EUROVOLC

European Network of
Observatories and Research Infrastructure for Volcanology

Deliverable Report

D20.1 Report on the WP20 VA service during the project

Work Package:	*VIRTUAL ACCESS TO EPOS VO-TCS*
Work Package number:	*20*
Work Package leader:	*Danilo Reitano*
Task (Activity) name:	
Task number:	
Responsible Activity leader:	
Lead beneficiary:	*Istituto Nazionale di Geofisica e Vulcanologia*
Author(s)	*Danilo Reitano, Lucia Cacciola, Giuseppe Puglisi, Kristin S. Vogfjörd*

Type of Deliverable:	*Report* [X]	*Demonstrator* [ ]
	Prototype [ ]	*Other* [ ]
Dissemination level:	*Public* [X]	*Restricted Designated Group* [ ]
	Prog. Participants [ ]	*Confidential (consortium)* [ ]

TABLE OF CONTENTS

1. Summary

The deliverable summarizes the activity in the WP20 and the use of the relevant Virtual Access service during the project, as well as the periodic reporting on the feed-back from questionnaires issued to the board of external users specifically selected to assess the service of the WP.

2. Introduction/objectives

The objective of WP20 is to provide and promote access to the EPOS "Volcano Observations" Thematic Core Service (VO-TCS) data to the EUROVOLC community, and implement new products and services produced inside the EPOS and EUROVOLC projects. This goal is achieved by creating a customized e-infrastructure: the "VO-TCS Gateway". During the lifecycle of the project, the structure of the "VO-TCS Gateway" has been designed and developed.

This tool takes inspiration from the experience gained in the volcanological observatories/research institutions and the results obtained in the European Supersite projects (FUTUREVOLC and MED-SUV).

Since volcanological data are intrinsically heterogeneous, Virtual Access (VA) in WP20 is also used to uniform the complexity of the VO-TCS data discovery and access data, by using common standard interfaces developed by each single European provider.

Concerning the objectives of the WP20, their main activities can be summarized as follow:

- give access to data, data products and services already existing in the EPOS "Volcano Observations" Thematic Core Service (VO-TCS);
- implement data and services developed within Networking Activities and Joint Research Work packages of EUROVOLC;
- create a tool for trans-national access for the Transnational accesses' second call of the project.

3. Activities

3.1 Activity 1 - Access to VO-TCS data and services [**INGV**, IMO, IPGP, UCA OPGC]

The first activity planned is *Access to VO-TCS data and services*.

The main goal of this activity is one of the main objective of the WP, i.e., to give access to data, data products and services (DDSS) existing in the EPOS VO-TCS Gateway. This task is strictly connected to Work Package 6 goals: in particular Subtask 6.1.1. which to define the list of the DDSSs that were not still implemented within the EPOS-IP project, according to the roadmap for service implementation in the Volcano Observations TCS

(VO-TCS). In collaboration with WP20, task 6.1.1, collected information about each DDSSS, concerning its organization, storage, standardized structures, format, the presence of associated metadata and the existence of a structured services for their distribution. Further details are provided in EUROVOLC Deliverable report D6.1.

Figure 1: First draft of the VO-TCS Gateway Service List.

Following this work, it became clear to the WP20 participants/developers that the list of services needed to be updated, following the EPOS-IP lifetime and remarks, so a revised structure was necessary.

The first step was to transfer existing data and service from different Research Infrastructures and Projects (MEDSUV, FUTUREVOLC, EPOS, EUROVOLC) to the new structure called *VO-TCS gateway* (http://vo-tcs.ct.ingv.it), which consist of different sections:

- *Service List* as result of EPOS existing services and Eurovolc products,
- *Software List*, implemented within the WP12 (see Task2),
- *Data Providers*, a direct connection to data providers web portals,
- *Eurovolc TNA* (see Task3) portal developed within the Eurovolc project
- *EDUBOX,* that represents all EUROVOLC project outputs (references, tutorials, video, etc) for dissemination objective (WP3 NA 1.3).

The activity 1 is also involved in the development of the Gateway guideline, in progress at the moment. The complete guide has not been finalized by the time this is written but will be released by the WP20 at month 46.

Figure 2: Home Page of the Gateway.

The VO-TCS Gateway new sitemap makes it easier for users to navigate the site, like a real map; it also provides an overview of the available content, with indications of the resources present and the path to reach them (see Figure 3).
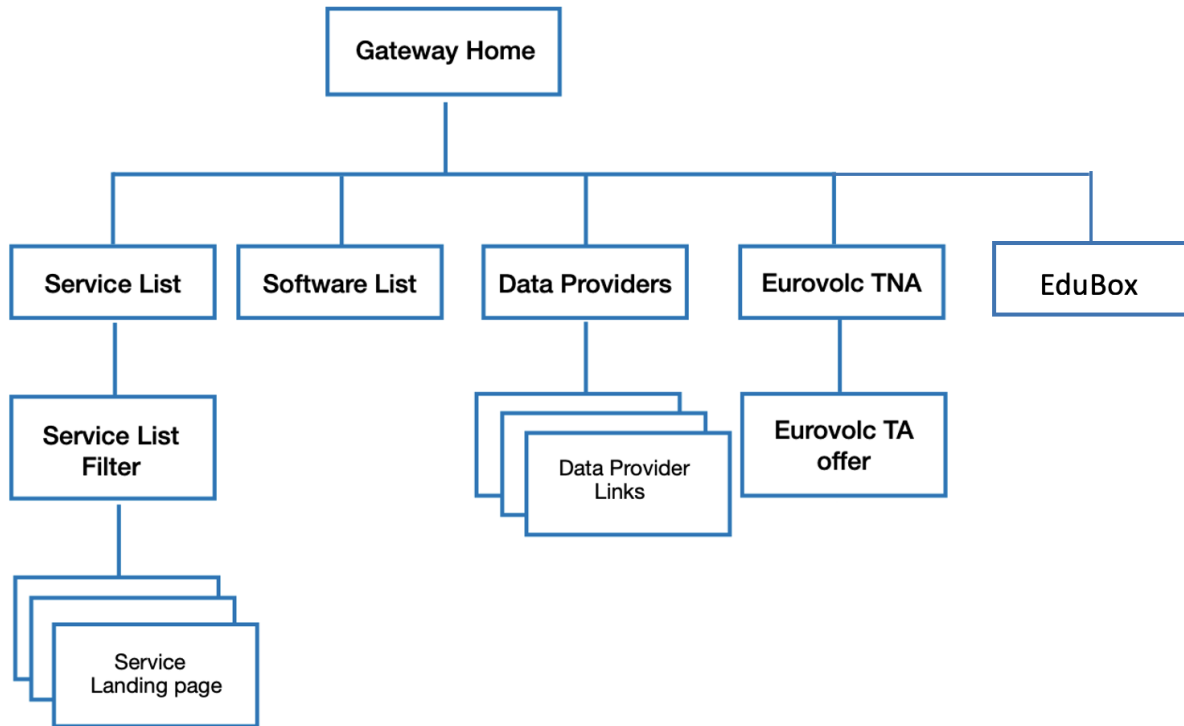
Figure 3: VO-TCS Gateway sitemap.
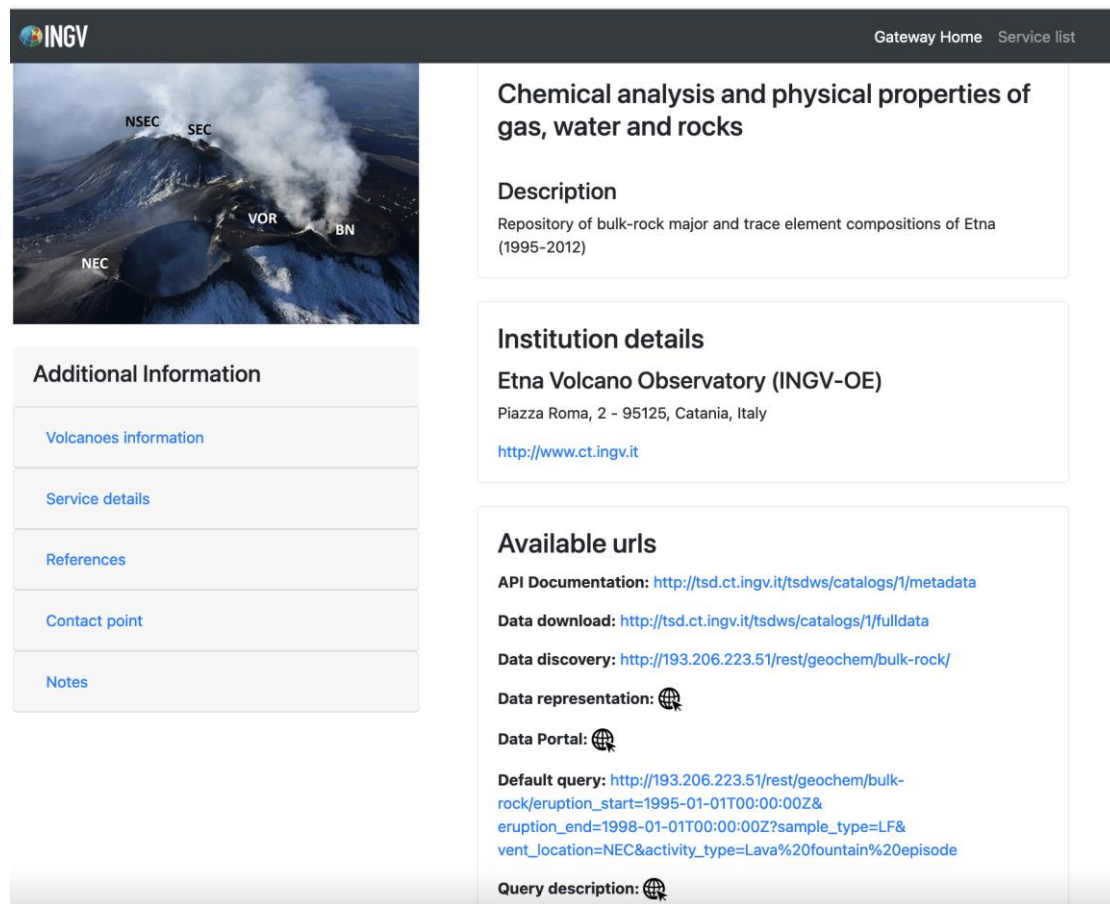
The information on web services is structured by using a landing page, accessible via specific link that provides details for each service.

This page includes the principal information of the proposed service, a small description about the service itself, the provided data and (if it exists) and a list of references.

Figure 4: Example of general information section details.

Figure 5: Landing Page for the INGV Bulk Rock service.

Moreover, this section contains the *documentation link*, a specific page that redirects to the service documentation page. It is very important for EPOS metadata documentations and it can also be used by machine readable tools. It reports the query description which provides operational information on how to query the service or the features notes section, which specifies the characteristics of the provided data.

To simplify the input process for each single Landing Page, a custom form page has been created only for administrative purposes: VO-TCS data providers can fill in all necessary information that will be discovered at the end of the process by the users.

Overall, the service list section allows a generic user to choose between the categories of web services (e.g. satellite data, geodetic data, etc.), but it is possible to organize the discovery of services based on the specific type of data provided by each individual institution.

The members of the VO-TCS Tech team had different roles in the Activity 1. INGV IT staff (Danilo Reitano, Lucia Cacciola) were in charge of the development of the Data Portal infrastructure. The other members (A. Geyer Traver (CSIC), Yannick Guehenneux (OPGC), Davíð Steinar Guðjónsson (IMO), Arnaud Lemarchand, Jean-Marie Saurel (IPGP)) i) verified the Data Portal ii) provided all necessary information to fill the Landing Pages for each service iii) validated the web pages with particular care of providers' landing pages.

A special thanks is due to Eng. Salvatore Mangiagli (INGV – Etna Volcano Observatory) that built the OS server and installed the CSS framework.

3.2 Activity 2 - Implementing EUROVOLC Data and Services
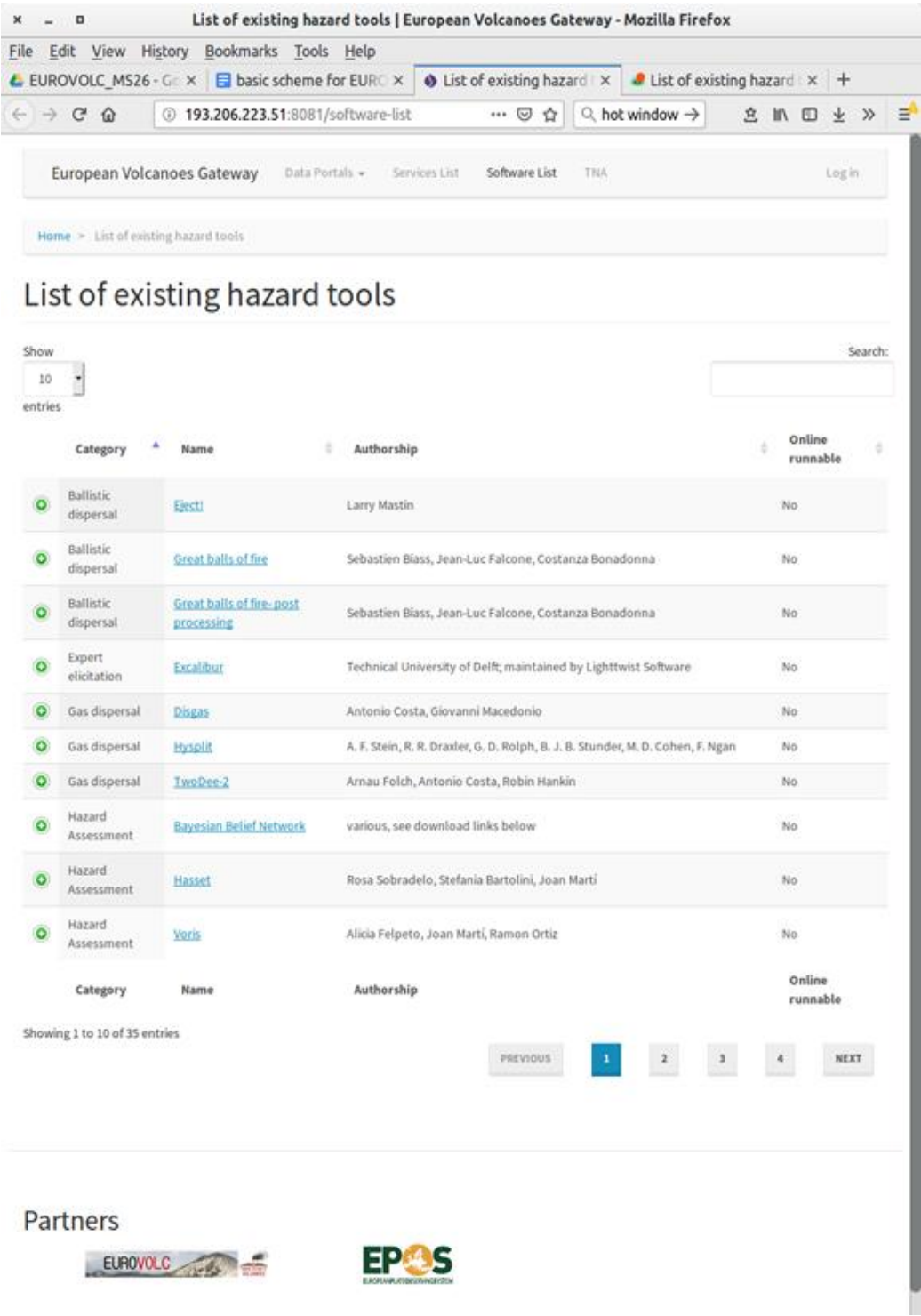
The first activity within this task is related to the implementation of a dynamic catalogue of Existing hazard tools. This work has been done in collaboration with Work Package 12 (Task 12.1: *Expanding on the work of previous projects on quantitative volcanic hazard assessment*) and focused on creating the on-line catalogue as result of the WP12 survey on the pre-existing tools for volcanic hazard assessment. Following the suggestions and requirements of the WP12 team group, this activity created a dedicated tool with the goal to promote software and let the user discover their features, according to the structure of the Gateway described in the previous section. Because hazard tool software's versions are continuously modified/updated, the main idea (and also the main effort in planning the system) is to develop an interactive tool, a "web catalogue", very simple to use and easy to upgrade. Experts, but also common users, can find details even if they do not know proper keywords: a power free search Area (see Figures 6-7, right side) can be used to search, filter, and also to group needed information and allow to discover metadata in a very intuitive way.

What is reported below is detailed in the WP12-JR4.2: *Exploitation of tools for hazard assessment risk and management* documentation and can be found in WP12 technical report in the EUROVOLC 3rd Periodic report and EUROVOLC Final reports. For technical point of view, details are provided in WP20 Technical Reports in EUROVOLC 1st and 2nd Periodic Reports.

The main information are presented into a dynamic Web table organizer by first:
a) Category;
b) Name;
c) Authorship;
d) On line runnable.

Figure 6: List of existing hazard tools. A search bar can be used to filter results.

Category		Name		Authorship		Online runnable
Ballistic dispersal		Eject!		Mastin L. G.		No
Ballistic dispersal		Great balls of fire		Biass S. , Falcone J. L. , Bonadonna C.		No
Ballistic dispersal		Great balls of fire- post processing		Biass S., Falcone J. L. , Bonadonna C.		No
Ballistic dispersal		Eject! for Matlab		Strehlow K., Mastin L., Sandri L., Gottsmann J., Kilgour G., Rust A., Tonini R.		No
Ballistic dispersal		Probabilistic studies with Eject! for Matlab		Strehlow K., Mastin L., Sandri L., Gottsmann J., Kilgour G., Rust A., Tonini R.		No
Expert elicitation		Excalibur		Technical University of Delft; maintained by Lighttwist Software		No
Gas dispersal		Disgas		Costa A. , Macedonio G.		No
Gas dispersal		TwoDee-2		Folch A. , Costa A. , Hankin R.		No
Hazard Assessment		Bayesian Belief Network		Various, see download links below		No
Hazard Assessment		Hasset		Sobradelo R. , Bartolini S. , Martí J.		No
Category		Name		Authorship		Online runnable

Figure 7: Searchable catalogue of pre-existing hazard tools implemented in the first draft and the actual VO-TCS Gateway.

Once the User has filtered the list, by using the +/- buttons he/she can access additional details concerning the description, the download URL and also a subset list of references (see Figure 8).

	Category	Name	Authorship		Online runnable
⊖	Ballistic dispersal	Eject!	Mastin L. G.		No
	Description:	It is a program that can be used for quick ballistics calculations			
	Implementation and requirements:	The code is written in Microsoft Visual Basic® and operates on any personal computer running Microsoft® Windows 95 or later.			
	Download:	hhttps://onedrive.live.com/			
	References:	https://pubs.usgs.gov/of/2001/0045/pdf/of2001-0045_v1-2.pdf			
⊕	Ballistic dispersal	Great balls of fire	Biass S. , Falcone J. L. , Bonadonna C.		No
⊕	Ballistic dispersal	Great balls of fire- post processing	Biass S., Falcone J. L. , Bonadonna C.		No
⊕	Ballistic dispersal	Eject! for Matlab	Strehlow K., Mastin L., Sandri L., Gottsmann J., Kilgour G., Rust A., Tonini R.		No
⊕	Ballistic dispersal	Probabilistic studies with Eject! for Matlab	Strehlow K., Mastin L., Sandri L., Gottsmann J., Kilgour G., Rust A., Tonini R.		No
⊕	Expert elicitation	Excalibur	Technical University of Delft; maintained by Lighttwist Software		No
⊕	Gas dispersal	Disgas	Costa A. , Macedonio G.		No

Figure 8: How to select details from the main Web page (the old and new one).

It is important to point out that this work has been completed within the first year of the project; only minor upgrades and a general maintenance have been conducted in the second part of it.

3.3 Activity 3 - Trans-national Access: EUROVOLC second call [INGV]

After the first call of Trans-national Access (TA) in EUROVOLC, discussions commenced about the possibility to create a tool, able to manage the TA calls, starting from the sec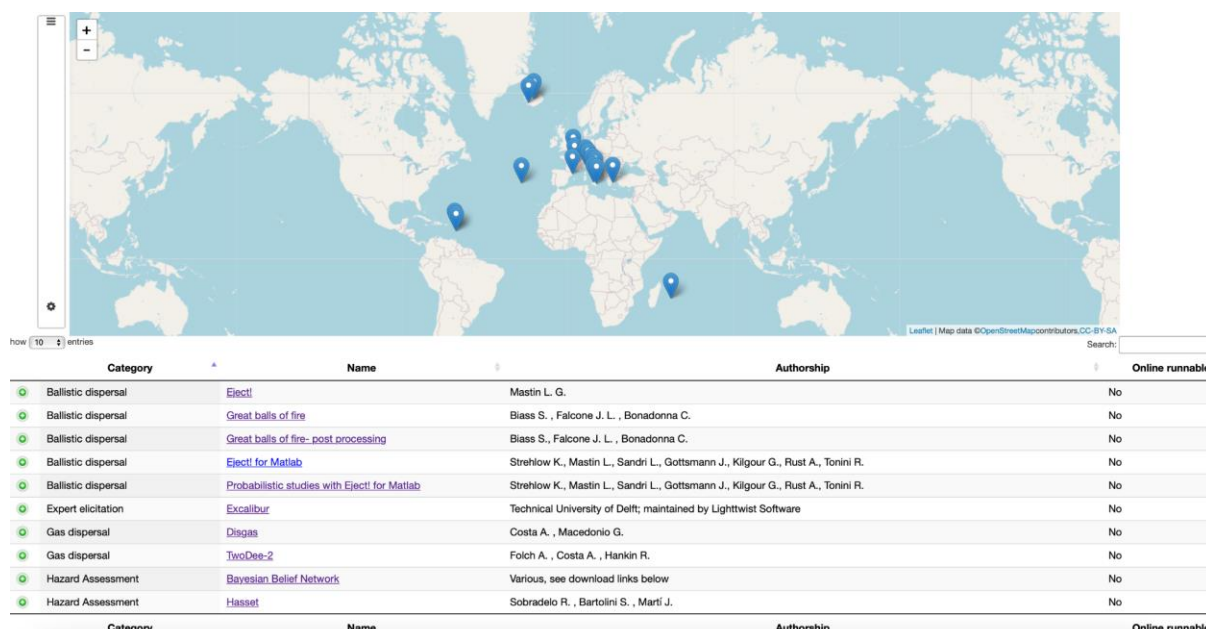ond one. To carry this out, a group of experts was asked to provide a solution in terms of minimum requirements needed to characterize a TA offer and to develop its main sections. At the end of this phase it was decided to share a survey to all partners to revise this product and contribute to improve it. This output (in form of excel sheets) was delivered to the WP20 IT team (in particular to INGV) that stared to plan and build a Web based solution.

3.3.1 Description of the system

Many hypothesis were considered during the IT planning phase. At the end, the proposed infrastructure is based on an interactive Web portal solution, that uses a relational database and the tool will be part of the EUROVOLC VO-TCS Gateway.

The infrastructure is composed of a *back end*, based on a Linux server that provides all necessary services and controls and a *front end*, created from scratch to build all connections and calls to the relational "MySQL" database. The database structure has

been built up and it manages all tables, views to query data information. A simplified schema has been reported in Figure 9.
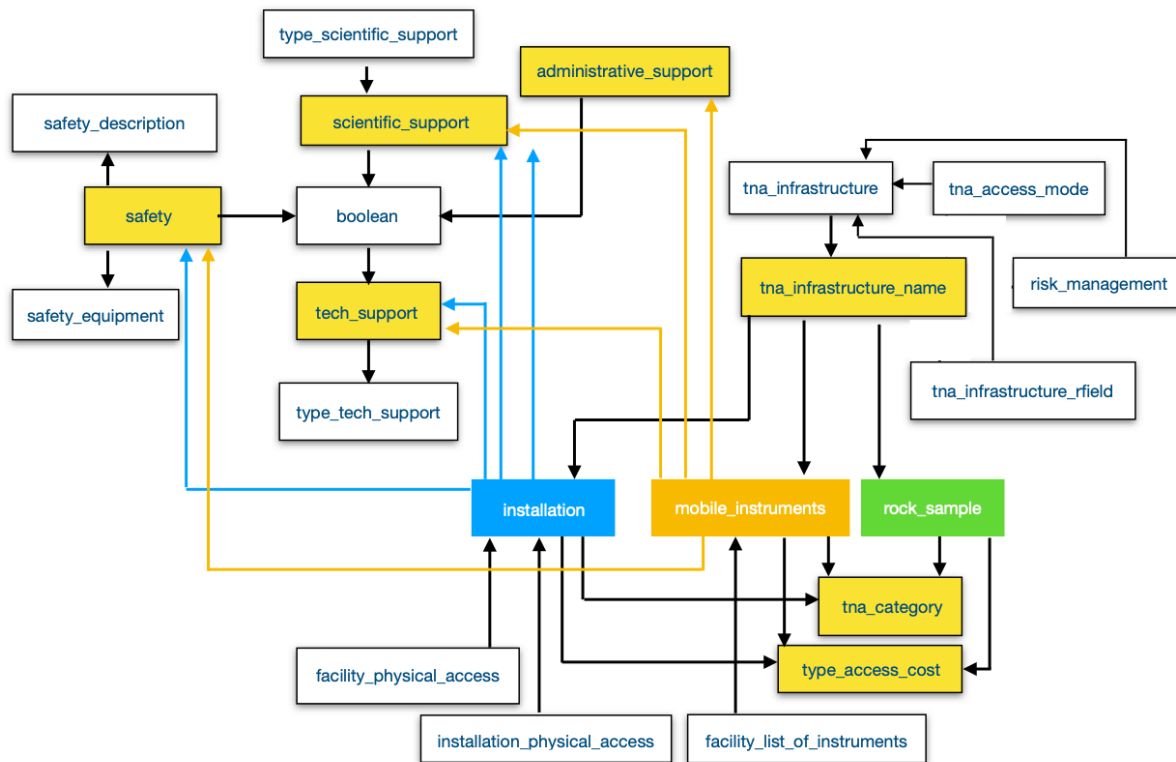
The Trans-national Access Web portal main page is composed of four main parts:

1. TA Offers
2. Request Form
3. TNA Guidelines
4. F.A.Q.

The **first part** shows the Trans-national Access available offers. By entering the web page, a generic user can find a map which represents the existing infrastructures that are proposing TA Offers; by clicking each marker, it is possible to access to their geographical location and look at the related Institution (Figure 10). The list below represents each single offer and shows four main keywords: the <u>Category</u> name, the name of the proposing Institution's <u>infrastructure</u>, the name of the single <u>facility</u> and at last, the Institution's <u>country</u>. The catalogue consists of three different categories:

- Access to Mobile Instruments

Figure 9: Overall simplified schema of the TA database.

- Access to Volcano Observatories and Volcano Research Institutions
- Provision of Rock Samples
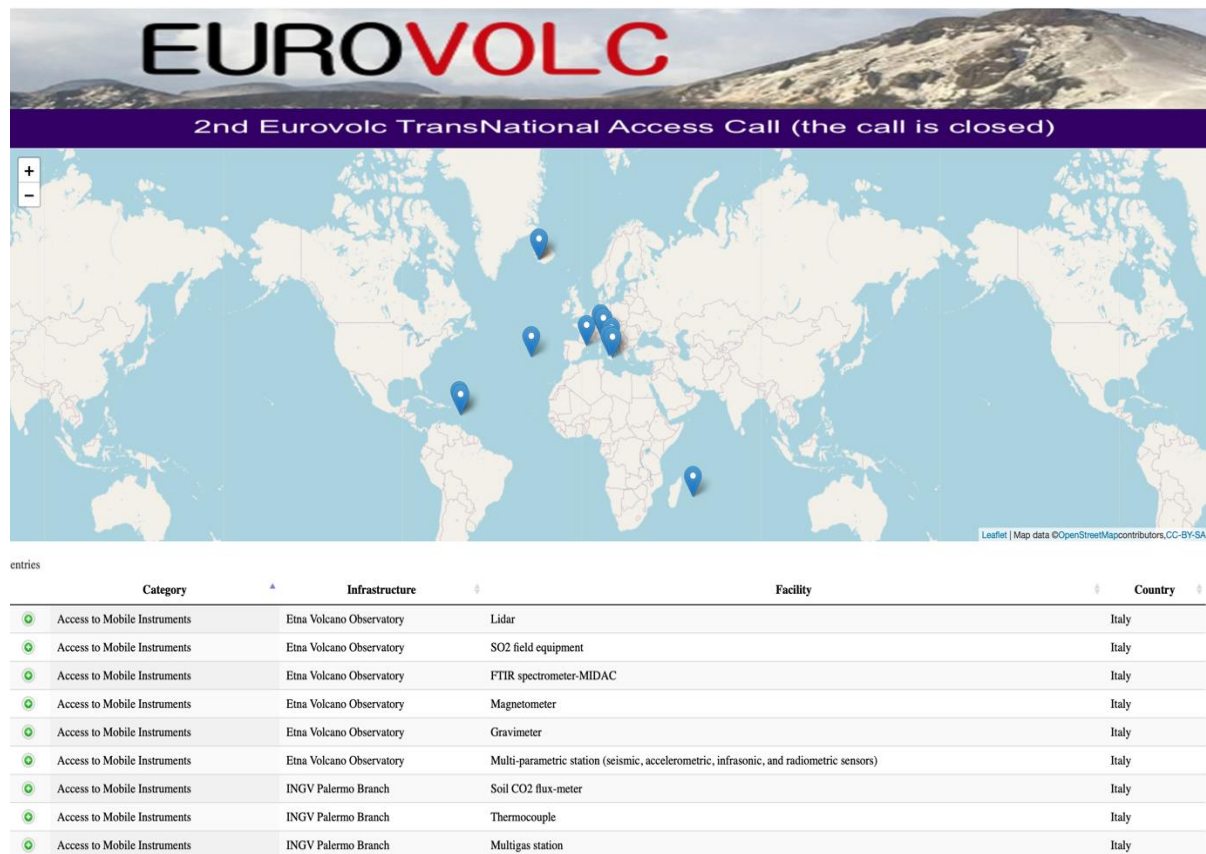
Figure 10:TA Offers page: A map and the related table show all the TA Offers of the second Call.

Once the user has filtered the list, by using the +/- buttons he/she can access additional details (see Figure 11).
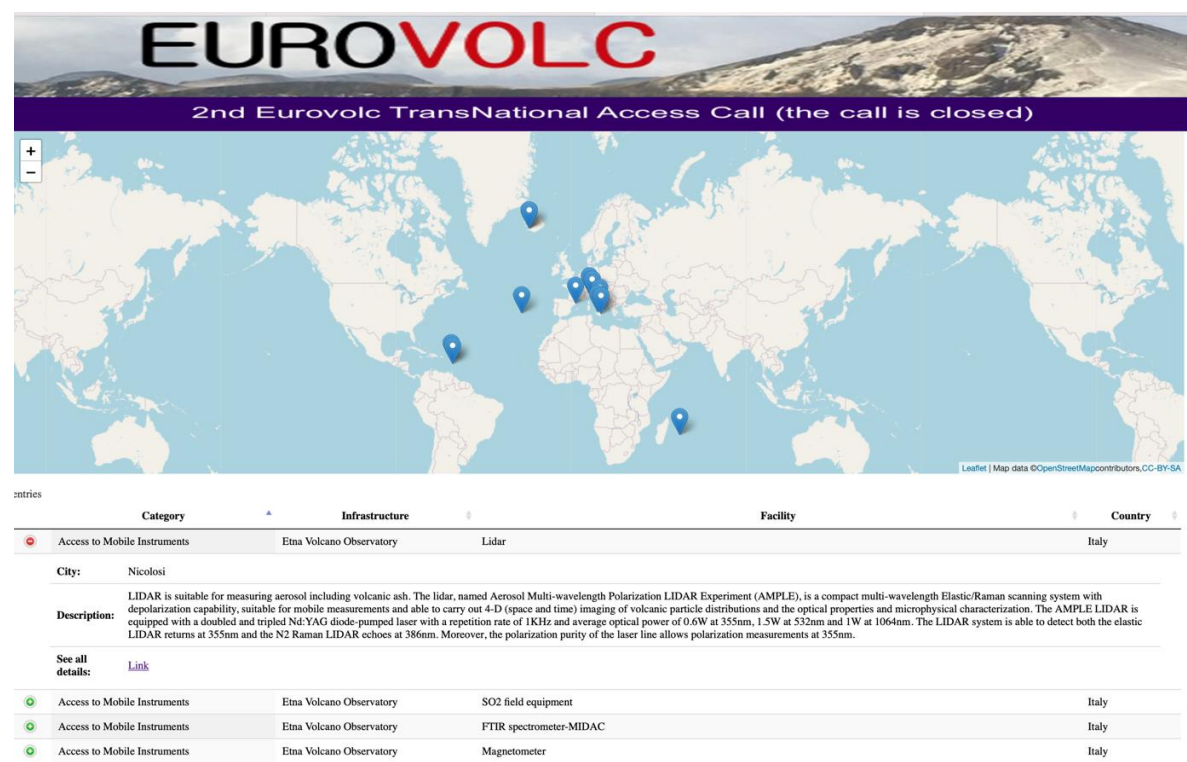
Figure 11: Click on the +/- button to access to details.

By clicking on the Link, in the section "See all details", a new page is loaded. The new page (Figure 12) is made by using an *accordion* style that helps the user to enter (by choosing each title) all features that compose a single offer. So many entries are necessary to describe all different features and following experts' suggestions, the whole page is divided into different sections.
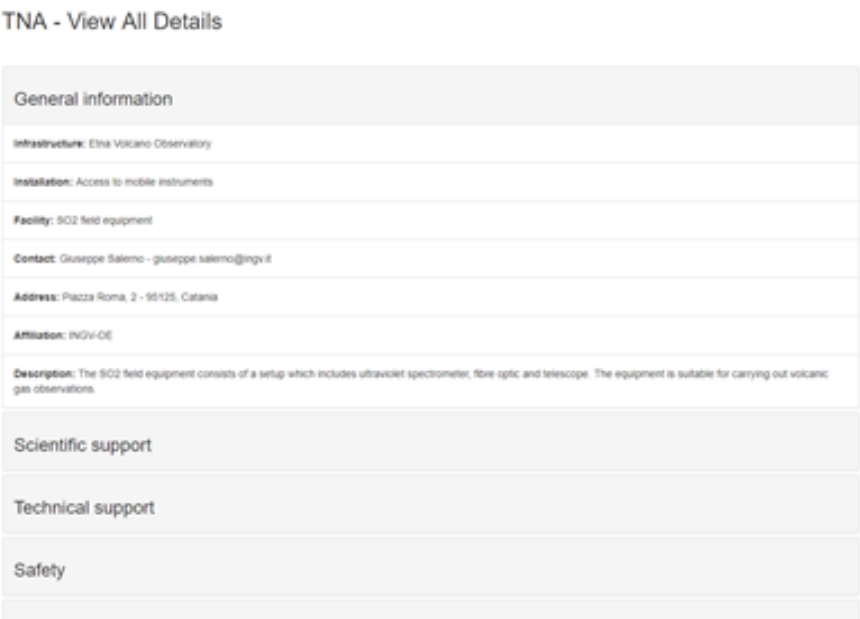
Figure 12: Report on all details that characterize a single TA Offer.

In particular, the main sections are:
- General information
- Scientific support
- Technical support
- Safety
- Administrative support
- Access modalities
- Financial support
- Risk management

Each section contains fields (mandatory or optional) each provider has compiled during the preparation phase of the TA Call. All of them are loaded into the TA database. When a user wants to access the details, an "*on the fly*" response query is created by the system, and the code build the results shown in Figure 12.

The **second part** is dedicated to the **Request Form**. Furthermore, this section is built with custom code that guides the user into the compilation of the form. The form is divided into three different sections: the first contains general information about the project, the principal investigator and team members and the second is made to request attached files (e.g. a CV of the principal investigator).

In order to combine offers and requests, the **third part** proposes the existing infrastructures. The database query and visualizes only the facilities related to the chosen infrastructure and the related financial combination as they have been compiled by the provider. The user can also review a draft proposal to modify it before the final submission, that is, instead, locked. For this reason, the user is requested to login into the portal, so the system can recognize user's identity and retrieve his/her form data submission from the database (Figures 13–14).

Figure 13: A detail of the first part of the Request Form.

13

Figure 14 shows the page related to the requested accesses by using the Infrastructure, the Category and Facility. Once the Infrastructure name is chosen the system shows the related offers with important details concerning the facilities and the number of offered accesses.

Figure 14: Part B of the Request Form: choice of the infrastructure and related facilities.

The **last part** (the *FAQ* section) reports some questions and answers regarding the main features of the Portal and also a guide to fill the Request Form.

3.4 Activity 4 - The EDUBOX section

Category	Name	Institution	Details	Link
Academy/Expert	Civil Protection Departement web site	Civil Protection Departement (Italy)	**Language:**Italian **Description:** Web page **Volcanoes:** Etna, Stromboli, Vulcano	https://rischi.protezionecivile.gov.it/it/vulcanico
Academy/Expert	The city of Napoli and its active volcanoes	not available	**Language:**English **Description:** Field trip GUIDES **Volcanoes:**Vesuvio, Campi Flegrei	https://www.geologicalfieldtripsandmaps.com/296/issue-39/the-city-of-napoli-and-its-active-volcanoes.html
Academy/Expert	Field trip to the Ischia resurgent caldera, a journey across an active volcano in the Gulf of Naples	not available	**Language:**English **Description:** Field trip GUIDES **Volcanoes:**Ischia	https://www.geologicalfieldtripsandmaps.com/296/issue-37/field-trip-to-the-ischia-resurgent-caldera-a-journey-across-an-active-volcano-in-the-gulf-of-naples.html
Educational	EDURISK Project (italian)	Istituto Nazionale di Geofisica e Vulcanologia	**Language:**Italian **Description:** Booklet for primary schools. The EDURISK Project website provide other resources on natural hazard for I primary-High School	http://www.edurisk.it/book/noi-e-i-vulcani/
Educational	EDURISK Project (english)	Istituto Nazionale di Geofisica e Vulcanologia	**Language:**English **Description:** Booklet for primary schools. The EDURISK Project website provide other resources on natural hazard for I primary-High School	http://www.edurisk.it/edition/volcanoes-and-us/
Educational	EDURISK Project (spanish)	Istituto Nazionale di Geofisica e Vulcanologia	**Language:**Spanish **Description:** Booklet for primary schools. The EDURISK Project website provide other resources on natural hazard for I primary-High School	http://www.edurisk.it/edition/los-volcanes-y-nosotros/

Fig 3.15 EduBox section

Last available section is represented by EDUBOX, a special storage area and a customized database that demonstrates the work done within WP3 - Subtask 3.2.3: *Developing of outreach resources on volcanoes* [Task lead INGV, other participants IMO; UNIGE; UI; CVISA; ICP; CSIC; IPGP].

The aim of this subtask is to develop the *EUROVOLC Outreach Box* (*EDUBOX*) based on the shared material uploaded on intranet EUROVOLC platform Basecamp and surveyed in WP3 Deliverable report D3.2. The initial work for the WP20 team concerns the definition of the technical structure of the database and of the framework where the EDUBOX will be available.

From a technical point of view, the EDUBOX section is built by using the same structure available for the other sections. In particular, the proposed documentation refers to three main categories:

- Resourse for *General Public,* outreach material for the general public;
- Resourse for *Educational;* material for educational activities (primary school to university level);
- Resourse for *Academy/Expert.*

Other details and related documentation can be found in the EUROVOLC Deliverable report D3.5 released by WP3 at the end of the project.

4. Criticalities

From a technical point of view, building a specific Data Portal for the European volcanological community is a big challenge in terms of requested effort. Different actions are necessary to design, develop and deploy the IT e-infrastructure: Activity 1, in particular, needed much more effort in terms of P/M and partners' contribution.
The design and development of the IT structure was in charge of INGV so, in order to update the Gateway features, the strategy was to ask the other Partners to:

- contribute to collect information about services, sharing all information and eventually fill the form to complete the landing pages;
- expose all available details for each product/service;
- populate the Gateway with existing/new services (EPOS and EUROVOLC products);
- work to create active links between the Gateway and the EUROVOLC products (i.e. the European Catalogue of Volcanoes (ECV) and EDUBOX).

These actions represented an initial criticality for the WP20 team, because the harmonization process was simultaneously carried out in the EPOS e-infrastructure.
At the end the Gateway contains both EPOS and not-EPOS datasets, exposed using tailored Landing Pages.

5. Conclusions

Integrated research on Earth science processes are intrinsically multidisciplinary, so covering a multitude of heterogeneous datasets collected by EUROVOLC data providers was one of the main goals of the project and, in this framework, WP20 has represented the aim to promote efforts for sustainability purposes. The European Plate Observing System (EPOS) establishes a sustainable and long-term access to solid Earth science data and services integrating diverse European Research Infrastructures under a common federated framework. The VO-TCS has the responsibility to coordinate the volcanological community in EPOS and the EUROVOLC project can really contribute to enrich data and services that will be active even at the end of the project itself. Although many criticisms have been highlighted during the project lifetime, great results have been achieved by the EUROVOLC community, most of them shared within the volcanological community and available for different kinds of stakeholders. Moreover, the Data portal follows the *open access* paradigm and the choice of landing pages to discover data and service details will also guide non-expert users within Earth Science. A detailed introduction and overview of the EPOS Volcano Observations services and the Gateway has recently been published in Annals of Geophysics (Puglisi et al., 2022).

6. References

Puglisi, G., Reitano, D., Spampinato, L., Vogfjörd, K., Barsotti, S., Cacciola, L., Geyer, A., Guðjónsson, D., Guéhenneux, Y., Komorowski, J-C., Labazuy, P., Lemarchand, A., Nave, R., Saurel, J-M., Bachèlery, P. (2022). The integrated multidisciplinary European volcano infrastructure: from conception to implementation. Annals of geophysics (65) 1-27. DOI: 10.4401/ag-8794.