

# GEOSS for Disasters

The GEO Disasters  
Societal Benefit Area

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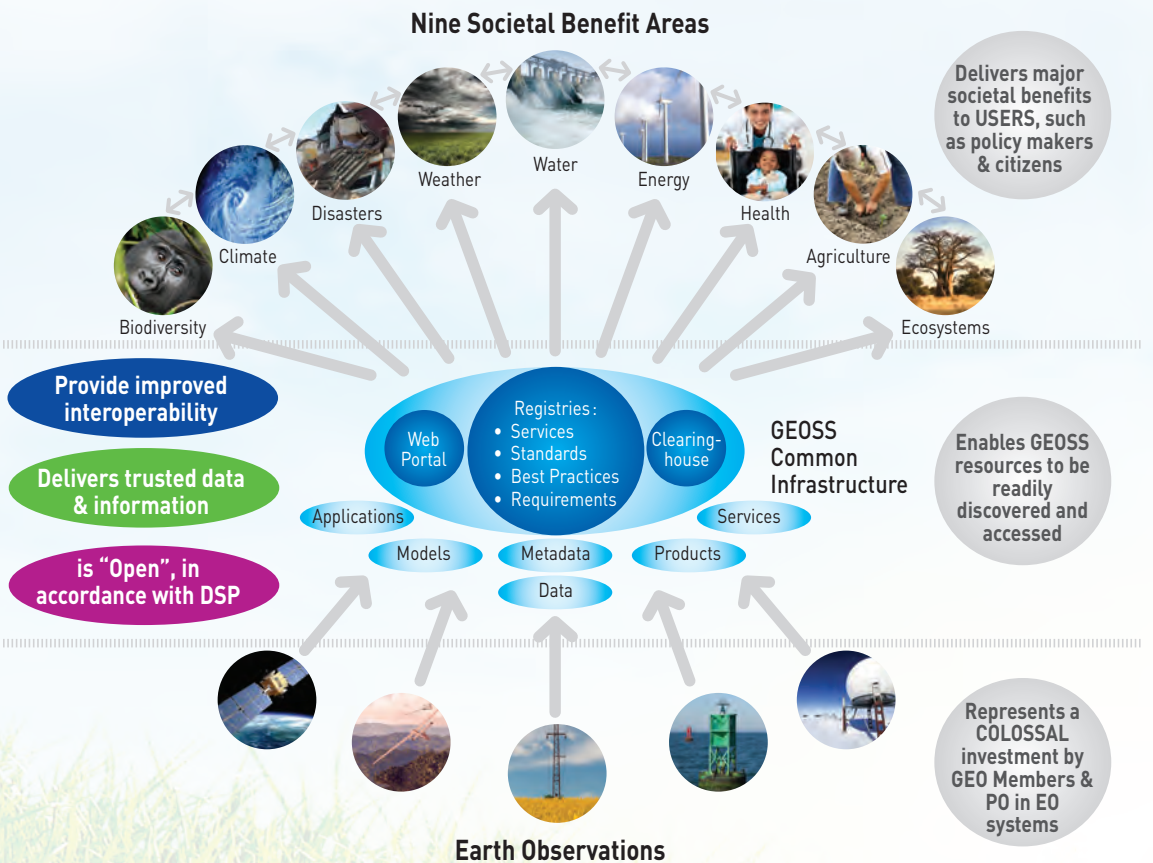


GROUP ON  
EARTH OBSERVATIONS

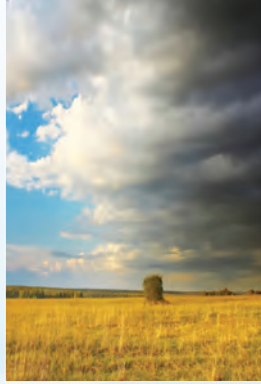
# GEOS - A GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS

The Group on Earth Observations (GEO) is coordinating efforts to build a Global Earth Observation System of Systems (GEOS). GEO was established in February 2005 by the Third Earth Observation Summit meeting in Brussels. This followed calls for action by the 2002 World Summit on Sustainable Development and the Group of Eight (G8) leading industrialised countries. **GEO is a voluntary partnership of governments and international organizations. It provides a framework within which these partners can develop new projects and coordinate their strategies and investments.**

[www.earthobservations.org](http://www.earthobservations.org).



**The vision for GEOSS** is to realize a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations and information. GEOSS will meet the need for timely, quality, long-term global information as a basis for sound decision-making and will enhance the delivery of benefits to society. GEOSS aspires to encompass all areas of the world, and to cover in-situ, airborne and space-based observations.



GEOSS will simultaneously address nine Societal Benefits Areas (SBA) of critical importance to people and society. It aims to empower the international community to protect itself against natural and human-induced **disasters**, understand the environmental sources of **health** hazards, manage **energy** resources, respond to **climate** change and its impacts, safeguard **water** resources, improve **weather** forecasts, manage **ecosystems**, promote sustainable **agriculture** and conserve **biodiversity**. GEOSS coordinates a multitude of complex and interrelated issues simultaneously.

This **cross-cutting approach** avoids unnecessary duplication, encourages synergies between systems and ensures substantial economic, societal and environmental benefits.

Many efforts are oriented towards **solving the standardisation of data and interoperability issues** within GEO.

At the GEO Ministerial Summit in November 2010, the **GEO Data Sharing Action Plan** was adopted. The Data Sharing Action Plan builds upon the concept of full and open exchange and on the Implementation Guidelines accepted by the Plenary which state that data, metadata and products made available through the GEOSS are made accessible with minimal time delay and with as few restrictions as possible on a non discriminatory basis, at minimal cost for no more than the cost of reproduction and distribution.

## THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS



## The Challenge

Disaster risk and vulnerability are increasing in many regions of the world. Natural hazards are a major cause of loss of life and property, and affect key natural resources.

Disaster-induced losses can be reduced through the timely, accurate and reliable provision of Earth observation data. To support disaster management, it is essential to provide information through coordinated systems in order to contribute to monitoring, predicting, risk assessment, early warning, mitigating and responding to hazards.

This requires extensive integration of diverse data streams, improved information extraction methods and modelling capabilities, and the generation and dissemination of the information needed by decision makers and the public.

## Europe's capability to respond

Substantial European developments and contributions to GEO are provided in the framework of the European Initiative on the Global Monitoring for Environment and Security (GMES).

The GMES Emergency Responses Services are being developed in several projects in the context of the EU RTD framework programmes and ESA GMES projects. Important contributions are currently being made by the EU FP7 project SAFER (Services and Applications for Emergency Response). GMES provides emergency mapping services for situation analysis and damage assessment as well as reference mapping services to support preparedness and risk assessment. High priority is given to quality assurance and validation of the services.

The future GMES Sentinel Missions will provide sustainable satellite resources for the GMES services. The data policy for Sentinel data will be based on a "free and open" access to the data which is in compliance to the GEO data sharing principles. Moreover, European Services are provided on an operational basis e.g. by the Joint Research Centre of the European Commission, such as the European Flood Alert System (EFAS), the European Forest Fire Information System (EFFIS), or the Global Disaster Alert and Coordination System (CDACS). The Global Fire Monitoring Centre (GFMC) provides a global portal for wild-land fire monitoring, which is based on a worldwide network of cooperating institutions.

In the field of spatial information Europe is implementing the Infrastructure for Spatial Information in Europe (INSPIRE) programme to build up standards and rules for a consistent geo-data infrastructure. INSPIRE sets the legal framework and technical implementing rules, which could form a substantial basis for the GEOSS Common Infrastructure (GCI).

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[http://www.eugene-fp7.eu/docs/EUGENE%20Broschure\\_Final\\_Web.pdf](http://www.eugene-fp7.eu/docs/EUGENE%20Broschure_Final_Web.pdf)



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## The GEO Disasters Societal Benefit Area in context

### Target 2015

The GEOSS Strategic Target for Disasters was defined:

Before 2015, GEO aims to:

**Enable the global coordination of observing and information systems to support all phases of the risk management cycle associated with hazards (mitigation and preparedness, early warning, response, and recovery).**

This will be achieved through:

- more timely dissemination of information from globally-coordinated systems for monitoring,
- predicting, risk assessment, early warning, mitigating, and responding to hazards at local, national, regional, and global levels;
- development of multi-hazard and/or end-to-end approaches, as appropriate to meet the needs for disaster risk reduction, preparedness and response in relevant hazard environments;
- supporting the implementation of the priorities for action identified in the Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters (HFA).

This will be demonstrated by:

- Improved use of observations and related information to inform policies, decisions and actions associated with disaster preparedness and mitigation.
- More effective access to observations and related information to facilitate warning, response and recovery to disasters.
- Increased communication and coordination between national, regional and global communities in support of disaster risk reduction, including clarification of roles and responsibilities and improved resources management.
- Improved national response to natural and man-made disasters through delivery of space-based data, resulting from strengthened International charter on "Space and Major Disasters."
- Support to the successful implementation of the Hyogo Framework for Action 2005-2015.



## Examples of the European Projects contributing to the Disasters Societal Benefit Area of the GEOS



The EUGENE project aims to foster collaboration between pan-European organisations in the field of earth observation and to strengthen the coordination of national and regional programmes and organisations in their work towards GEO. Three societal benefit areas were selected as a starting point. These are Climate, Disasters and Water.

The activities performed under EUGENE's Disaster workpackage aim at identifying opportunities to improve the global European action on disasters. This is achieved by bringing together all the main players together to devise ways to strengthen the coordination and cooperation. The project resulted in the identification of the following gaps and opportunities for European action

- GEO should support the coordination of information provision services like the GMES Emergency Services, UN Space Aid, SERVIR, Sentinel ASIA
- GEO should facilitate access to in-situ data and integration with space data
- Links between forecast services and emergency responses should be improved
- Transfer of R&D results into operational services should be fostered, in particular in the framework of GMES



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Website: [www.eugene-fp7.eu](http://www.eugene-fp7.eu)



Every year, fires, floods, earthquakes and volcanic eruptions, landslides and other humanitarian crises claim the lives of thousands of citizens in Europe and around the world. With climate change, the frequency or intensity of such events may even increase.

In the frame of the GMES Programme (Global Monitoring for Environment and Security), the GMES Emergency Response Service reinforces the European capacity to respond to emergency situations:

It provides a reactive cartographic service to the registered users involved in the management of humanitarian crises,

natural disasters and man-made emergency situations with timely and high quality products derived from Space Observation.

The GMES Emergency Response Service is based on two pillars:

- The Emergency Response Service: The first priority is the delivery of Emergency Response products, available in rush mode, to European Civil protections and Humanitarian actors.

These Emergency Response Service is on the forefront of the GMES service and therefore its most visible part.

- The Emergency Support Service: Sustaining and completing this service, the Emergency Support service provides reference products and situation maps. These geo-information products are specifically dedicated to the preparedness and recovery phases of the crisis.

Website: [www.emergencyresponse.eu](http://www.emergencyresponse.eu)



effective earthquake predictions.

Numerous scientific findings show a high correlation of space-time anomalies of geophysical parameters shortly before earthquake occurrences; however so far no methodology has proven reliable enough for



The project aims at bringing together European and Russian scientists and the observation capabilities at their disposal for integrating and comparing the different methodologies to

- advance the knowledge of the preparatory phases of earthquakes and their possible precursors;
- promote a global Earthquake Observation System (EQuOS) as a contribution to GEOSS (Global Earth Observation System of Systems);
- develop and offer to the international scientific community an integration platform (PEG) where independent observations and new data analysis methodologies devoted to the research on/of earthquake precursors can be collected and validated;

Different ground and satellite based observations, different data analysis methods and different measured parameters will be compared and integrated in order to move the research in this field beyond its present frontiers.

The project's main aim is to investigate to what extent earthquake short-term predictions can be improved-bringing together multiple observations and knowledge available in Europe and Russia (so far all prediction experiments have been relying only on one or, only a few parameters).

The project will be implemented along three main lines, namely by:

- coordinating data gathering and sharing
- implementing a collaboration platform
- sharing methodologies for validation and fostering the open contribution of the global science community

Highly seismic and well monitored regions (Sakhalin region in Far Eastern Russia, Italy and Turkey in Europe) have been selected as suitable areas where the integration of different observations and methodologies is expected to offer the best results.

Website: [www.pre-earthquakes.org](http://www.pre-earthquakes.org)



The G-MOSAIC (GMES services for Management of Operations, Situation Awareness and Intelligence for regional Crises) Collaborative Project will provide the European Union with intelligence data that can be applied to early warning and crisis prevention as well as to crisis management and rapid interventions in hot spots around the world. It aims at identifying and developing products, methodologies and pilot services for the provision of geo-spatial information in support to EU external relations policies and

at contributing to define and demonstrate the sustainability of GMES global security services.

G-MOSAIC will develop services for security to:

1. Support Intelligence & Early Warning, with the objective to deploy and validate those information services which contribute to the analysis of the causes leading to regional crises, such as weapons proliferation, fight for natural resources, population pressure, land degradation, and illegal activities. One important aspect will be the development of crisis indicators.
2. Support Crisis Management & Operations, with the objective of deploying and validating those information services which contribute to support the planning for EU intervention during crises, the EU intervention itself and citizen repatriation during crises, the crisis consequences management, reconstruction & resilience.

The main expected results of G-MOSAIC are:

- organised service chains and infrastructure for the provision of pre-operational pilot services in support to security activities, in particular focusing on External Regional Crises
- pre-operational Services for Security, and identification of related Services, based on previously conducted GMES security and emergency response projects
- a prototype portal for the management and harmonisation of the different service cases in a secure service network

Website: [www.gmes-gmosaic.eu/](http://www.gmes-gmosaic.eu/)

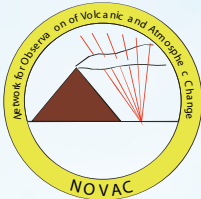


This project consists of a Co-ordinating Action aimed at developing Global Navigation Satellite Systems (GNSS) expertise communities contributing to all the nine societal benefit areas of GEO. The broad objectives of the project are:

1. To consolidate a community of experts interested in the scientific exploitation of GNSS for GEO and GEOSS
2. To explore novel applications derived from GNSS for GEO and GEOSS while enhancing research-industry collaboration to implement these applications
3. To identify the research and technological challenges and define the strategic vision, roadmap and policy for GNSS for GEO and GEOSS available or under development
4. To assess the value of a European GNSS independent constellation (EGNOS-GALILEO) in the support to GEO and GEOSS
5. To promote the public understanding of GNSS for GEO and GEOSS research and use within the GEO community, providing support to the GEO tasks and fostering the application of the Data Sharing Principle

In the disaster areas, positioning and navigational data have an essential role both in the pre-crisis phase and in crisis management, providing vital information on infrastructure and ground slow movements for assessing the geo-hazard risks and real time position of rescue teams to support crisis management. The project intends to explore novel applications to determine enablers of and barriers to the uptake of novel applications by the community

Website: [www.gfg2.eu](http://www.gfg2.eu)



The primary target of the project is to establish a network for measurement of gas emissions from volcanoes, and to use data from this network for risk assessment and volcanological research both locally and on a regional and global scale. The network will be based on a novel type of instrument developed within the EU project DORSIVA and will provide UV absorption measurements from which volcanic gas emission risks can be estimated. The new instrumentation delivers data automatically at high temporal resolution in a way can then be correlated with other observations (seismic data) potentially enabling a much improved volcano risk assessment and also providing new insights in the volcano.

The aim of the NOVAC project is to establish a global network of stations for the quantitative measurement of volcanic gas emissions by UV absorption spectroscopy making use of a novel type of instrument, the Scanning Dual-beam miniature – Differential Optical Absorption Spectrometer (Mini-DOAS) developed within the EU-project DORSIVA. Primarily the instruments will be used to provide new parameters in the toolbox of the observatories for risk assessment, gas emission estimates and geophysical research on the local scale. In addition to this, data are exploited for other scientific purposes than local volcanic gas emissions, e.g. global estimates of volcanic gas emissions, large scale volcanic correlations, studies of climate change, studies of stratospheric ozone depletion. In particular large scale validation of satellite instruments for observing volcanic gas emissions will be possible for the first time, allowing observation of volcanic gas emissions from space to take a significant step forward.

The Scanning Dual-beam Mini-DOAS instrument represents a major breakthrough in volcanic gas monitoring, it is capable of real-time automatic, unattended measurement of the total emission fluxes of SO<sub>2</sub> and BrO from a volcano with a better than 5 minutes time resolution during daylight. The high time-resolution of the data enables correlations with other geophysical data, e.g. seismic data, thus significantly extending the information available for real-time risk assessment and research at the volcano. By comparing high time resolution gas emission data with emissions from neighbouring volcanoes on different geographical scales, or with other geophysical events (earthquakes, tidal waves), mechanisms of volcanic forcing may be revealed.

The spectra recorded by the instrument will also be used to derive data that complement global observation systems related to climate change and stratospheric ozone depletion research. These data are particularly valuable due to the fact that many volcanoes are located in remote areas sparsely covered by existing networks.

The consortium encompasses observatories of 20 volcanoes worldwide, including some of the most active and strongest degassing volcanoes in the world.



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Recognising the need to improve our understanding of the Earth system and enhance our ability for informed decision making for the benefit of our planet and the sustainability of our societies, over 130 governments and leading international organisations are participating in the Group on Earth Observations, or GEO, to coordinate the construction of a Global Earth Observation System of Systems (GEOSS) by the year 2015.

This series of brochures provides a snapshot of the process developed by the GEO to build the GEOSS taking advantage of the international framework of cooperation and of the common vision to share and integrate information with a view to serving nine Societal Benefit Areas.

Examples of contributions from European and the European Commission-funded projects benefiting to the specific societal area or to the GEOSS building blocks are presented in each thematic brochure

GEOSS for Disasters  
GEOSS for Health  
GEOSS for Energy  
GEOSS for Climate  
GEOSS for Water  
GEOSS for Weather  
GEOSS for Ecosystems  
GEOSS for Agriculture  
GEOSS for Biodiversity

Architecture and Data Management within GEO  
Capacity Building within GEO  
Science and Technology within GEO  
User Engagement within GEO

[http://ec.europa.eu/research/environment/index\\_en.cfm?pg=earth](http://ec.europa.eu/research/environment/index_en.cfm?pg=earth)



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