Global Monitoring for Environment and Security

Background

1. Recent years have confronted mankind with many natural as well as man-made catastrophes: Tsunami in Indonesia, the hurricane Katrina that devastated New Orleans, the bomb explosions in the London subway, the water pollution of Danube River and many others. Actually, technology has advanced and has brought many methods for early warning, for prevention and rescue operations. Important however is timely information to be used in cases of disasters. This has been recognized by the European authorities and led to the creation of the initiative Global Monitoring for Environment and Security (GMES).

2. GMES is a common concept of the European Commission (EC) and European Space Agency (ESA) initiated in 1998 and endorsed in 2001. Politically, the programme should ensure European independence in critical data sources and is considered a European flagship programme after the Galileo navigation system. A challenge for GMES is to gather relevant spatial and aerial images and in-situ measurement data and to provide innovative, cost-effective, sustainable and user-friendly services. They will enable decision-makers to better anticipate or integrate crisis situation issues related to the management of environment and security. GMES can assist through improved prediction, monitoring and assessment capabilities, in the preparation of strategies to cope with natural hazards and human made disasters, thus contributing to the reduction of the resulting economic losses.

Expected results from GMES

3. According to the Final Report for the GMES Initial Period (2001-2003) “the geo-hazards, floods, earthquakes, windstorms and droughts have been identified as the most costly for Europe in terms of humanitarian costs (people killed) and related damages (people affected). Considering these hazards together with extreme temperatures, forest and scrub fires, and volcanic eruptions, GMES could reduce the overall risk and therefore losses of life and losses due to damage by improved monitoring. The goals of GMES can be described as:

• **Informational:** Creation of a ‘European Shared Information System’ for exchanging of a wide range of useful information on environment and security matters.

• **Collaborative:** To bring data and information providers together with users, so they can better understand each other and agree on how to make environmental information available to the people who need it.
• **Organizational:** To make a permanent dialogue by creating a specific authority and funding framework. GMES is driven by the need to improve the monitoring of the European and global environment in view of pursuing the sustainable management of our resources and the security of the citizen.

4. Currently GMES has 3 fast track services (FTS) that are in the developmental stages. These are Ocean FTS, Land FTS and Emergency FTS. Gradually, more services such as Atmosphere FTS and Security applications will be added to the portfolio. GMES is fast moving towards an operational phase. The key to providing operational GMES services is to have an appropriate governance and business model structure in place which supports provisioning of these services. With this in mind, European Commission has commissioned a 30 month research project named BOSS4GMES that would recommend appropriate business models and governance structure for GMES.

**Space Missions**

5. There is a planned first series of three earth observation missions called **Sentinels.** Each mission will be based in a two satellite constellation which fulfils coverage and other requirements. First planned missions are:

- Sentinel 1 will be equipped with Synthetic Aperture Radar (SAR) that will measure altimetry data.
- Sentinel 2 will provided high resolution optical data for land and emergencies services.
- Sentinel 3 will provide optical and microwave observation for marine and land services.

Two more Sentinel satellite are foreseen for later deployment for atmospheric chemistry monitoring.

**GMES Users**

6. Everybody could benefit from GMES: Public sector organisations may access reliable, timely and cost effective information on environment and security issues to manage their policy implementation. Scientists may benefit by better access to data for their research work which could be on climate and environmental pressures. Industry may become an operator in the value chain, or can use new environmental and security information for higher quality services or products. Citizens, as the main users, can directly view high quality data for weather forecast, for assessing their exposure to risk, for exercising their democratic rights. The Fig1 presents the GMES users. The major benefits for GMES users can be described as:
• Enhanced cost effectiveness in collecting information required by the policy or laws, which includes integration of national data collection networks.

• More accurate decisions with respect to allocation of resources, determination of best practices and identification of policy targets.

• Expansion of capabilities in areas where reliable information was formerly not available;

• Improved citizen participation in democratic processes, or enhanced trust in government data.

---

**Fig 1: GMES users**

**GMES Organization**

7. Two major entities are set up: the Advisory Council, to guarantee "political ownership" of GMES, and the GMES Bureau, in charge of implementation.

• **The GMES Advisory Council** brings together representatives from the EU/ESA Member States, the European Commission and ESA, as well as other stake-holders on an ad-hoc basis: relevant international organisations, representatives of end-users, industry, service providers, research organisations and universities. Members are supposed to be
high-level, authoritative individuals with decision-making capability in the sector, who should be able to contribute with significant advice and to influence the stakeholders in planning operational and research programmes related to GMES. The main missions of the GMES Advisory Council is to provide strategic guidelines for integration of the users with the services, for the harmonization of the data and for interoperability. It also will coordinate the European and national activities relevant to GMES and will facilitate the establishment of partnerships for the development of the GMES services.

• **The GMES Bureau** was established in the European Commission to develop a federated and structured demand for Earth Observation (EO) data and information and to ensure the delivery of fast track EO services by 2008. The structure of the Bureau is unique, gathering staff from the Commission’s Directorates-General for Enterprise and Industry, Research, Environment, Information Society, Agriculture, Rural Development, Fisheries and Maritime Affairs, as well as the Joint Research Centre. GMES Bureau is also responsible for the GMES governance structure and longer-term financial sustainability. One of the further activities of this body is to develop proposals for managing GMES service, provision beyond the Commission. This will include other EU institutions and bodies, Member States and inter-governmental organisations.

**The Time Line of GMES**

8. In May 1998, GMES was launched by the European Space Agency and European Union Council with the so-called “Baveno Manifesto”. Only after its formal adoption in 2001, its Initial period (2002-2003) started. Its **Strand 1**, called “Deliver to Learn”, dealt with Information and Services, realized by thematic projects and the consolidation phase of the ESA GMES Services Element (GSE); **Strand 2** - “Assess to Structure” - followed with assessments and recommendations, published in the GMES Initial Period final report. The **Implementation Period (2004-2008)** followed with the EC’s publication of a communication to the Parliament and the Council outlining the Action Plan 2004-2008. Activities during the implementation period are based on four interrelated components, called GMES diamond:

![GMES diamond](image)

Fig 2 : GMES diamond
The **Operational phase (2008 onwards)** of GMES is continuing the services improvement by upgrades; building, launching and flying the space component; expanding in-situ networks; running the data centre’s **GMES**.

**Services provided by GMES**

9. GMES provides different services in the area of environment and security. There are three major services which might be outlined as:

- **Mapping**, including topography or road maps but also land-use and harvest, forestry monitoring, mineral and water resources that do contribute to short and long-term management of territories and natural resources.

- **Support for emergency management** in case of natural hazards and particularly civil protection institutions responsible for the security of people and property.

- **Forecasting** is applied for marine zones, air quality or crop yields.

In the initial period of GMES the following areas were considered:

- Marine & coastal environment
- Risk management (floods & fires)
- Risk management (subsidence & landslides)
- Air pollution (local to regional scale)
- Land cover state and changes
- Forest monitoring
- Food security
- Global change issues
- Maritime security (transport, coastal, ice-monitoring)
- Humanitarian aid

10. After having some practical experience, GMES started the development of three fast track services:

**Land Monitoring Core Service (LMCS)** – Provide core land cover data for delivering timely, relevant information on land use and land cover changes for a number of targeted policy areas.
• **Marine Core Service (MCS)** – Need for European capacities for: International treaties and European policies, marine resources exploitation, transport & offshore operations, hazards & pollutions, coastal management, seasonal climate prediction, marine research

• **Information Service in Response to Crises, Disasters and Emergencies (INSCRIT)** – Enhance European capacity to respond to crises and emergencies associated with natural and man made disasters (e.g. floods, fires, earthquakes, landslides, tsunami, industrial accidents), through relevant and timely information (Europe and World).

### Participation of Central and Eastern European Countries in GMES

11. In the aspect of EU enlargement processes, Central and Eastern Europe Countries (CEEC) are very specific and important part of Europe. First, the geographical allocation of the region needs special attention. Problems as the illegal people traffic, floods, earthquakes, hailstorms are only part of the disasters and catastrophes in the region. Second, the EU enlargement process concerns very much CEEC. Some of the countries are old member states (Greece), some are EU members since 2004 (Czech Republic, Cyprus, Malta, Slovakia and others), others are since 2007 (Bulgaria and Romania); there are also acceding countries (Turkey and Croatia) and potential candidate countries (Western Balkans). All those countries should be prepared for the EU challenges, initiatives and programmes. Third, there are many advanced research institutes in the region and many European data/service providers expand their markets in the region. All those factors will transform CEEC in important participant in GMES projects in the near future. This paragraph describes the participation of CEEC in GMES as analyses the following two indicators:

- Number of GMES projects in CEEC;
- Number of organizations from CEEC involved in GMES

### Number of GMES projects in CEEC

12. A total of 19 countries from the region were analyzed. The results are presented in the graph below:

Based on the graph several conclusions might be done:

- The average participation rate of CEEC in GMES projects is 3.42 projects per country.
- The most active countries in GMES projects in the region are the member states since the enlargement 2004. Among them Poland comes into the position of leader, followed by Czech Republic and Slovenia. The average participation rate of those countries is 4.3 projects per country.
The average participation rate of the newest members states since EU enlargement process 2007 (Bulgaria and Romania) is 2.5 projects per country which is much below the average rate for the region.

Fig 3: GMES projects in Central and Eastern European Countries

- Among the acceding countries, Turkey has a majority in GMES projects participation.
- Among the other countries, Russia registers sufficient number of GMES projects.

Promoting GMES in CEEC

13. The analysis clearly shows that CEEC need more information about GMES. In fact, some projects for the promotion of GMES are underway, with a few concentrating on Central and Eastern Europe. The major and "official" GMES dissemination project is GENACS - GMES European wide Network Assistance and Coordination Support. GENACS’s main objective consists of raising awareness of GMES in EU Member States and most particularly in New European Union Member States. It is due to historical reasons that ‘old’ EU Member States are working together on GMES issues. Representatives of Central and Eastern Europe participate in two actions to better promote GMES. One of them is GMES-Poland - Promoting of Polish participation in GMES. The project aims are:
• Support for participation of Polish institutions in GMES thematic projects and introduction of institutions from other candidate countries into these projects.

• Support for growth of user segment of GMES-related projects.

A similar GMES promotional project is needed for the region of CEEC. It should be based on the experience and results from the mentioned projects. Also it should reflect the special futures and characteristics of the region.

**Financing of GMES**

14. There are four major ways for financing GMES projects:

• European Commission

• European Space Agency

• National contribution

• Users – industrial data providers and data service providers in the fields of environment and security

EC can finances GMES projects via the Framework Programmes (FP). The key objective of the ongoing Framework Program Seventh (FP7) is to support the achievement of the Lisbon goal and namely: “By 2010 Europe should become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion.”

There are four specific programmes in FP7:

• **Cooperation**: Trans-national cooperation on policy-defined themes.

• **Ideas**: Investigator driven research based on the initiative of the research community.

• **People**: Support of individual researchers.

• **Capacities**: Support of research capacities.

GMES projects belong to the specific programme Cooperation which consists of several thematic areas. The following diagram presents the thematic areas in FP7 relevant to GMES:
Improvement of the Union’s response capacity to disasters

15. The European Commission presented on the 5th of March 2008 its recommendations to improve the European Union’s response, to disasters, natural or man-made, within EU boundaries and abroad. Major disasters, such as the tsunami in the Indian Ocean in December 2004, the 2006 war in Lebanon, forest fires and floods in Europe in the summer of 2007 and the increasingly frequent disasters caused by climate change have shown the need for the EU to have a rapid and effective response capacity. The approach adopted by the EU combines prevention and disaster relief and brings together all policies, instruments and services at the EU’s and Member States' disposal to work as a team. The Commission has begun the assessment of its own role in the EU response to emergencies, crises and disasters. A task force has been set up to help it provide the most effective response. At a wider scale, to reach a more coordinated EU response, the Commission suggests:

(a) Greater coherence, effectiveness and visibility of European action: In the event of a major natural disaster, the Commission recommends greater rationalization of coordination between itself, the Presidency, Member States and
the High Representative for the Common Foreign and Defence Policy, both in Brussels and on the ground. To this end, it suggests real-time exchange of factual information and the setting up of joint planning and operational teams.

(b) Reinforcing the Community Civil Protection Mechanism: The Monitoring and Information Centre (MIC) should be built up into an operational centre for European civil protection intervention which can predict emergency situations or provide follow up in real time. This change includes setting up an early warning system and the use of monitoring capabilities such as those developed under GMES (Global Monitoring for Environment and Security).

(c) Reinforcing European humanitarian aid: The Commission proposes identifying existing gaps in the delivery of European and international humanitarian aid through a mapping study on logistical capacity.

(d) Capacity building across Community policies and instruments: The Commission proposes the creation of a European disaster response training network.

Shared Environmental Information System

16. Timely, reliable and relevant information on the state of environment is essential for sound policies and should be made available to all and be easily understood. To this end the Commission proposes to improve, modernize and streamline the present information systems by establishing a European Shared Environment Information System (SEIS), a collaborative initiative of the European Commission and the European Environment Agency (EEA) to establish together with the Member States an integrated and shared EU-wide environmental information system. The objective of this system is to tie better together all existing data gathering and information flows using modern tools such as the internet and satellite technology. Today, a large amount of environmental data is thus collected by various levels of public authorities throughout the EU and this bulk of information is neither made available in a timely manner nor in a format that policy makers and the public can readily understand and use. The Shared Environmental Information System (SEIS) will allow environmentally-relevant data and information to be stored in environmental databases throughout the European Union and be interconnected virtually and be compatible. Thus, the SEIS is a decentralized but integrated web-enabled information system based on a network of public information providers sharing environmental data and information. Information and communication technology will enable real-time data to be made available to decision-makers and allow them to make immediate and life-saving decisions. Recent experiences of forest fires, floods and droughts show how much timely environmental information can make a difference during an emergency. Tackling today’s environmental challenges such as water scarcity, preserving ecosystems and biodiversity, and adapting to climate change depend on the assessment of data from a variety of sectors and sources.
Conclusions

17. GMES is an important European initiative and will benefit all identified users after starting the first real services this year. The programme still needs more promotion in Europe, especially in the region of SEE. Poland is the most advanced country, but even here, no real actions seem to happen, apart from very active research participation. The stakeholder group is however much larger than the research participants, and in particular national governments in many countries of the East have to receive better information about the GMES initiative. So, GMES needs clearly more awareness building in these countries that GMES can be linked to national strategy, and in turn, national strategy is directed versus GMES and possibly other European programmes. Before GMES can eventually reach the citizen, the private sector has to take an active part. It is not only the public administrations that have an obligation to follow the European Programmes such as GMES, but the private sector has to realize the opportunities that lie in such programmes for future and innovative services and revenue creation.