

International review of geo-spatial information and the 7th European Framework Programme

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ABSTRACT: In the field of geo-spatial information has been activated or are coming programs that will influence the research, industry and professional areas at European and International levels in the medium period (10 years). In this paper are discussed the fundamental issues of the GMES programme, the INSPIRE initiative, the GALILEO project, GEO and GEOSS. The presentation includes the presentation of the 7th Framework Programme of the European Commission for the period 2007–2013 with a selection of the possibility to access to budgets allocated, of interest for Geo-Spatial Information.

1 GLOBAL MONITORING FOR ENVIRONMENT AND SECURITY – GMES

The initiative *Global Monitoring for Environment and Security* (GMES) is, with the Galileo programme, the main element of the European Space strategic development.

The GMES initiative was launched in 1998 to bring together both users and suppliers of information derived from satellite observation. GMES has since become a key element in the European space strategy, oriented towards strengthening the Community's ability to acquire high-quality information derived from spaceborne, atmospheric, terrestrial and marine observations integrated with geographical and socio-economic data.

Following endorsement by the EU Council, the Commission and the European Space Agency (ESA) are now implementing the action plan on GMES developed in 2001. The ambitious goal is to achieve a European GMES capacity by 2008; a Steering Committee has been formed with the Member States and other stakeholders to accompany the preparation of a report on the initial phase of GMES development by the end of 2003.

The requirements that drive the implementation of GMES include: openness, federated architecture, simplicity of architecture, scalability, dependability, user-friendliness, data security, quality of service, and global ubiquity of access.

The European Commission's Joint Research Centre (JRC) Directorate-General makes a substantial contribution to the GMES initiative through a wide range of capabilities. It has led the way in the establishment and development of databases of European geo-spatial information, successfully integrating information from satellites into databases as well as a range of other research and monitoring activities.

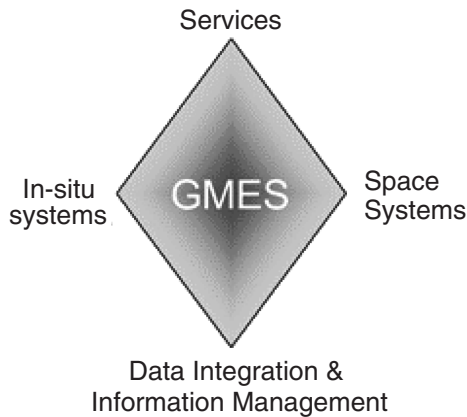


Figure 1. The GMES capacity as represented by the “GMES diamond”, from the Communication from the Commission to the European Parliament and the Council, “Global Monitoring for Environment and Security (GMES): Establishing a GMES capacity by 2008 – (Action Plan (2004–2008))”.

GMES consists of four main components as shown:

- The space component, which includes development and operations of all satellite and ground segment infrastructure providing the required data streams.
- The in-situ component, which includes development and operation of all ground based and airborne data gathering networks. This also includes socio-economic data such as demographic data, industrial output data and epidemiological data.
- Data harmonisation and standardisation, including infrastructure for data assimilation, standardised processing, data fusion, modelling and forecasting and service support infrastructure such as data access, catalogue, archive and customer support facilities.
- User oriented services, including data procurement, information generation and delivery, product quality assurance and monitoring compliance with user domain working practices, standards and legislative requirements.

These four elements have to be considered as interconnected, following a modular approach, to serve the GMES general objectives.

2 INFRASTRUCTURE FOR SPATIAL INFORMATION IN THE EUROPEAN COMMUNITY – INSPIRE

The Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) was published in the official Journal on the 25th April 2007. The INSPIRE Directive entered into force on the 15th May 2007.

The Article 1 of the Directive clearly focuses the objective:

1. The purpose of this Directive is to lay down general rules aimed at the establishment of the Infrastructure for Spatial Information in the European Community (hereinafter referred to as Inspire), for the purposes of Community environmental policies and policies or activities which may have an impact on the environment.
2. Inspire shall build upon infrastructures for spatial information established and operated by the Member States.

The general situation on spatial information in Europe is one of fragmentation of datasets and sources, gaps in availability, lack of harmonisation between datasets at different geographical scales and duplication of information collection. These problems make it difficult to identify, access and use data that is available.

Fortunately, awareness is growing at national and at EU level about the need for quality geo-referenced information to support understanding of the complexity and interactions between human activities and environmental pressures and impacts. The INSPIRE initiative is therefore timely and relevant but also a major challenge given the general situation outlined above and the many stakeholder interests to be addressed.

INSPIRE is complementary to related policy initiatives, such as the Commission proposal for a Directive on the re-use and commercial exploitation of Public Sector Information.

The initiative intends to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services. These services should allow the users to identify and access spatial or geographical information from a wide range of sources, from the local level to the global level, in an inter-operable way for a variety of uses. The target users of INSPIRE include policy-makers, planners and managers at European, national and local level and the citizens and their organisations. Possible services are the visualisation of information layers, overlay of information from different sources, spatial and temporal analysis, etc.

In Europe several Countries have begun the process of realization of the Spatial Data Infrastructure (SDI) based on the following principles:

- Data should be collected once and maintained at the level where this can be done most effectively
- It should be possible to combine seamlessly spatial data from different sources and share it between many users and applications
- Spatial data should be collected at one level of government and shared between all levels
- Spatial data needed for good governance should be available on conditions that are not restricting its extensive use
- It should be easy to discover which spatial data is available, to evaluate its fitness for purpose and to know which conditions apply for its use.

3 GALILEO EUROPEAN GLOBAL POSITIONING SYSTEM

The American Global Positioning System NAVSTAR-GPS is the actual world-wide standard with one major flaw: It is under military control. Being operated by the US Department of Defense, there is always the risk that in times of crisis, GPS will be degraded and/or switched off over specific regions if deemed necessary.

For this reason, the European Community got the decision to build Galileo, a *Global Navigation Satellite System* (GNSS), as an independent, better-performing system under exclusive civilian control.

In 2003 the final decision was made, when ESA and the European Commission agreed on building Galileo in a Private Public Partnership (PPP) with European industry.

The Galileo system will comprise 30 satellites (27 operational and 3 spares), circling the Earth in three distinct orbital planes with 9 + 1 satellites each, at an inclination of 56° and an altitude of 23616 km. Because of the larger number of satellites and more advanced technology (atomic clocks, dual frequencies, etc.), Galileo aims to provide a better availability and accuracy than GPS and will even offer services under the most extreme circumstances.

The available options with Galileo are the following:

- Open Service (OS): Combines open signals, free of charge, interoperable with GPS. Position and timing performances competitive with other GNSS systems.
- Safety of Life Service (SoL): Improves OS performances by providing timely warnings to the user when system integrity is hampered. A service guarantee is envisaged.
- Commercial Service (CS): Provides access to two additional signals, to allow for a higher data rate throughput and to enable users to improve accuracy. A service guarantee is envisaged. This service also provides a limited broadcasting capacity for messages from service centres to users (in the order of 500 bits per second).
- Public Regulated Service (PRS): Provides position and timing to specific users requiring a high continuity of service (also during times of crisis), with controlled access. Two PRS navigation signals with encrypted ranging codes and data will be available.
- Search and Rescue Service (SAR): Will broadcast globally the alert messages received from distress emitting beacons, enhancing the performance of the international COSPAS-SARSAT SAR system.

This bundle of services has been identified to cover the widest range of users' needs, including professional users, scientists, mass-market users, safety of life, and public regulated domains.

3.1 Applications

GALILEO will offer everybody everywhere satellite positioning services with guaranteed reliability in the fields of transportation, road, rail aviation, public transportation, energy, telecommunication, finance, insurance, civil engineering, agriculture, people with disabilities, civil protection, time reference, science, leisure, etc.

4 GEO & GEOSS

Earth observation systems consist of measurements of air, water, and land made on the ground, from the air, or from space. Historically observed in isolation, the current effort is to look at these elements together and to study their interactions.

Producing and managing better information about the environment has become a top priority for the Nations around the world. In July 2003, the Earth Observation Summit brought together 33 nations plus the European Commission and many International Organizations to adopt a declaration that signified a political commitment toward the development of a comprehensive, coordinated and sustained Earth Observation System to collect and disseminate improved data, information, and models to stakeholders and decision makers.

An ad-hoc group of senior political officials from all participating Countries and Organizations, named the Group on Earth Observations (GEO), was formed to undertake this global effort. GEO was charged to develop a *Framework Document* plus a more comprehensive report to describe how the collective effort could be organized to continuously monitor the state of our environment, increase understanding of dynamic Earth processes, and enhance forecasts on our environmental conditions. Furthermore, it was to address potential societal benefits if timely, high quality, and long-term data and models were available to aid decision-makers at every level, from intergovernmental organizations to local government to individuals.

On February 16, 2005, member countries of the Group on Earth Observations (GEO) agreed to a 10-year implementation plan for a Global Earth Observation System of Systems known as GEOSS. The GEOSS project will help all nations involved produce and manage their information in a way that benefits the environment as well as humanity by taking a pulse of the planet.

GEOSS is envisioned as a large national and international cooperative effort to bring together existing and new hardware and software, making it all compatible in order to supply data and information at no cost. The developed nations have a unique role in developing and maintaining the system, collecting data, enhancing data distribution, and providing models to help all of the world's nations.

The European view of GEOSS is GMES, that focuses to integrate the Systems of Systems with a chain of services calibrated on the necessity of Europe and its inhabitants.

Outcomes and benefits of a global informational system will include:

- disaster reduction
- integrated water resource management
- ocean and marine resource monitoring and management
- weather and air quality monitoring, forecasting and advisories
- biodiversity conservation
- sustainable land use and management
- public understanding of environmental factors affecting human health and well being
- better development of energy resources
- adaptation to climate variability and change.

Table 1. Financial Resources of the 7th Framework Programme of the European Commission, 2007-2013 (in millions of euro).

	9 Themes	July 2006
Cooperation	Health	6050
	Food, agriculture and biotechnology	1935
	Information technology & communication	9110
	Nanosciences, nanotechnologies,	3500
	Materials & new production technologies	
	Energy	2300
	Environment (including climate change)	1900
	Transports (including aeronautics)	4180
	Socio-economic sciences and the	610
	Humanities	
	Security & space	Space 1430
		Security 1350
<i>Total Cooperation</i>		32365
Ideas	European Research Council	7460
People	Marie Curie Actions	4728
Capacities	Research and infrastructures	1850
	Research for benefit of SMEs	1336
	Regions of knowledge	126
	Research potential	370
	Science in society	280
	Coherent development of	70
	research policies	
	Activities of international	185
	cooperation	
<i>Total Capacities</i>		4217
non-nuclear actions Joint Research Center (JRC)		1751
TOTAL EC		50521

5 THE EUROPEAN COMMISSION 7TH FRAMEWORK PROGRAMME 2007–2013

The Seventh Framework Programme (FP7) is the world's biggest single publicly funded research programme and is the main funding mechanism for supporting collaborative Research and Technological Development in the EU. It will run from 2007–2013, with a budget of E53.2 billion, which represents the third largest item in the EU budget.

The 7th FP is articulated in four programmes:

- **Cooperation** supports all types of research activities carried out by different research bodies in trans-national cooperation and aims to gain or consolidate leadership in key scientific and technology areas: Health, Food, Agriculture and Biotechnology, **Information technology & Communication**, Nanosciences, Nanotechnologies, Materials & new Production Technologies, Energy.

- **Environment (including Climate change)**, Transports (including aeronautics), Socio-Economic Sciences and the Humanities, **Security & Space**.
- *Ideas*, Investigator-driven **frontier research**, within the framework of activities commonly understood as basic research, is a key driver of wealth and social progress, as it opens new opportunities for scientific and technological advance, and is instrumental in producing new knowledge leading to future applications and markets.
- *People*, The FP7 programme's activities will be based on the long and successful experience of the **Marie Curie actions** and will cover all stages of a researcher's professional life, from initial research training to life-long learning and career development.
- *Capacities* programme aims to enhance research and innovation capacities throughout Europe and ensure their optimal use.

To the programme Cooperation the 64% of the budget (32,265 billions of euro) is allocated, Ideas 15% (7,460 billions), People 9.5% (4,728 billions) and Capacity 7.8% (4,217 billions) (Table 1).

The Programme will have a continuous upgrade and two intermediate reviews will be done in 2009 and 2011.

5.1 *Topics of interest in the GeoSpatial Information*

Among the nine basic themes of the 7th FP, the following are of main interest in the GeoSpatial Information.

5.1.1 *Information technology & Communication (Theme 3)*

The objective is the improving of the competitiveness of European industry and enabling Europe to master and shape future developments in ICT so that the demands of its society and economy are met. ICT is at the very core of the knowledge-based society. Activities will strengthen Europe's scientific and technology base and ensure its global leadership in ICT, help drive and stimulate product, service and process innovation and creativity through ICT use and ensure that ICT progress is rapidly transformed into benefits for Europe's citizens, businesses, industry and governments. These activities will also help reduce the digital divide and social exclusion.

The topics of the GeoInformation are important part of several activities concerning ICT.

5.1.2 *Environment (including Climate change) (Theme 6)*

The main objective of environment research under FP7 is to manage both the man-made and natural environment and its resources. By increasing the knowledge on the interaction between the climate, biosphere, ecosystems and human activities, new environmentally-friendly technologies should be developed.

Funded actions should focus on:

- predicting climate, ecological, earth and ocean systems changes;

Table 2. Directorates Generals of reference for GeoSpatial Information in the European Commission and Founding schemes in supporting trans-national cooperation.

DGs of reference in the EC	Founding Schemes
DG: <i>Environment</i> (Env. & Global Change)	Collaborative Projects (small to medium/large/ targeted to specific groups)
DG: <i>Industry & Enterprise</i> (ICT, Energy, etc.)	Networks of Excellence
DG: <i>Information Society & Media</i> (ICT & INSPIRE)	Coordination and Support Actions
DG: <i>Research</i> (GMES & INSPIRE)	Support for Frontier Research (ERC)
	Research for the Benefit of Specific Groups
	Support for Training and Career Development of Researchers (Marie Curie)
	Joint Technology Initiative

- tools and technologies for monitoring, prevention and mitigation of environmental pressures and risks including on health;
- sustainability of the natural and man-made environment.

5.1.3 *Security & Space (Theme 9)*

Security and Space are grouped together but with separate budget.

The objectives of the **Security** theme are:

- to develop technologies and knowledge needed to ensure the security of citizens from threats such as terrorism and (organised) crime, natural disasters and industrial accidents while respecting fundamental human rights;
- to ensure optimal and concerted use of available and evolving technologies to the benefit of civil European security;
- to stimulate the cooperation of providers and users for civil security solutions; improving the competitiveness of the European security industry and delivering mission-oriented results to reduce security gaps.

The aim of the **Space** theme under FP7 is to support a European Space Programme focusing on applications such as ‘Global monitoring for environment and security’ (GMES) with benefits for citizens and for the competitiveness of the European space industry.

This will contribute to the development of a European space policy, complementing efforts by Member States and by other key players, including the European Space Agency (ESA).

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