EUROVOLC

European Network of Observatories and Research Infrastructure for Volcanology

Deliverable Report

12.3 Online questionnaire "Volcano watch: Tell us what happened?" Web service to collect citizen science observations

Work Package:	*Exploitation of tools for hazard assessment and risk management*	
Work Package number:	*12*	
Work Package leader:	*Laura Sandri*	
Task (Activity) name:	*Citizen science – Development of a European adaptive web page for witnessing volcanic eruptions*	
Task number:	*2*	
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Lead beneficiary:	*UNIVLEEDS*	
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Dissemination level:	*Public [X]* *Prog. Participants [ ]*	*Restricted Designated Group [ ]* *Confidential (consortium) [ ]*

Contents

Summary

Deliverable 12.3 consists of a prototype web service serving as a citizen science tool for volcanology in Europe. In particular, the developed web service is available at https://eurovolc.bgs.ac.uk/, and is able to:

1. Collect new data for observed volcanic activity (time, hour, location, type of observation and possibly pictures);
2. Search for existing records of observed volcanic activity across some of the other European tools (by type of phenomenon, or by time window, or by location). In order for this to be possible, data from the other existing tools need to be open and accessible by the EUROVOLC service; this requirement has limited, at present, the accessibility to the data by four existing tools:
   a. **MyVolcano** by British Geological Survey (BGS) at https://www.bgs.ac.uk/myVolcano/
   b. **Brennisteinsmengun (SO2_IMO)**, an SO_2 tool by the Icelandic Meteorological Office (IMO) at https://www.vedur.is/skraning_brennisteinsmengun/
   c. **Tefranet** by Istituto Nazionale di Geofisica e Vulcanologia (INGV)
   d. **Events_INGV-OV**, a web questionnaire to report anomalous events from Neapolitan volcanoes developed by INGV-Osservatorio Vesuviano;
3. Visualize the above.

Introduction

Citizen science is where members of the public partake in collection and/or analysis of data; in a few words, information from people witnessing a volcanic event (e.g., tephra fallout, a volcanic plume, or smelling volcanic gases, felt earthquakes, explosions) is collected via user-friendly web pages or apps, to assess the impact of the volcanic event (e.g., eruptive scale, extent of volcanic products).

As one of the purposes of WP12 is *to raise awareness among citizens and institutions*, citizen science tools may represent an effective mean to reach this goal (Mee and Duncan, 2015). Consequently, one of the objectives identified in the EUROVOLC proposal is *to develop a European online questionnaire to collect citizens' data on volcanic activity*, to collect information (along with pictures or videos) from people witnessing volcanic events at European volcanoes either in continental Europe or overseas territories.

Results

In the recent past, building on the experience from earthquakes, and from the trans-national effects of the Eyjafjallajökull eruption in Iceland, European research groups have built tools (e.g questionnaires or apps) for facilitating the collection of data by citizens (Stevenson et al, 2012; 2013).

These efforts have, so far, been fragmented and sparse across Europe (and across the world), so in WP12 we conducted a reconnaissance survey and collected existing examples of citizen science tools in volcanology. A detailed description of this collection is accessible in spread sheet format at: https://public.3.basecamp.com/p/gBNFSdQkRiw86nnba4TRmkZR and was previously reported in milestone MS26.

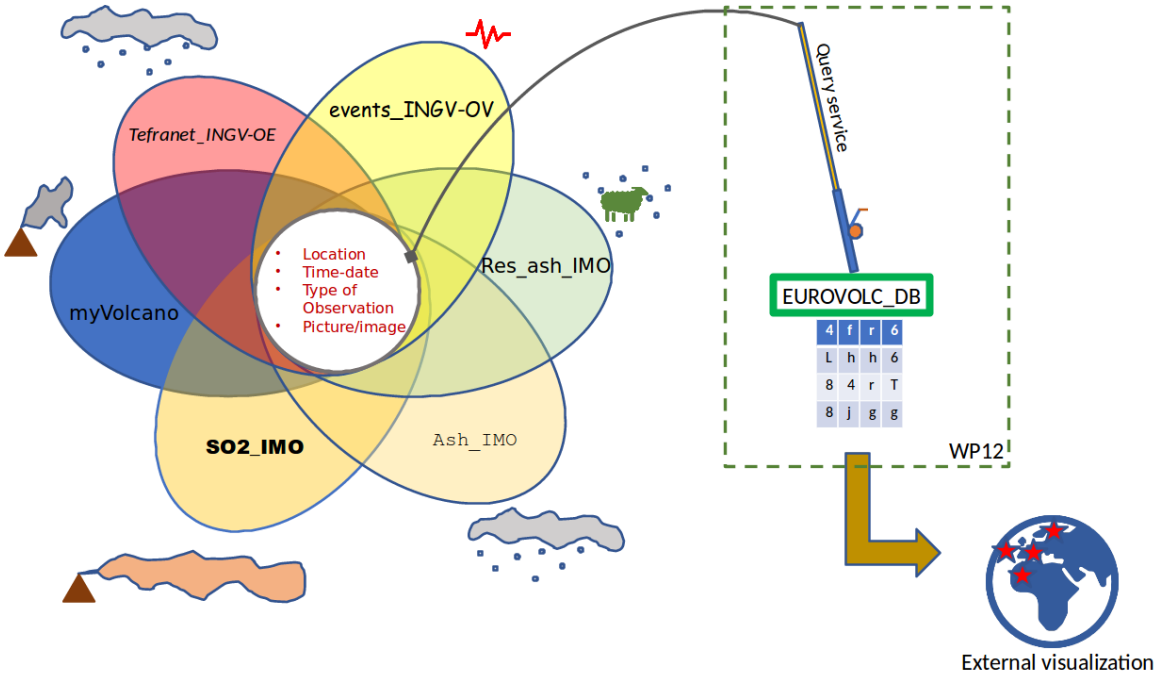

Figure 1 - Cartoon showing the overlapping information among the European tools already existing for citizen science in volcanology

Among the tools listed in the spread sheet, we have identified those developed, or under development, by EUROVOLC partners

1. 'myVolcano' by BGS, Duncan et al, 2017 and https://www.bgs.ac.uk/myVolcano/;
2. SO_2 and ash tools by IMO, https://www.vedur.is/skraning_brennisteinsmengun/, http://skraning.vedur.is/skra/osku/, http://skraning.vedur.is/skra/oskufok/;
3. Osservatorio Vesuviano web questionnaire, Tefranet by INGV-Catania, Andronico et al, 2015; and
4. a citizen science questionnaire named "COMUNICAÇÃO DE OCORRÊNCIAS" set for Azores volcanoes at http://www.ivar.azores.gov.pt/no-navigation/Paginas/comunicacao-ocorrencias.aspx

By analysing the set-up of these tools, we have found that they share in common a collection of the following information:

- Location of the observation
- Time & date
- Type of Observation
- Picture/image (optional)

On this basis, we first prepared a sketch (**Figure 1**) that summarises the most feasible idea for developing a EUROVOLC citizen science tool, considering the resources available.

The EUROVOLC tool that we have prepared was designed through discussions of the WP12 working group. Several options were compiled and sent for comments to the wider EUROVOLC community in order to identify user needs. This was followed by free-form interviews with selected members of the EUROVOLC community during the 1st annual meeting in February 2019. The options and interview discussion points are here summarized:

A) Open issue nr. 1: Content and purpose of the citizen science tool which we are considering (Define the so-called "use cases")

Option 1: The EUROVOLC tool visualizes the data collected by the other tools (no new data collection). The pros of this option were that it was easily feasible, but the cons raised concerns about the limited usefulness, as it would only visualizes already-collected data.

Option 2: The EUROVOLC tool is also able to collect new data spanning over European countries, volcanoes and languages. This had the pros of being more useful, but new data need to be validated and verified, and this needs to be sustained after the end of the EUROVOLC project. We also faced the issue of European languages: in what and how many languages can we realistically collect data, and validate them?

Option 3: Use one of the already existing tools as a "standard" for the EUROVOLC tool (potentially investing in translating these existing tools into different spoken languages). Here the pros were that no new tool development was required, and the same cons on different languages and potential problems with validation as above were foreseen.

Option 4: Could be to implement a simple form (as a web service) that, depending on the type of data and the area of interest, links the user to one of the already available tools. The pros here were that no new tool development was required, it was simple and cost-effective. The cons were that it does not cover areas without pre-existing tools.

B) Open issue nr. 2: Type of tool

Option 1: Adaptive Web Page (as in the proposal)

Option 2: App; this would be more ideal to collect data "on the spot" when a citizen is taking the observation, however this option needs a big effort in terms of maintenance. An app will need long-term commitment to updating and up-keeping, and will have to work on different operative systems. Given the EUROVOLC resources, the only realistic way of having an app, is to make use of an already existing one.

Based on the outcome of the interviews and the discussions of the WP12 working group, it was concluded that the EUROVOLC citizen science tool had to:

1) Pull/collate/access the *common* data collected by other existing tools (at least those with an openly-readable storage of data) according to the different modalities shown in **Figure 2**;
2) Store new recorded data into an accessible database/platform (**Figure 3**);
3) Visualise, map and/or download the data from points 1 and 2.

As regards point 1, we have positively consulted the legal representative at IMO to exclude any potential issue on the visualization of data from other European tools. Further, we had to discard, at least for now, the data from the web questionnaire developed for the Azores volcanoes, as they are not open. In the next months, up to M30, further checks on the feasibility to include the data from the IMO tool for ash observation will be ongoing.

In order to be able to search and visualise observations from other European tools (point 1 above), the EUROVOLC citizen science tool needs to populate and routinely update an internal database, as the dynamic fetch of observations on user demand seemed unfeasible and not practical from so many differently-structured databases. In **Figure 4** we show the proposed Data Structure for the tool.

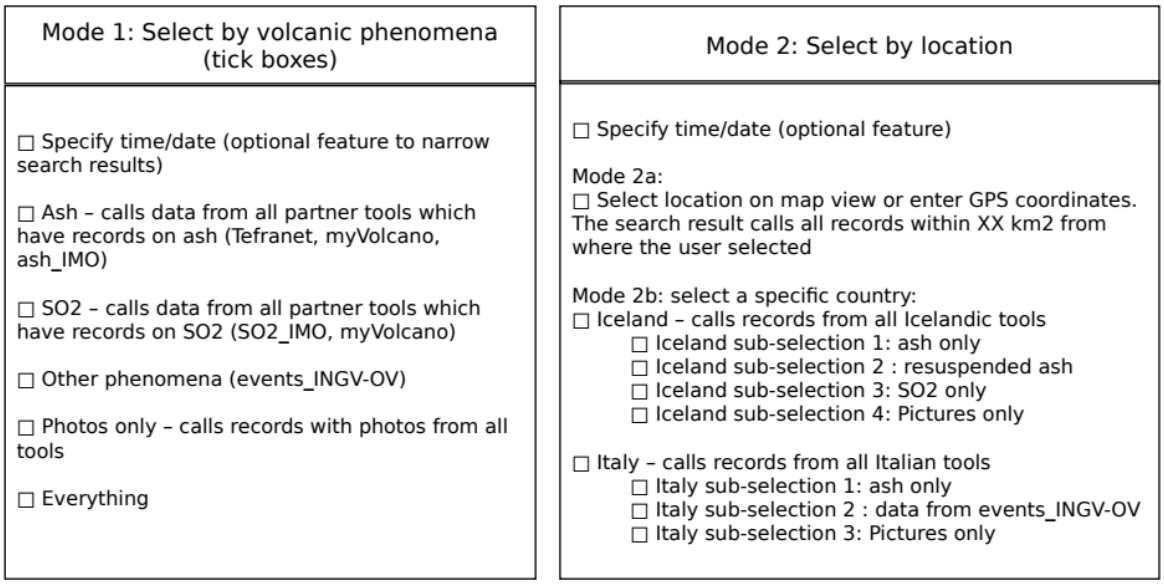

Figure 2 – Envisaged modes to access data collected by pre-existing European citizen science tools.

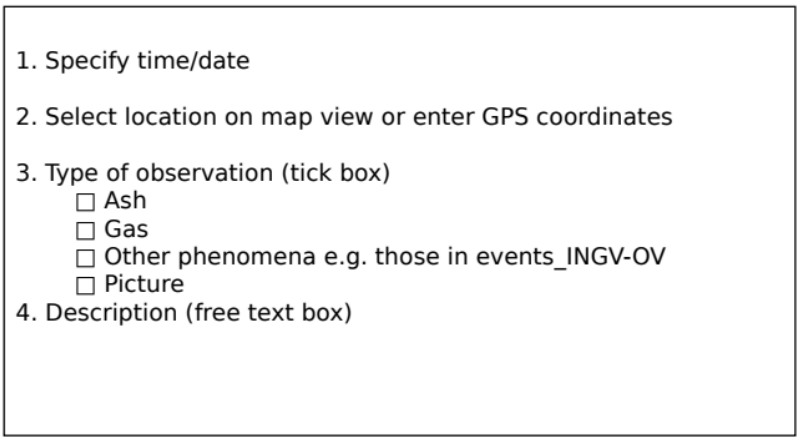

Figure 3 – Envisaged mode to input new data in the EUROVOLC citizen science tool.

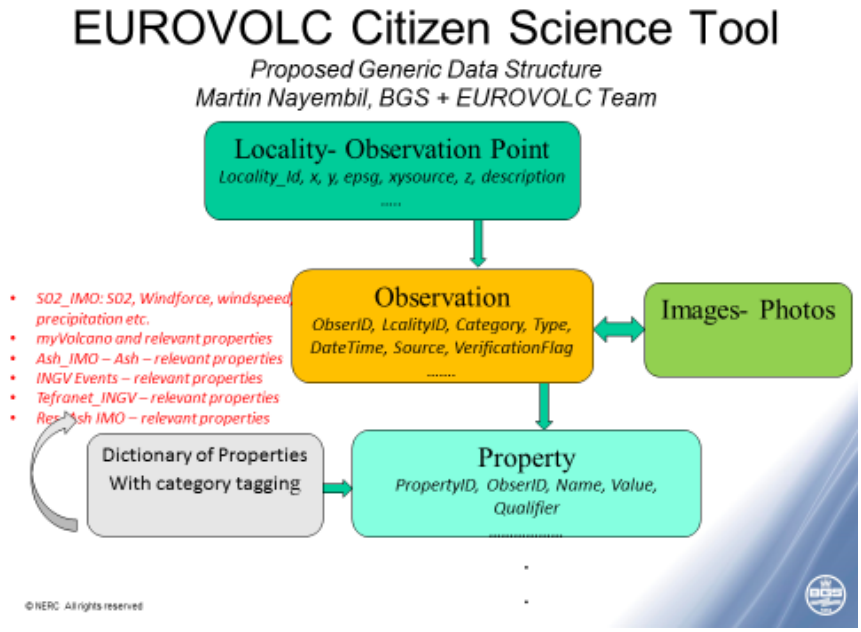

Figure 4 – Data structure for the EUROVOLC citizen science tool

It is important to stress that internal funding at BGS has made it possible to fully implement the EUROVOLC web tool service on time.

The prototype web service tool is now under internal validation and trial within the EUROVOLC community, at the link https://eurovolc.bgs.ac.uk/, and still considered to be in developmental stage while it is being internally tested. By month 34 it will be made public and will be advertised on the EUROVOLC social media channels. The process to link it to the EPOS (European Plate Observing System) services will also be started once the web service has been internally validated.

In the following figures, some functionalities of the tool are given as screenshots from the web service.

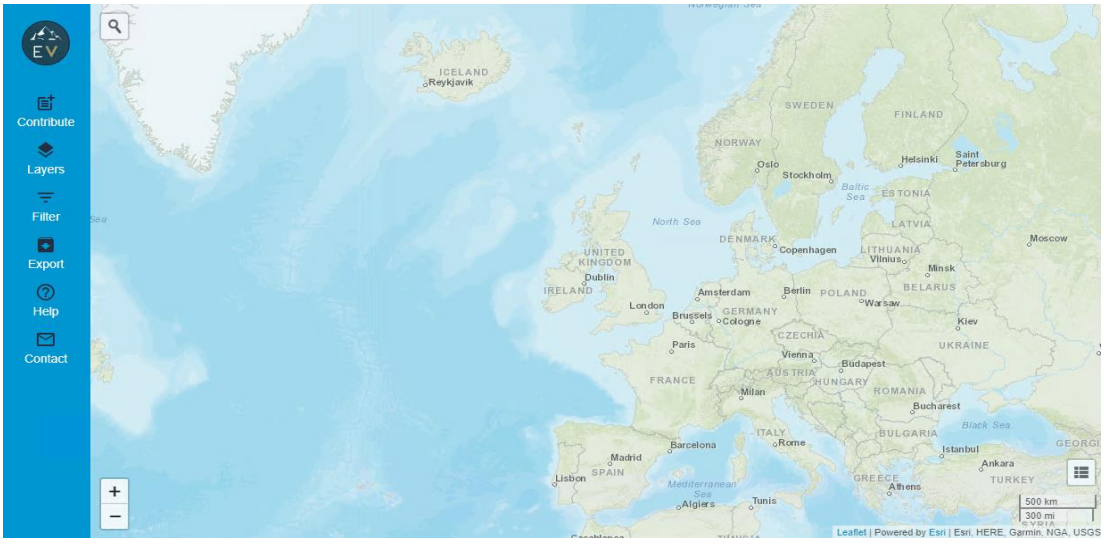

Figure 5 – Screenshot of the tool: *initial lookup*.

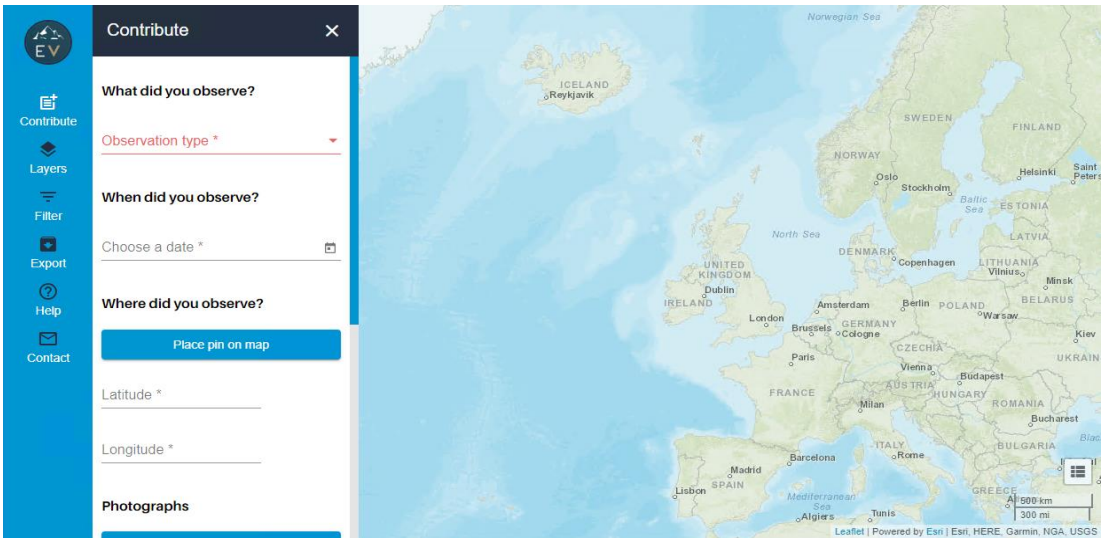

Figure 6 - Screenshot of the tool: Selecting "Contribute" in the main menu to the left to input a new observation. *Popup menu* to insert the *observation type*.

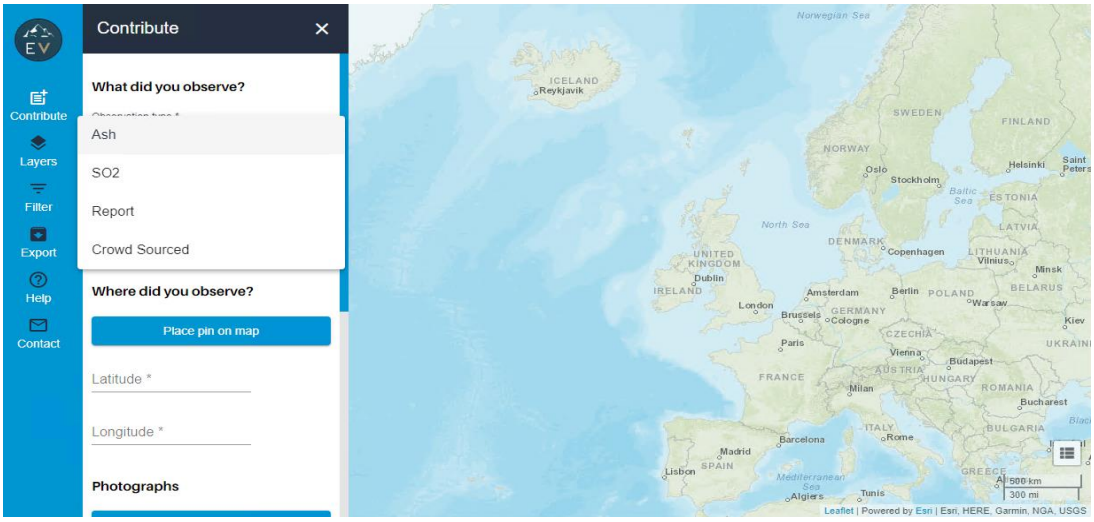

Figure 7 - Screenshot of the tool: Selecting "Contribute" in the main menu to the left to input a new observation. *Drop down menu* to choose the *observation type* to be inserted.

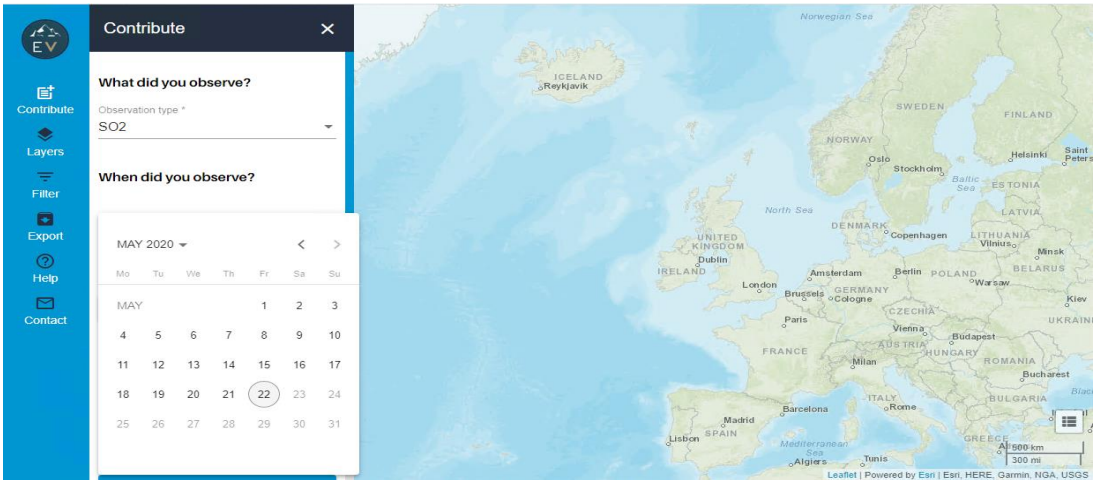

Figure 8 - Screenshot of the tool: Selecting "Contribute" in the main menu to the left to input a new observation. *Drop down menu* to insert the *time of observation*.

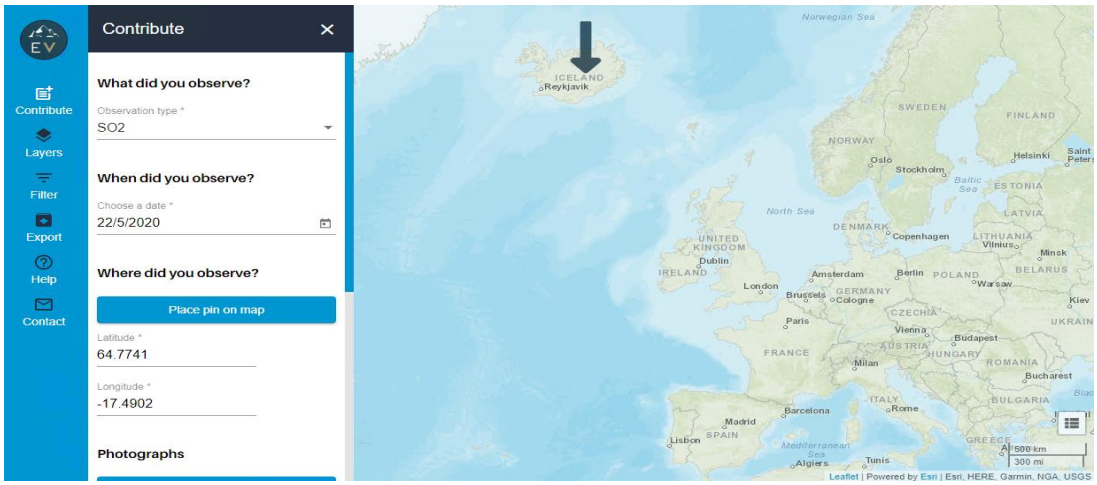

Figure 9 - Screenshot of the tool: Selecting "Contribute" in the main menu to the left to input a new observation. Pin to point the *location on the map or insert the coordinates*.

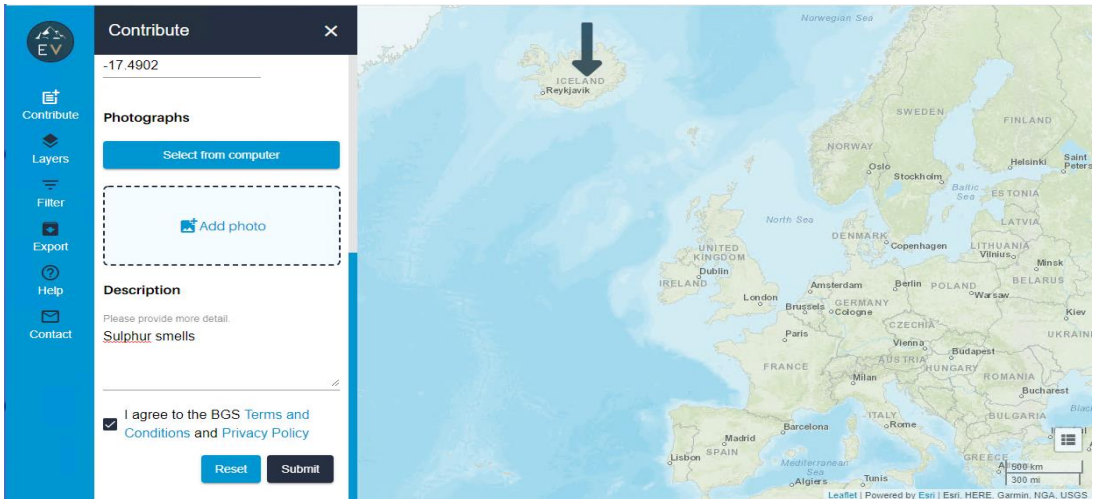

Figure 10 - Screenshot of the tool: Selecting "Contribute" in the main menu to the left to input a new observation. Box to *add a photo* (optional) *or further description* of observation (optional).

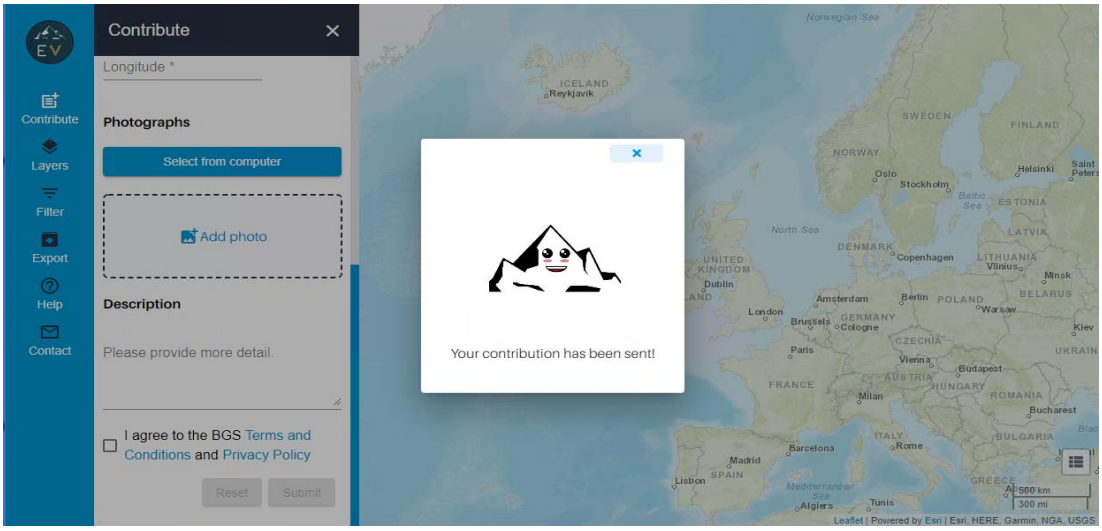

Figure 11 - Screenshot of the tool: Panel *acknowledging* the *contribution as saved*.

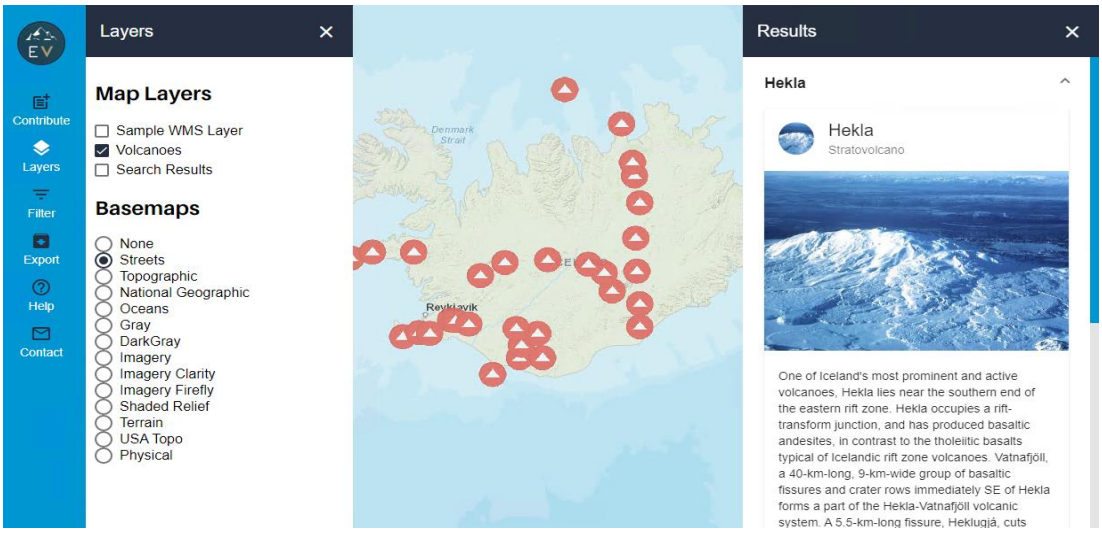

Figure 12 - Screenshot of the tool: Selecting "Layers" in the main menu to the left to indicate which *layers to show in mapping* already collected observations. Here, it is possible to map the layer "*Volcanoes" from the European Catalogue of Volcanoes* developed in EUROVOLC.

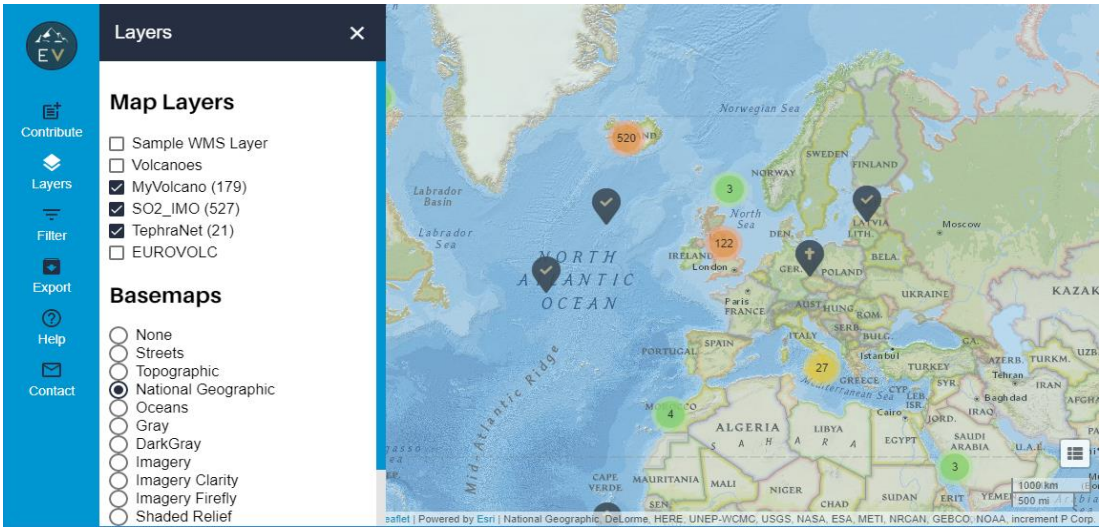

Figure 13 - Screenshot of the tool: Selecting "Layers" in the main menu to the left to indicate which *layers to show in mapping* already. collected observations. Here, it is possible to select *observations already collected by pre-existing tools* (by clicking on "Search Results").

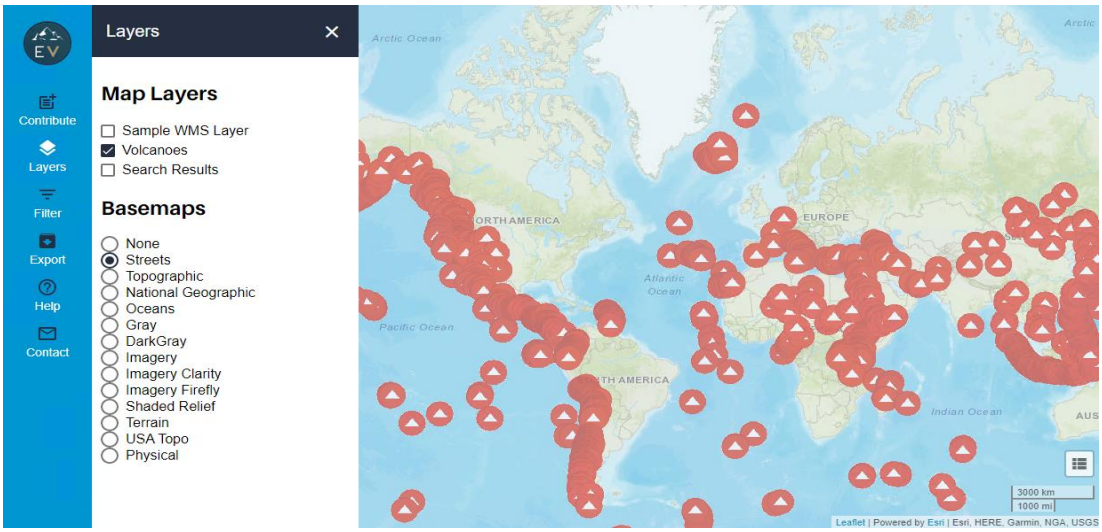

Figure 14 - Screenshot of the tool: Selecting "Layers" in the main menu to the left to indicate which *layers to show in mapping* already collected observations. Here, it is possible to *map the layer "Volcanoes" on a larger scale*, so from the Smithsonian Catalogue of Volcanoes.

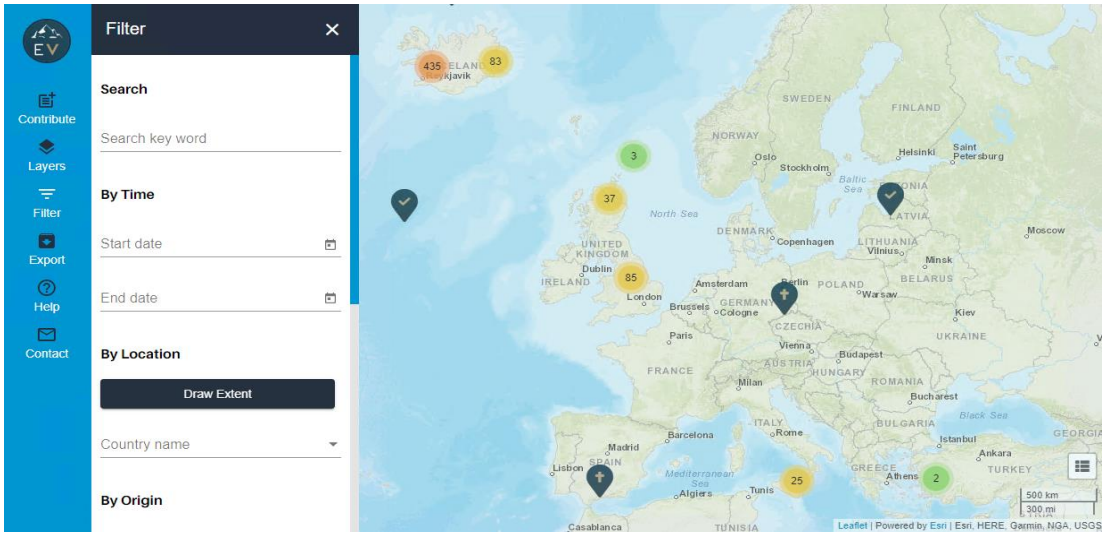

Figure 15 - Screenshot of the tool: Selecting "Filter" in the main menu to the left *to extract data already collected*.

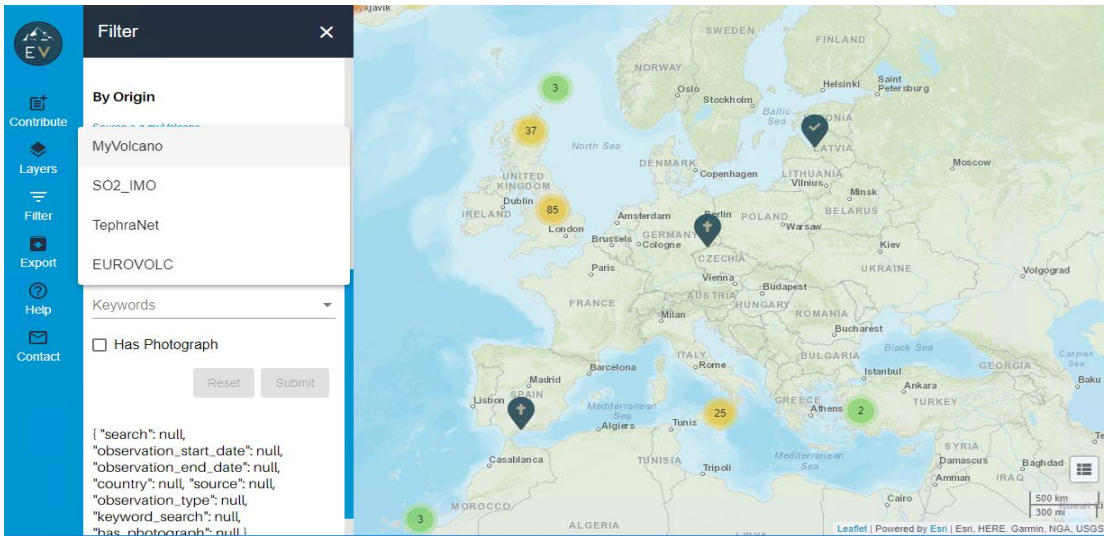

Figure 16 - Screenshot of the tool: Selecting "Filter" in the main menu to the left to *extract data already collected*. Here, selection by tool ("*By Origin*").

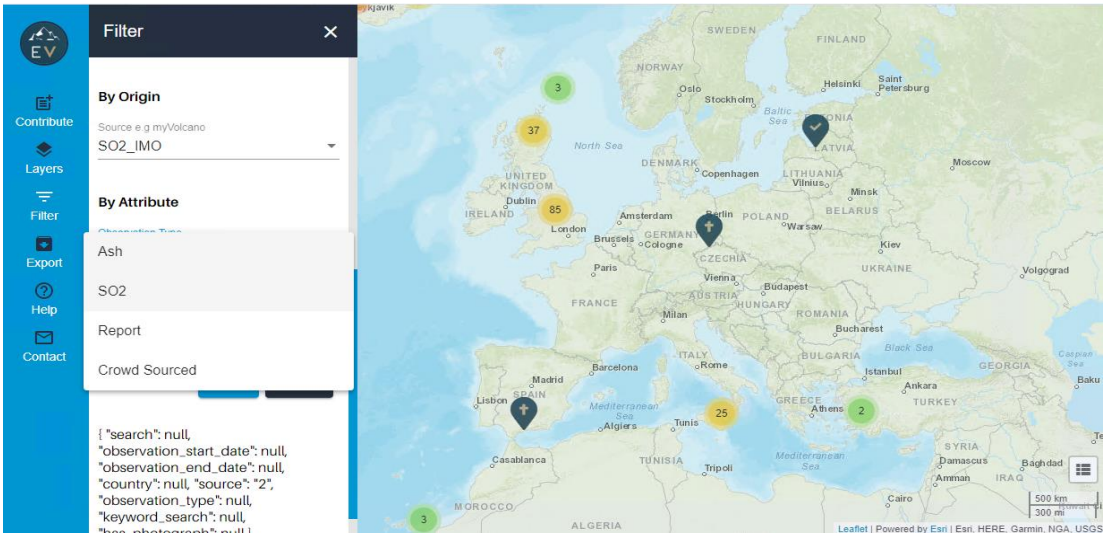

Figure 17 - Screenshot of the tool: Selecting "Filter" in the main menu to the left to *extract data already collected*. Here, selection *by attribute*.

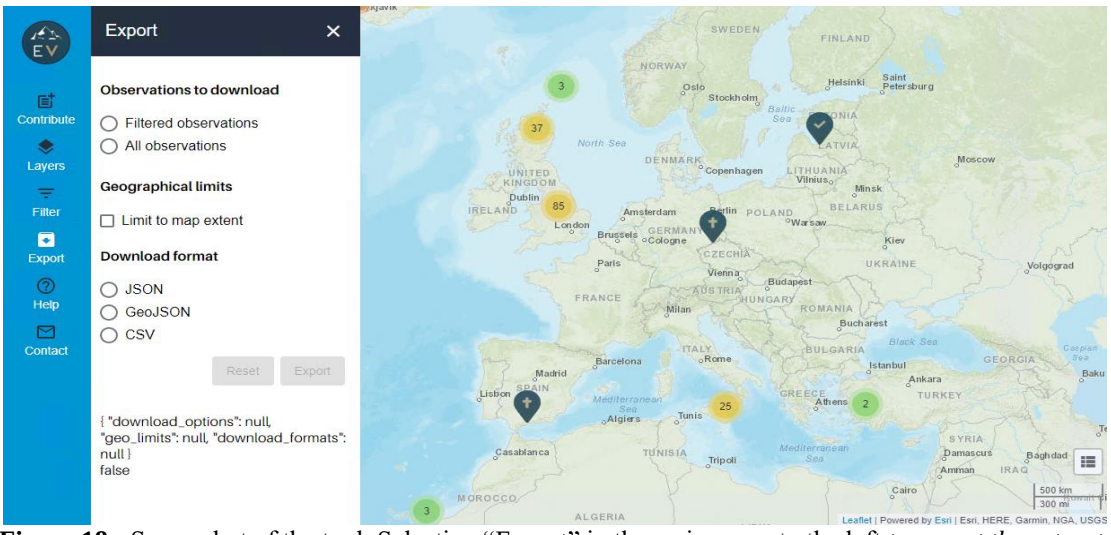

Figure 18 - Screenshot of the tool: Selecting "Export" in the main menu to the left *to export the extracted data*.

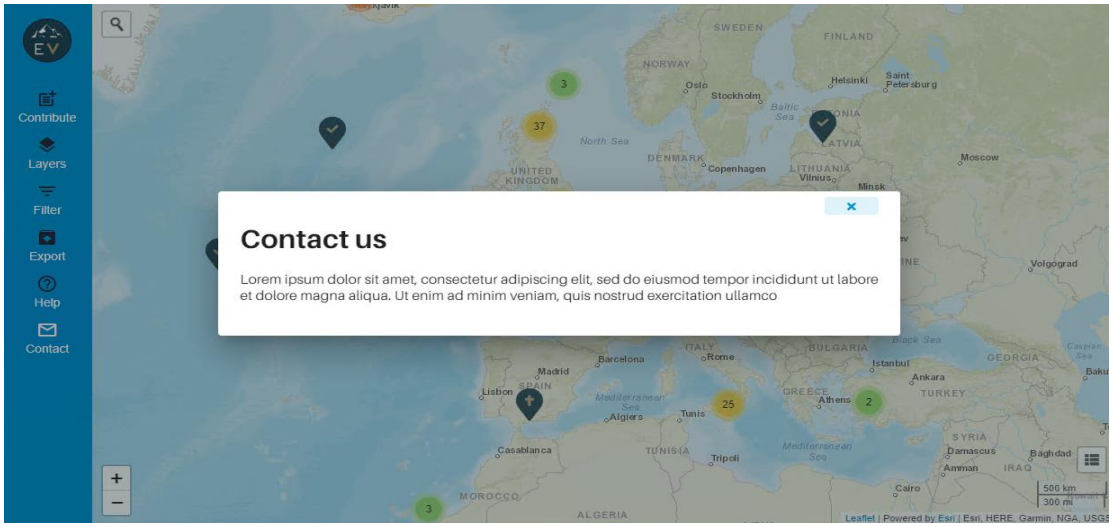

Figure 19 - Screenshot of the tool: Selecting "Contact" in the main menu *to the contact* one of *the institutions providing the data*.

References

Andronico et al (2015). TefraNet: a collaborative system for tephra fallouts from Etna using mobile and web-based apps, 26th IUGG GA, Prague, July 2015.

Duncan, M, Mee, K, Hicks, A, Engwell, S, Robertson, R, Forbes, M, Ferdinand, I, Jordan, C, and Loughlin, S. 2017. Using the 'myVolcano' mobile phone app for citizen science in St. Vincent and the Grenadines: a pilot study. British Geological Survey Open Report, OR/17/045.

Mee, K. and Duncan, M. 2015. Increasing resilience to natural hazards through crowd-sourcing in St. Vincent and the Grenadines. Nottingham, UK, British Geological Survey, 50pp. (OR/15/032)

Stevenson JA, Loughlin SC et al. (2012) Distal deposition of tephra from the Eyjafjallajökull 2010 summit eruption, Journal of Geophysical Research, 117, doi:10.1029/2011JB008904

Stevenson J, Loughlin SC, Font A, Fuller GW, Macleod A, Oliver IW, Jackson B, Horwell CJ, Thordarson T, Dawson I (2013) UK monitoring and deposition of tephra from the May 2011 eruption of Grímsvötn, Iceland. Journal of Applied Volcanology 2(3): 1-17. doi:10.1186/2191-5040-2-3

https://www.vedur.is/skraning_brennisteinsmengun/
http://skraning.vedur.is/skra/osku/
http://skraning.vedur.is/skra/oskufok/
https://www.bgs.ac.uk/myVolcano/

Activity meetings

In total for this task, we have been cooperating remotely by means of roughly monthly web-meetings, held on:

- 5th October, 2018
- 6th November, 2018
- 6th December, 2018
- 11th January, 2019
- 25th February, 2019,

- 21st March, 2019,
- 13th June, 2019,
- 12th September, 2019,
- 16th December, 2019,
- 10th January, 2020,
- 17th April, 2020.

In addition, we had in-person task meetings in the Azores during the 1st annual meeting and in Catania during the 2nd annual meeting (27th January, 2020).