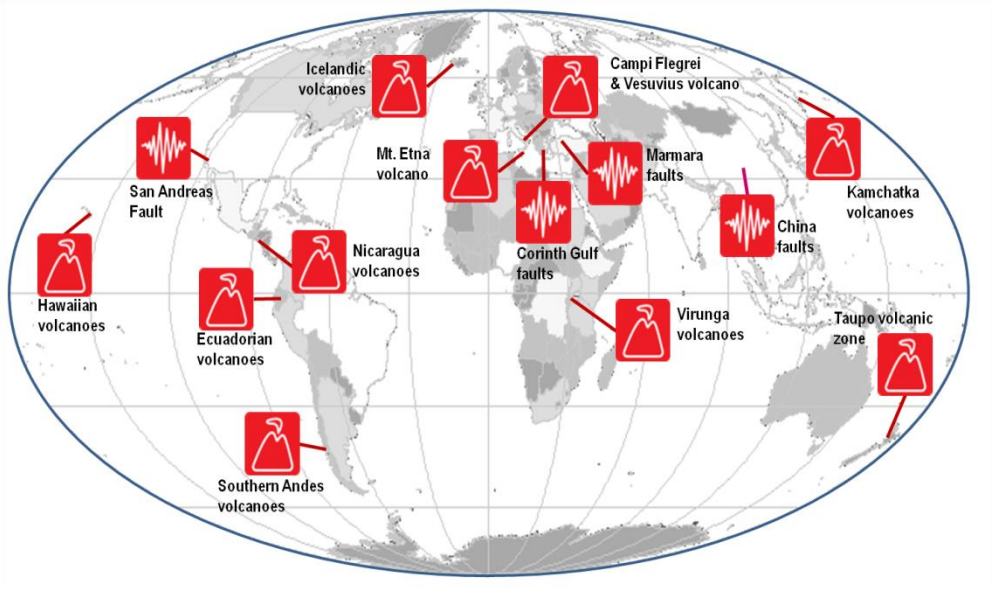
GSNL in a nutshell

The Geohazard Supersites and Natural Laboratory initiative (GSNL) is a voluntary international partnership aiming to improve, through an **Open Science** approach, **geophysical scientific research** and **geohazard assessment**, promoting rapid and effective uptake of the new scientific results for enhanced societal benefits in **Disaster Risk Reduction** (DRR).

The GSNL goal is pursued promoting broad **international scientific collaboration** and **open access** to a variety of space- and ground-based data, **focusing on areas with important scientific problems and high risk levels**: the Supersites and the Natural Laboratories. For these areas a joint effort is carried out: the CEOS[1] space agencies provide **satellite imagery** at no cost for scientific use, the monitoring agencies[2] provide access to **ground-based data** (according to their data policy), the global scientific community exploits these data to generate **state of the art scientific results**.

The coordination of each Supersite is normally assumed by one or more **local geohazard scientific institutions** which are part of a national, authoritative framework able to provide information for **science-based decision making** in risk management and reduction. **GSNL supports the leading role of the local scientific community** to stimulate a coordinated international collaboration, focusing on the aspects which have the highest potential to benefit Risk Reduction actions.

GSNL is presently a **network of 14 global Supersites**, and as such aims to connect its various nodes promoting transfer of scientific knowledge, data, capacities, tools, as well as best practices for optimal uptake of scientific results in risk management.



GSNL objectives

1. to enable the global scientific community with open, full and easy access to a variety of space- and ground-based data over the Supersites and the Natural Laboratories;
2. to promote advancements in geohazard science over the selected sites;
3. to promote the rapid uptake of scientific results by DRR stakeholders and decision makers;
4. to innovate technologies, processes, and communication models, enhancing data sharing, global scientific collaboration, and capacity building in geohazard science.

[1] The Committee for Earth Observation Satellites
[2] As USGS, INGV, IMO, KOERI, IGEPN, GNS-Science, ITSAK, SERNAGEOMIN, GVO

Stakeholders and their interests

There are three main types of stakeholders involved in each Supersite or Natural Laboratory:

1. The **data providers** (for in situ and EO data). They support the initiative to promote their activities, demonstrating the societal benefits of the data they produce and creating the conditions for establishing a widespread data sharing practice in the entire scientific community. For the in situ data the Supersite Coordinators can negotiate site-specific data policies.
2. The **global geohazard scientific community**. Within a Supersite community, scientists can access thousands of satellite images and important in situ datasets: seismic, geodetic, geologic, geochemical, etc. Such data can be exploited in the collaborative framework to address local or general scientific problems and, under guidance by the Supersite Coordinators, contribute results of direct societal benefit in risk management. Thanks to latter activities, Supersite may benefit from specific funding lines at national or international level.
3. The **final users** of the geohazard scientific information. This category includes public risk reduction agencies, policy makers at various scales, and in general all subjects who can benefit from science-based decision making in DRR. They are involved by the Supersite Coordinating institutions and can provide recommendations for priority research topics to the global scientific community.

The GSNL network

In 2022 the GSNL network is composed of 13 **Permanent Supersites** and 1 **Natural Laboratory**:

Permanent Supersite	Coordinator	Coordinator institution	Date established	End-user
Hawaiian volcanoes	M. Poland	USGS, USA	October 2012	Hawai'I County Civil Defense, Hawai'I Volcanoes National Park
Icelandic volcanoes	F. Sigmundsson, K. Vogfjord	University of Iceland and IMO, Iceland	November 2013	Icelandic Police - Dep.t of Civil Protection and Emergency Management, Environmental Agency of Iceland, Directorate of Health
Mt.Etna volcano	G. Puglisi	INGV, Italy	April 2014	National Department of Civil Protection, Regional Civil Defense
Campi Flegrei & Vesuvius volcano	S. Borgstrom	INGV, Italy	April 2014	National Department of Civil Protection, Regional Civil Defense
Marmara Fault	S. Ergintav	KOERI, Turkey	April 2014	Istanbul municipality
Ecuadorian volcanoes	P. Mothes	IGEPN, Ecuador	October 2014	Secretariat for Risk Management, Regional governments, Municipalities
Taupo volcanic zone, NZ	N. Fournier, I. Hamling	GNS Science, New Zealand	October 2014	Ministry of Civil Defence and Emergency Management, Department of Conservation, Regional councils, MetService
Gulf of Corinth-Ionian Islands	S. Lalechos	OASP-EPPO , Greece	November 2016	Greek Civil Defense
San Andreas Fault Natural Laboratory	C. Wicks	USGS, USA	April 2017	California Office of Emergency Services, Federal Emergency Management Agency, plus many other local stakeholders
Southern Andes Volcanoes	L. Lara	SERNAGEOMIN, Chile	October 2017	ONEMI (Oficina Nacional de Emergencias), under the Ministry of Interior and Public Safety
Virunga volcanoes	C. Balagizi	Goma Volcano Observatory, D.R. of Congo	October 2017	DRC Civil Protection, NGOs for Emergency and Disaster Management, also in Rwanda, Virunga National Park offices

In addition, **Event Supersites** are established following strong magnitude earthquakes or eruptions (e.g. the Tohoku or Gorkha earthquakes); for them the data provision is guaranteed only for ~one year after the event.

How Supersites work

The following is a description of the target operation mode for a Supersite or Natural Laboratory, which they should attain within a 4-5 year period.

Satellite optical and SAR data are acquired by space agencies following specifications by the scientific community. The data are provided to the community, usually through web-based services/catalogues. Data from ground-based monitoring networks are also made available to the community according to a specific data policy. In less developed countries, foreign scientists are invited to involve local scientists/data providers in their research, to ensure effective knowledge transfer and local capacity building.

Scientists seek funding through national/international projects, leveraging on the Supersite status. Research results are published but also digitally shared within the community (and to the public) to allow easy re-use. Digital data infrastructures are used as much as possible to allow easy sharing of information. The GSNL governance and the Supersite Coordinators monitor the scientific progress of the community, promote international collaboration, capacity building, data and resource sharing, use of standardized formats, and technological innovations (e.g. remote processing services).

Research products which have a direct use in hazard assessment and in risk prevention/reduction activities, should be periodically discussed within the community, stimulated by the Supersite Coordinator. Consensus reports are eventually generated and disseminated to the end-users to facilitate research result uptake. Dissemination to the end-users is carried out by the Supersite coordinating institutions, following the procedures in place in the national risk management framework. The end-users evaluate the scientific information received and may provide requirements and priorities for further research topics of DRM interest.

Examples of **research products** generated for a Supersite are:

Science products to support Hazard Assessment and Risk Prevention	***Science products to support Disaster Response (frequently updated during a crisis)***
Long term ground deformation maps	Short term ground deformation maps
Strain rate maps	Seismic and volcanic source models
Maps of active faults	Seismicity, and Regional Moment Tensor solutions
Long term fault slip rates, recurrence intervals and other parameters	Coulomb stress transfer analysis maps
Hazard and damage scenarios	Maps of the effects of earthquakes and eruptions: fault scarps, landslides, soil
Models of volcanic sources and plumbing systems	Maps of building and infrastructure damage
Volcanic hazard scenarios	Near real time scenarios for mass eruption rate, plume heights, ash fall, etc.

How to join

To become part of a specific Supersite community, contact the Supersite Coordinator or the GSNL Chair.

To establish a new Supersite, set up an initial scientific core team and submit a proposal. Requirements and approval procedure are available here.

Our partnership

More info

Please visit our website geo-gsnl.org for more information.

Details of Supersite Coordinators and GSNL Steering Committee members are available on the website.

The Chair of the GSNL initiative is Stefano Salvi (INGV/Italy), stefano.salvi@ingv.it

Contact us at: info@geo-gsnl.com