 School teachers' evaluation

Selected outreach material

Four of the five categories of outreach material were selected for evaluation by the Icelandic teachers' focus group, leaving out the pamphlets from the NCIP.

Results from the focus group

In general, the teachers found the website of the **Catalogue of Icelandic Volcanoes** to be **too complicated** and slow. They reported that the material did not even suit the students of the upper grades and saw limited opportunities to include the material in their curriculum. However, they liked the amounts of maps and photos on the website, which catch the attention of the students. However, **one enthusiastic teacher** of the elementary school, Langholtsskóli in Reykjavík, teaching in the first grades, **saw many opportunities with the outreach material**. Suggestions included providing the students with iPads, browsing through the Catalogue on their own, choosing their volcano and being able to choose different layers, see how far tephra/ash can be distributed, and the distance to different volcanoes (often children are afraid of volcanoes and believe that they are very close). Teachers experience that **students prefer to seek information on their own**, the interactive learning procedure is more efficient than when the students being fed with data. **Videos** from the field **are** always **inspiring**, and they make it easier for the students to visualize what volcanoes look like and they find it exciting to see scientists at work. The teacher found the **strengths of the material** to be **detailed without being overwhelming**.

The **website of** the **Icelandic Meteorological Office** (www.vedur.is) is **frequently used by teachers** as a source for information on various natural phenomena.

5. Evaluation of outreach material in Azores islands

Selected outreach material

The outreach material selected in the Azores islands for evaluation by the teachers focus group, included presentations given during visits by schools (primary, secondary and university level)

to the CIVISA facilities (see Fig 4.). Presentations are mainly in Portuguese but are also given in English to international visitors. The visits are divided into two parts. The first part consisting of (**a**) a presentation explaining some concepts that are referred to in the students' classes (educational program) and (**b**) description of the natural hazards in the Azores and the how CIVISA monitors them. The second part is a visit to the CIVISA Data Acquisition Centre, where the students can see how the observatory operates and where CIVISA's relation to Azores Civil Protection is explained.

Figure 4*. Example from presentation given to students visiting CIVISA Data* Acquisition *centre.*

Results from the focus group

In general, the teachers agreed that the material was useful and inspiring to the students. Weaknesses were that some of the material was too difficult for elementary and secondary level students to understand and suggestions were that the presentations should be adapted to meet the students' level of understanding. Suggested improvements included f. ex. seismic and volcanic hazard maps, geological maps, videos of/about recent and historical volcanic events, experiments and field trips.

6. Evaluation of outreach activity on Vulcano island, Italy

Description of the role-playing activity

Since 2011, the University of Geneva has been carrying out an educational outreach volcano emergency exercise with the elementary school students of Vulcano island, a small (21 km^2) volcanic island off the coast of southern Italy. The island has a permanent population of about 800

inhabitants living in close proximity to frequent eruptions, with the last one occurring in 1888-1890. The activity, which is part of the "*Specialization Certificate in Geological and Climate-related Risk"* CERG-C program (http://www.unige.ch/sciences/terre/CERG-C/) of the University of Geneva involves a role-playing exercise, in which the students experience a mix of laboratory and theatrical activities during a simulated volcanic event. The purpose of the exercise is to influence and educate the students to become facilitators for learning in the entire community.

In EUROVOLC an improved version of the activity was developed at the University of Geneva by combining the original exercise with material produced by the European project RACCE ("Raising Earthquake Awareness and Coping Children's Emotions" (2011-2014); (http://racce.nhmc.uoc.gr/it) (Fig. 5), in which INGV Osservatorio Vesuviano was also a partner. The main aim of the RACCE project was to increase awareness of natural hazards and improve knowledge of earthquakes and volcanoes by promoting the education of specific groups of people (teachers, parents, volunteers and civil protection workers) on best practices to address these hazards. The material added from RACCE included a guidebook for the teachers and posters demonstrating appropriate behaviours to adopt when faced with different hazards due to a volcanic eruption.

Figure 5*. Material from a RACCE poster (English version) used in the elementary school exercise, demonstrating appropriate responses to different types of volcanic hazard.*

The EUROVOLC educational, role-playing activity "*Knowing and living together with volcanic phenomena*" was carried out at the primary school of Vulcano island on May 10th, 2019. The activity involved the participation of the teachers and scientists from the University of Geneva (UNIGE), Instituto Nazionale di Geofisica e Vulcanologia INGV) and University of Azores

(CIVISA/IVAR) and University of Pisa. Representatives of the Italian Civil Protection were also present as observers. A manual with the exercise explanation and script of the text for each role involved was provided to each student and all roles were rehearsed before the activity started. More details about the exercise can be found in Appendix I.

The objective of this educational activity was to provide the students on Vulcano island with the opportunity to learn what happens during a volcanic eruption and what preventive actions can be taken, through an exercise with experimental activities and a role-playing game. Fifteen children of the III, IV and V class (age 8-11) played the roles of scientists, journalists, and representatives of the different institutions (18 roles in all) (see Figs. 6 and 7). The main goals were the following:

- to understand and be able to explain the main phenomena associated with a volcanic eruption
- to know which volcanic phenomena may occur in their district
- to acquire awareness of the risks and adopt the appropriate behaviour in the event of danger
- to know how to read and interpret risk maps

Results from the focus group

All **teachers agreed** that this **activity** was **very useful to** help **raise awareness of volcanic risk** in Vulcano, both for the children that participated and the children that assisted with the exercise. Both the students and the teachers also found the exercise to be more dynamic and interesting by focusing on simple actions to be implement in their territory. All teachers agreed that **children were enthusiastic to play**: the **strongest point** of the activity was that it raised awareness towards volcanic risk, while the **weakest point** was the lack of preparation time for the children to learn their roles. All teachers also agreed that this activity should be extended to the secondary school and the whole population of the island.

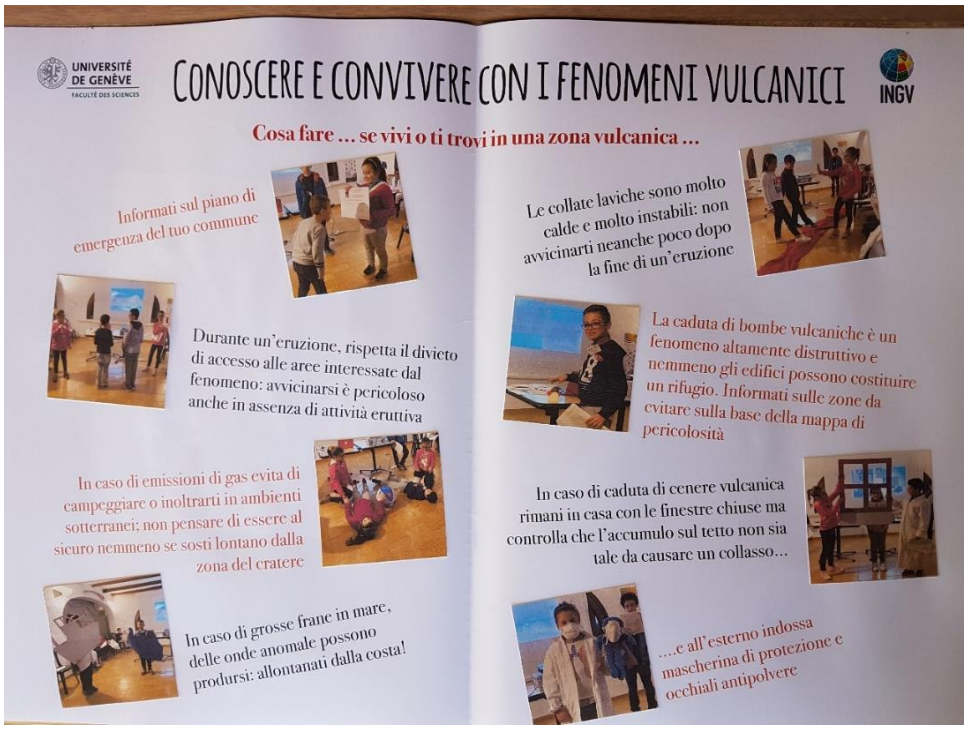

***Figure 6**. Photos from the exercise carried out with the school children at the elementary school on Vulcano island, Italy.*

The representatives of the **Italian Civil Protection agreed** that **this educational activity** was very **important to raise children's awareness of volcanic risk** and should be extended to middle and high school as well as to the whole population if possible. An important suggestion was that such an educational activity could be integrated within the program of the Local and Regional Civil Protection in order to provide more continuity. The **most** important **beneficial aspect** of this activity **was the strong engagement** of the school children **through experiments and theatrical activities** that are more efficient than traditional lectures. The exercise also provided training for the correct behaviour during volcanic eruption, and improved the participants' understanding of the roles and responsibilities of the stakeholders involved in risk mitigation (e.g. mayor, scientists, media, civil protection)

The combination of the role-playing exercise with the RACCE actions, in order to raise awareness towards the appropriate behaviour to be adopted in volcanic areas has largely improved the original role-playing exercise carried out at the elementary school of Vulcano island. In fact, both the students and the teachers found the exercise more dynamic and more interesting and it helped them to focus on simple actions for the local population. Integration of participants from the CERG-C program of the University of Geneva in the exercise, made it even more effective by maximising its international exposure. In fact, on one hand, the exercise raises awareness of volcanic risk among the island's young generation, and on the other hand, it inspires international practitioners and graduate students participating in the CERG-C in the effective use of educational strategies. Certainly, this educational activity could benefit from having more continuity within the scholastic program so that children could be exposed to long-term important concepts of risk reduction and could have more time to develop a full and long-lasting understanding of volcanic hazards and risk.

Figure 7. *Focus group team and school children participating in the outreach exercise on Vulcano island, Italy.*

7. General conclusions and thoughts

For the assessment of volcanological outreach material, **two different approaches** were chosen: (**1**) Elementary and secondary level school teachers in Iceland and Azores islands and staff members of parks in Iceland **evaluated** a selection of **on-line material about volcanoes and volcanic risk**, and (**2**) a **role-playing exercise for children** based on collaboration between the elementary school of Vulcan and a few research institutions was carried out. **Both** approaches **showed the importance of including teachers and science communicators** from the start **in the design of outreach projects**. The general message received from the focus groups is that scientists should work more closely together with the stakeholders who communicate science and outreach tasks to the public. Through preparation and simplified presentation of the data, without losing the meaning and keeping the audience interested, these communicators can help **bridge the gap between** exciting **scientific results and the public**. The wide range of material listed in the previous deliverable, *D3.3* including images, maps and online interactive material, demonstrates that there is a **wealth of information available on volcanoes and volcanic risk**, but to reach and influence the public, **the information needs to fit the audience**. **Creation of outreach products**, however, is **time consuming** and therefore needs to be included in the original project plan, because it is a very important by-product of scientific work.

Hands on experience is **more likely to result in a thorough understanding** of the subject, as was demonstrated by the exercise carried out with the school children on Vulcano island. Through such interactive training, teachers, school children, their parents, as well as scientists, get involved and experience what type of activity suits best to inform the public about volcanic hazard. This type of exercise **also inspires scientists to make a larger effort in science outreach** and to explore the possibilities of educational strategies. The challenge for the organizers will be to refine this practice and include a wider group (older students and adults).

According to the feedback from the Icelandic focus groups, it is clear, that the newly released website of the ***Catalogue of Icelandic Volcanoes*** (***CIV***) is **an important source of information** about volcanic activity, the history of eruptions, distribution of ash, volcanic hazard, precursory signals, etc. However, since the ***CIV*** is only available in English, its use is rather limited for the Icelandic public, teachers and science communicators. But the Icelandic version will soon be released. Several respondents of the focus groups mentioned that they used the **website of the Icelandic Meteorological Office** (**IMO**) to find information about volcanoes. The general conclusion was that the **material should not be too complicated** and both **science communicators and teachers** would like to be **involved in creating outreach products** and to collaborate with the scientists.

The overall positive evaluation of the ***CIV*** implies that the ***European Catalogue of Volcanoes*** (***ECV***), which is being generated (in English) for several volcanoes in Europe within EUROVOLC's WP11, **will be equally successful** and useful to a wide range of audiences and outreach activities. The two catalogues, ***CIV*** and ***ECV*** should therefore be included in the third and final deliverable from Task 3.2, the ***EUROVOLC Outreach box***. The comments from the Icelandic focus groups about the **importance to provide the catalogue in the national language**, also demonstrates the need for immediate translation of the European catalogue into the respective national languages.

Finally, several **ambitious projects** carried out in recent years **in Iceland** have resulted in the publication of reports, scientific papers, websites, etc about volcanoes and volcanic hazards, including numerous maps and images that should be made available to the public. These include:

- Hazard and risk assessments for Öræfajökull and Markarfljót (Guðmundsson et al., 2016) hazard assessments for jökulhlaups in Skaftá river (Egilsson et al., 2018)

- Jökulhlaups from Sólheimajökull (Guðmundsson et al., 2015)
- Scientific papers on volcanic hazards in Iceland (Guðmundsson et al., 2008; Jóhannesdóttir and Gísladóttir, 2010; Bird et al., 2010, 2011, 2012, 2017)
- Student theses (for example, Morales, 2010; Bergsson, 2016; Guðmundsdóttir, 2016; Hayes, 2017; Andrésdóttir, 2018)
- Contingency plans published by the National Commissioner of the Icelandic Police – Department of Civil Protection and Emergency Management (Almannavarnardeild Ríkislögreglustjóra 2013, 2015, 2017a, 2017b)
- A wealth of information about volcanic eruptions is found on the website of the Icelandic Meteorological Office (https://www.vedur.is/skjalftar-og-eldgos/eldgos/ – the material about volcanoes under "eldgos" is still under construction and its final web-path will eventually change to https://www.vedur.is/eldgos/) and the Institute of Earth Sciences, University of Iceland (http://www.jardvis.hi.is/rannsoknir).
- Nomination of Vatnajökull National Park -dynamic nature of fire and ice – for inclusion in the World Heritage list (https://www.vatnajokulsthjodgardur.is/static/files/Utgefid-efni/VJP-sameiginlegt/unesco-nomination-of-vatnajokull-national-park-dynamic-nature-of-fire-and-ice.pdf)

Some of this information could be "recycled" and prepared for the general public, for school children, for science outreach in the national parks, museums and visitor centres etc. Perhaps a **joint effort between the NCIP, IMO and the University of Iceland** could lead to the creation of a website where this information is accessible.

Additionally, there are a number of events that could be used as lessons learned for participants in the project. These include:

- The 100 year anniversary of the Katla 1918 eruption, held in Vík in South-Iceland in October 2018. For a whole weekend, scientists, school children, locals, tour operators, Civil Protection representatives and others met and gave oral presentations (200 people attended), and outreach activities were conducted in the school next door to the conferences.
- Information meetings for locals held by the Department of Civil Protection and Emergency Management in cooperation with the Icelandic Meteorological Office and the Institute of Earth Sciences, University of Iceland during periods of volcanic unrest.
- The traffic through www.vedur.is, the website of the Icelandic Meteorological Office is considerable, much more than through the FUTUREVOLC or the University websites. Perhaps the best way to connect between different websites, is to have the main gateway via www.vedur.is.

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Appendix 1

EUROVOLC educational focus activity with the primary school on Vulcano island (Italy): "Conoscere and convivere con i fenomeni vulcanici" (i.e. "Know and live together with volcanic phenomena") – University of Geneva, INGV, University of the Azores

Experiential learning exercises are effective educational tools for school-age children that can be easily implemented at the local level. Since 2011, the University of Geneva has been carrying out an educational volcano emergency exercise with the elementary school students of Vulcano Island, Italy, with a permanent population of about 800. The last eruption of La Fossa, the main volcanic structure of Vulcano, occurred in 1888-1890 and areas that are now densely populated are located on the deposits from the eruption. The proximity of residents and visitors on the island to hazards associated with an eruption exacerbate the risk to both people and property. In our work with the elementary school of Vulcano, students experience a mix of laboratory and theatrical activities, in order become learning facilitators for the entire community.


Attività didattica Isola di Vulcano: Conoscere e convivere con i fenomeni vulcanici, 10 Maggio 2019

UNIVERSITÉ DE GENÈVE
FACULTÉ DES SCIENCES

EUROVOLC

CONOSCERE E CONVIVERE CON I FENOMENI VULCANICI

RACCE
Raising earthquake Awareness & Coping Children's Emotions

CERG

10 Maggio 2019

Istituto Comprensivo S. Lucia, Vulcano

Attività didattica

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Fig. 1 First page of the manual of the educational activity that was given to the students and teachers to prepare for the focus activity

On May 10, 2019, an EUROVOLC educational focus activity was carried out at the primary school of Vulcano island (Italy), "Conoscere and convivere con i fenomeni vulcanici" ("Know and live together with volcanic phenomena") that involved the participation of scientists from the University of Geneva (Prof. Costanza Bonadonna, Dr Eduardo Rossi, Ms Lucia Dominguez), INGV (Dr Rosella Nave, Dr Tullio Ricci) and University of the Azores (Prof. Fatima Viveiros). Representatives of the Italian Civil Protection were also present as observers (Dr Chiara Cristiani, Dr Antonio Ricciardi).

The exercise was developed by the University of Geneva combining the educational volcano emergency exercise carried out since 2011 with the material produced by the European project RACCE ("Raising Earthquake Awareness and Coping Children's Emotions"; http://racce.nhmc.uoc.gr/it) (Fig. 1). The main aim of the RACCE project (2011-2014) was to increase awareness of natural hazards and improve knowledge of earthquakes and volcanoes by promoting the education of specific groups of people (teachers, parents, volunteers and civil protection workers) on best practices to address these risks.

The objective of this educational activity was to provide the students of the primary school of the island of Vulcano the opportunity to learn what happens during a volcanic eruption and what preventive actions can be taken, through an exercise that alternated experimental activities and a role-playing game. Fifteen children of the III, IV and V class (age 8-11) have played the roles of scientists, journalists, and representatives of the institutions as described in Table 1. The activity with children involved the introduction of the exercise on Monday morning with the teachers at the school (1 hour), the preparation of the roles (about 3 hours) on Monday afternoon, and the actual theatrical activity on Thursday (about 1 hour). Participants of the

Specialization Certificate in Geological and Climate related risk (CERG-C; http://www.unige.ch/hazards) have also been involved in the exercise in order to maximize the international exposure.

Main goals:

• understand and be able to explain the main phenomena associated with a volcanic eruption

• know which volcanic phenomena may occur in their territory

• acquire awareness of the risks and adopt appropriate behavior to be implemented in the event of danger

• knowing how to read and interpret risk maps

Specific objectives:

• understand and be able to explain the basic physical processes that regulate the dynamics of an eruption, with particular attention to the rheological behavior of magmas and lava flows and the effect of volcanic gases on the dynamics of the eruption

• understand and be able to explain the main effects of an eruption on population and infrastructure

• learn about the volcanic alert system

• familiarize with the measures to be taken in the event of a volcanic eruption

Methodologies:

• theoretical introduction to the dynamics of eruptions, with particular reference to Vulcano island

• educational experiments to reproduce some physical phenomena related to a volcanic eruption

• preparation of a theatrical activity for other students of the school, teachers and parents involving simple physical experiments and role playing

1) TV presenter "SAPIENS"	School student
2) Mayor	School student
3) Coast Guard	School student
4) Regional representative of the Italian Civil Protection	School student
5) National representative of the Italian Civil Protection	School student
6) Volcanologist University of Florence (Effusive volcanism experiment) 1	School student
7) Volcanologist University of Florence (Effusive volcanism experiment) 2	School student
8) Volcanologist University of Palermo (Lava rheology experiment) 1	School student
9) Volcanologist University of Palermo (Lava rheology experiment) 2	School student
10) Volcanologist University of Palermo (Lava rheology experiment) 3	School student
11) Volcanologist INGV Napoli (Ash-fallout impact) 1	School student
12) Volcanologist INGV Napoli (Ash-fallout impact) 2	School student
13) Volcanologist INGV Catania (Ash-fallout risk map)	School student
14) Volcanologist INGV Catania (Ballistic risk map)	School student
15) Volcanologist INGV Palermo (Gas impact)	School student
16) Representative "Commissione Grandi Rischi" of the Civil Protection	Prof Mauro Rosi (University of Pisa, Italy)
17) Volcanologist of National University of Mexico	CERGC Participant
18) Representative of the Colombian Civil Protection	CERGC Participant

Table 1. Roles played in the educational focus group activity

Description of the educational activity

Fig. 2 Preparation of the theatrical activity with the school children

The educational activity consisted in a theatrical activity were the school children played various roles together with two CERGC participants and Prof Mauro Rosi (University of Pisa and teacher in the CERGC training) (Table 1). The school children were prepared a few days in advance to present their role. A manual with the exercise explanation and script of the text for each role was provided for each student (Fig. 1) and all roles were tested (Fig. 2). In particular, we pretended to be in the TV studio of SAPIENS, a scientific TV program of the Italian National TV presented by and Italian geologist (Dr Mario Tozzi). To start the exercise, the school child playing the TV presenter introduced the theme of the TV program, which was focused on how volcanoes work with a special look at Vulcano island and how to behave in case of an eruption.

Fig. 3 RACCE poster complemented with the sketches of the children

First, 3 selected experiments were carried out: one showing the influence of gas on volcanic eruptions, one on the rheology of lava flows and one on the impact of ash fallout on buildings.

Second, a few sketches were presented, based on the RACCE poster (Fig. 3) to show to the school children what behaviours to adopt in case of eruption. In particular, the sketches present in the poster of RACCE were reproduced by the children and photos were glued on the same poster (e.g. Fig. 4). The poster was then left at the school so to make sure that these concepts are well integrated by the children.

The sketches carried out with the school children within the educational activity included a variety of behaviours to adopt in volcanic areas all reproducing the actions shown on the RACCE poster (Fig. 3):

1) Inquire about the emergency plan of your municipality
2) During the eruption obey the prohibition to enter the affected areas
3) It is dangerous to go near craters even when the volcano is not active
4) Do not approach a lava flow even if it is flowing down regularly; even after the eruption has ended, do not walk on the surface of a lava flow because high temperature can be kept for long times
5) In case of falling volcanic bombs inquire whether the area where you are is subject to falls of coarse material
6) In case of falling volcanic ash stay home with closed windows and check the deposit on your house roof
7) Outdoors wear an ash mask and protective glasses and drive carefully
8) In case of gaseous emissions avoid stopping or camping and do not enter underground places
9) Do not think that you are safe if you stop far from the crater (gaseous emissions can affect and/or occur even in distal areas)
10) In case of pyroclastic flows get ready for a possible evacuation
11) In case of large landslides, anomalous waves can be produced: leave the coastline and reach high grounds

Fig. 4 Sketch played by the school children to learn how to wear an ash mask

The theatrical activity was then acted in front of the other students of the school, the teachers and the families (Fig. 5). A certificate was also given at the end of the activity to all children that played (Fig. 6). The certificate contained some of the sketches played in the activity so that they can better memorize the appropriate behaviours to adopt in their territory. In fact, even though the volcanic systems on Vulcano (i.e. La Fossa, Vulcanello) are not currently active, the island is characterized by diffuse soil degassing that require some attention also in case of no eruption.

Fig. 5 Activity played at the school in front of other students of the school, the teachers and the families: a) beginning of the TV program with the TV presenter introducing the show; b) experiment of lava rheology

Fig. 6 Certificate given to each child at the end of the activity: the first page shows the role played, while the internal part shows some of the sketches played

Fig. 7 Group photo with the school children and the focus group team. From left to right: R Nave (INGV – OE), M Rosi (University of Pisa) , Maria Teresa Piedrahita (CERGC participant), C Cristiani (Italian Civil Protection), E Rossi (UNIGE), C Bonadonna (UNIGE), Amiel Nieto (CERGC participant), A Ricciardi (Italian Civil Protection), F Viveiros (University of Azores), L Dominguez (UNIGE).

Before the exercise, evaluation forms where given to the 4 teachers assisting asking:

1) Do you think that this activity has raised awareness towards volcanic risk in their territory in the students that have participated?
2) Do you think that this activity has raised awareness towards volcanic risk in their territory in the students that have assisted?
3) Do you think this activity well integrates within your educational program?
4) Which do you think are the strong points of this activity?
5) Which do you think are the weak points of this activity?
6) Do you think this activity could also be extended to other classes, schools and people?
7) Do you have other suggestions?

All teachers agreed that this activity is very useful and helps raise awareness towards volcanic risk in Vulcano both in the children that participated and in the children that assisted to the exercise. All teachers agreed that children were enthusiastic to play: the strongest point of the activity is that it raises awareness towards volcanic risk, while the weakest point is the lack of time for the children to learn their role. All teachers also agree that this activity should be extended to the secondary school and the island population.

The representative of the Italian Civil Protection also filled in an evaluation form with the following questions:

1) Do you think that this activity has raised awareness towards volcanic risk in their territory in the students that have participated?
2) Do you think that this activity has raised awareness towards volcanic risk in their territory in the students that have assisted?
3) Do you think this activity well integrates within the training initiatives of the Italian Civil Protection?
4) Which do you think are the strong points of this activity?
5) Which do you think are the weak points of this activity?
6) Do you think this activity could also be extended to other classes, schools and people?
7) Do you have other suggestions?

The representatives of the Italian Civil Protection agree that this educational activity is very important to raise awareness of school children in relation to volcanic risk and should be extended to middle and high school as well as to the whole population if possible. Nonetheless, some of the children assisting at the exercise were probably too young to integrate the main concepts (i.e. children of the nursery school ranging between 3-5-year-old that assisted at the final theatrical activity). An important suggestion is that such an educational activity could be integrated within the program of the Local and Regional Civil Protection in order to provide more continuity. The most important beneficial aspect of this activity according to the representatives of the Italian Civil Protection is the strong engagement of the school children through experiments and theatrical activities that are more efficient than traditional lectures. Other strong points include the training on the correct behaviors to undertake in order to mitigate volcanic risk, the understanding of the different roles and responsibilities of the various actors involved in risk reduction (e.g. Mayor, scientists, media, civil protection), and the presence of parents assisting to the theatrical activity that helps raise awareness also in the adult fraction of the population. The weak point is related to the short time available to prepare the school children. The representatives of the Italian Civil Protection also suggest engaging more with the actual school teachers so that such an activity could be integrated within the national initiative “The week of the Civil Protection” that will be performed every year in Italy starting from next October. They also believe that such an educational activity should be extended to additional natural risks, such as

earthquakes, floods, landslides and tsunamis. Ideally, such an educational activity could be organized by the school teachers in multiple training activities distributed within the scholastic program that could be concluded with a theatrical exercise including various aspects of risk reduction. The school teachers could be advised by National and Regional Civil Protection, in collaboration with research institutions (e.g. INGV) on how to organize such an activity and which material could be used.

Discussion and conclusions

The combination of the role-playing exercise with the RACCE actions to raise awareness towards the appropriate behaviours to adopt in volcanic areas has largely improved the original role-playing exercise carried out at the elementary school of Vulcano island (Italy). In fact, both the students and the teachers found the exercise more dynamic and more interesting helping focus on simple actions to implement in their territory. The integration of the exercise with the participants of the Specialization Certificate in Geological and Climate-related Risk (CERGC) of the University of Geneva made the exercise even more effective. In fact, on one hand, the exercise raises awareness of volcanic risk among the island's young generation, and on the other hand, it inspires international practitioners and graduate students participating in the CERG-C on the effective use of educational strategies in a volcanic context. Certainly, this educational activity could benefit from having more continuity within the scholastic program so that children could be exposed long-term to important concepts of risk reduction and could have more time to develop a full and long-lasting understanding.