

GMES, the second flagship

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The Global Monitoring for Environment and Security (GMES) initiative, launched in 1998 by the European Commission (EC), ESA and national space agencies, is often overshadowed by what is perceived to be the flagship program of European space, Galileo. As a matter of fact, GMES is just as important, and faces many similar challenges.

The launch of GMES was motivated by comparable strategic goals. First, it will increase Europe's autonomy, by providing independent access to space data and enabling independent decision-making (GMES will deliver information in six areas: Land, Marine, Atmosphere, Emergency Response, Security and Climate Change). Second, it will strengthen the EU contribution to global knowledge on climate change, as GMES will be the European contribution to the Global Earth Observation System of Systems (GEOSS). Last but not least, GMES is expected to provide major societal and economic benefits to the EU citizens, in line with the Europe 2020 strategy.

However, unlike Galileo, GMES is more than a space infrastructure. It is conceived as a system of systems, combining existing and future Earth Observation (EO) satellites, airborne sensors and ground stations to provide comprehensive and unified EO data "to better manage the environment, understand and mitigate the effects of climate change and ensure civil security"¹. GMES will rely on three components: Space, In-Situ and Services². As such, GMES is a user-oriented project, aiming at responding to user communities needs.

This paper will focus exclusively on the space-related aspects of GMES. The GMES Space Component (GSC) comprises existing systems such as Spot and Cosmo-Skymed, as well as the future Sentinel series. The procurement contracts for six Sentinels have been awarded³, and the launch contract for the first one was won by Arianespace in December 2010.

As a consequence, GMES is already delivering services, unlike Galileo which relies entirely on the launch of new spacecraft. The GMES pre-operational phase⁴ was launched in 2008, and the operational phase is expected to start by 2014. In September 2010, a Regulation providing the legal basis for the GMES program and its funding by the EC was adopted for the period of initial operations (2011-2013)⁵.

GMES demonstrates the EU political will to become an international space actor, as well as the difficulties to get there. At structural level, GMES is confronted with governance and funding problems customary to the European Space Policy (ESP) (1). At policy level, the security and commercial implications of GMES remain to be defined (2). However, GMES is also the expression of a strong EU leadership at international level, in particular in the global fight against climate change (3).

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Governance and funding issues

GMES is confronted with structural governance and funding obstacles somewhat similar to Galileo's. The uncertainties surrounding the future of the GMES Space Component illustrate these issues.

A complex governance architecture

The great number and diversity of stakeholders explain the complexity of the GMES governance architecture. Indeed, besides the traditional space actors in Europe (the EC, ESA, national space agencies and EUMETSAT) comes a number of EU agencies⁶, regions, intergovernmental agencies⁷ and end users⁸. The program is also divided in five sequential phases⁹ that have each a different governance structure. A GMES Bureau was set up in 2006 as a coordination platform to tackle these problems, but it lacks efficiency due to limits in its mandate, resources and institutional settings¹⁰. One has to hope that the setting up of the adequate governance scheme for such a complex project will prove to be a progressive and iterative process...

The Regulation adopted in September 2010 to set up the initial GMES operations phase (2011-2013) clarified the governance structure. Most importantly, it confirmed the division of tasks between the EC, who exerts political leadership and holds responsibility for the overall management of the program, and ESA, who will be responsible for technical knowledge and capability of the GSC, relying on EUMETSAT when necessary. The EC will be assisted by a series of management bodies¹¹. At the implementation level, the Space Component is led by ESA, the Service Component is implemented by the EC and the In situ Component is coordinated by the European Environment Agency (EEA).

A number of governance issues remain open. The most structural one is the splitting of strategic decisions between ESA and the EC. The two institutions have different decision-making bodies, mechanisms and schedules, which is a hindrance to coordination¹². All in all, it seems necessary to strengthen the continuity and the stability of the institutional set-up by defining more precisely, for instance, the role of each stakeholder¹³. A related and important pending issue is that of the ownership of the Sentinel spacecraft once operational. Let's also bear in mind that the governance architecture might be modified again once the operational phase starts in 2014 and that a new agreement between the EC and ESA will be needed to specify the attribution of tasks for the operation of the GSC¹⁴. All in all, GMES has to be considered as a "test case": the EU and ESA have to learn working together, and lessons drawn from their cooperation on GMES will certainly be helpful for the overall future evolution of the European space governance.

An incomplete funding strategy

The funding of the program is fully public -and therefore closely linked to governance. So far, €2,3 billion have been spent for the GSC¹⁵ (72% by ESA Member States and 28% by the EC)¹⁶ and €500 million for the Service and the In situ Components (by the EC) . The recent Regulation added a further €107 million for GMES initial operations between 2011 and 2013, as well as €209 million from FP7 for research programs accompanying the initial operations¹⁷.

It is clear however, that additional funding will be needed before the beginning of the operational phase in 2014. The GMES Bureau estimates that an annual €819million¹⁸ will be necessary to ensure the operational sustainability of GMES¹⁹. While the EC is expected to bear these costs, its constraining financial rules will likely make it difficult to find the money before the beginning of its next Multiannual Financing Framework (MFF) in 2014. This raises the more general problem of elaborating adequate funding solutions for ambitious space programs involving the EU. In its recent mid-term review on Galileo, the EC pointed out the inadequacy of the EU budgetary framework to conduct projects running over several decades²⁰. This statement can be applied to GMES as well. In this perspective, the GMES Regulation urged the EC to submit a long-term financing strategy for the future MFF during the first semester of 2011.

The uncertain future of the GMES Space Component

The difficult building-up of the GSC is a concrete manifestation of the governance and funding hurdles of the program. Contrary to Galileo, the procurement of the hardware went without controversy, as the workload was split between the two main space manufacturers in Europe, EADS and Thales Alenia Space²¹. However, funding the GSC was a difficult endeavor, given the different procurement rules at ESA and the EC. A specific agreement had to be negotiated between both institutions, imposing some restrictions on procurements²². In addition, ESA made it clear that it will not be able to contribute to the funding of the C series of the Sentinel spacecraft, due to its policy as an R&D-oriented organization funding prototypes and not operational systems²³. This could lead to an unbearable cost increase for the EU, and possibly to a gap in the continuity of data and services.

In this context, the central focus put on the GSC (that concentrates 80% of the total funding) might have been detrimental to the user-oriented nature of GMES. As a matter of fact, the lack of an adequate link between the end-users and the actors involved in the technical implementation of the program was identified as a main weakness²⁴. In general, user-governed entities such as EUMETSAT play a key role in the transition of space programs to the operational phase²⁵. As GMES is currently in a pre-operational phase, it could be useful not only to reinforce the role of such entities in the overall governance framework, but also to ensure that the Sentinels are designed to fulfill user requirements. While this aspect has been insufficiently considered until now, putting the end-users at the centre of the game is necessary to ensure both the scientific and commercial success of GMES, as end-users are usually willing to pay for the fulfillment of their requirements.

Commercial and security issues

The setting-up of competitive downstream markets is indeed a contentious issues within GMES, as is the use of GMES for security applications.

The lack of commercial perspectives

A general orientation of the ESP is to focus on space applications to foster the development of downstream markets in a user-driven approach, in particular by including SMEs. The contribution of space to the construction of a European knowledge-based society was acknowledged by the 5th Space Council. All subsequent EU documents on GMES highlight the priority of developing viable downstream markets for EO applications, in order to fully reap the social and economic benefits of the program.

However, the growth of such commercial markets is strongly dependant on the public sector for three main reasons: public authorities set the legal and regulatory framework, they are large clients of EO products and they conduct general policies to influence market demand²⁶. This is reflected in the architecture of the GMES Service Component, defined in the "Munich Road-map"²⁷: a distinction is made between Core Services, providing standardized multi-purpose information for a broad range of European institutional actors, and Downstream Services, derived from products from the Core Service and fulfilling more specific information needs. As a European public good, the Core Services would be entirely publicly funded, while the Downstream Services would be developed for and paid by the end-users. As such, the business case for GMES end-user services is "to improve the efficiency of the downstream sector by providing access to basic processed and modeled products more cheaply than would be the case if each company had to undertake the basic processing and modeling"²⁸. At the end of the day, GMES is primarily a public service, in which publicly-owned observation infrastructure produce a first set of data, the Core Services, destined to public users. Meanwhile, the development of Downstream Services is supposed to foster commercial applications.

The major obstacle to this scheme is the absence of a coordinated private offer for commercial EO services. Despite the potential demand for EO products, the market in Europe is still fragmented and composed of small-size companies that cannot offer integrated solution to customers. Another difficulty is that end-users will mostly be public institutions. As a consequence,

they might have to pay for Downstream Services although they would already contribute to the financing of Core Services²⁹. Finally, no reliable market analysis is currently available, which makes it difficult to calculate potential future revenues from private customers.

A related issue is the definition of an adequate data policy, which should guarantee the continuity and the reliability of the data flow, facilitate commercial developments and take into account security restrictions. There is an important distinction between the data policy for the Sentinel missions and for the contributing missions. The former is based on the principles of free and open data access as adopted by ESA Member States in September 2009 and confirmed by the EC in the recent GMES Regulation. This policy is “intended to stimulate the uptake of information based on EO data for end-users”³⁰. The data policy for existing space components is more complex, as it implies a great number of assets owned by a large variety of stakeholders. ESA and the EC launched a formal dialogue with the concerned Member States to elaborate a long-term data access scheme³¹.

Defining the “S” in GMES

GMES initially stood for “Global Monitoring for Environmental Security”, but in 1999, only one year after the launch of the program, it was renamed “Global Monitoring for Environment and Security”, thus broadening its scope to all security-related issues. However, similar to Galileo, the potential security applications of GMES represent a controversial issue within the EU, which has already led to delays in the program.

The definition of GMES security applications had to take into account both the rising demand from certain Member States for security services and the reticence of others in this field, while keeping in mind that GMES is defined as a civilian program under civilian management. A GMES Working Group on Security was set up in 2002, and identified five security-related policy areas where GMES could contribute: prevention and response to crisis related to natural and technological risks; humanitarian aid and international cooperation; conflict prevention and treaty monitoring; surveillance of borders; and Common Foreign Security Policy/Common Security and Defense Policy (CFSP/CSDP)³². This large array of activities is consistent with the redefinition of the concept of security after the Cold War which was enshrined in the European Security Strategy³³, moving away from a narrow military and defense perspective towards a broader scope of security.

Despite this initiative to define the security aspects of GMES, the question remains open. On the one hand, the EC is sending contradictory signals, highlighting the potential contribution of GMES to CSDP in certain documents, while stating in a recent communication that “for the foreseeable future it is not foreseen to give GMES a defence dimension”³⁴. Other EU institutions, such as the European Parliament emphasized « the importance of GMES for foreign as well as security and defence policies of the European Union »³⁵. On the other hand, the demand from certain Member States for security-related services is high, as testified by their request to launch a pilot service called G-MOSAIC (GMES services for Management of Operations, Situation Awareness and Intelligence for regional Crisis) in addition to the four pre-operational services³⁶. Currently, the security dimension of GMES is still being discussed in the frame of the Structured Dialogue on Space and Security involving all relevant stakeholders and three priority areas were already identified: border surveillance, support to external action and maritime surveillance³⁷.

All in all, GMES security aspects are a highly political question, and developments in this field are closely tied to the overall progress of the CFSP, which will greatly depend on the effective setting up of the European External Action Service (EEAS). The EEAS will indeed have the crucial task of ensuring continuity between policies, strategies, capability developments and operations in the field. In particular, its Crisis Management Planning Directorate (CMPD) will be responsible for the strategic and political planning, including both civilian and military aspects. As such, it will have the responsibility to define the “S” in GMES more precisely. The political mandate to reach this goal is clearly laid down in the recent 7th Space Council Resolution.³⁸ In this perspective, GMES is destined to become a responsive and integrated component of a broader “system-of-systems” providing space capabilities for crisis management.

An expression of European leadership

GMES will reinforce Europe's position on the international scene. First, GMES is the most ambitious integrated EO program to date from a technological and scientific point of view. Indeed, it intends to tackle crucial weaknesses of the EO sector, namely meeting the daily needs of users, ensuring data continuity and distributing space-based data in an integrated information system³⁹.

Second, GMES is the strongest contribution to the Global Earth Observation System of Systems (GEOSS). GEOSS is the leading international initiative to pool worldwide EO capabilities. It is managed by the Geneva-based GEO (Group on Earth Observation), comprising 85 governments, the EC and 61 participating international organizations. GEO will address nine areas of critical importance: disasters, health, energy, climate, water, weather, ecosystems, agriculture and biodiversity. These threats are transnational by nature, which requires transnational answers. GMES will provide a powerful instrument to tackle these challenges, and therefore constitutes a major political contribution to global governance. However, the concrete links and interfaces of GMES services with GEOSS have still to be defined⁴⁰.

Finally, GMES will also serve as a foreign policy tool for the EU. This is shown by the "Lisbon Declaration on GMES and Africa" of December 2007. As part of the joint EU-Africa strategy, this initiative contributes to the objectives of sustainable development, stability and humanitarian aid for Africa.

Conclusion

A series of challenges remains to be addressed to ensure the sustainability of the GMES program. They focus in particular on the completion of an adequate data policy, the establishment of a governance framework for the operational phase, the efficient integration of GMES into the CFSP, the securing of sufficient funding after 2014 and the better involvement of end-users.

These questions all reflect the overall structural constraints of the ESP, and similar to Galileo, the full operational servicing of GMES can be viewed as a test case for the future of the European space effort. The strong political support to GMES voiced by many Member States, coupled with the growing political role played by the EC within the program, seems to indicate that Europe will stand up to its ambitions. While the setting-up of such a complex program is by nature a slow and progressive endeavor, the tremendous benefits that are expected to arise from GMES certainly constitute a strong driver to move forward.

1. Aschbacher, Josef and Maria P. Milagro Pérez. « GMES – Status review and policy developments », in Schrogl et. al. (Eds.), Yearbook on Space Policy 2008/2009: Setting New Trends, Vienna, Springer, 2010, p. 188.

2. Aschbacher, Josef; Beer, Thomas; Ciccolella, Antonio; Pilar Milagro, M.; Paliouras, Eleni. « Observing Earth, for a Safer Planet. GMES Space Component: status and challenges » ESA Bulletin 142, May 2010.

3. The six satellites are Sentinel 1A/B, 2A/B and 3A/B.

4. Four Core Services were officially launched at the 2008 GMES Forum in Lille: Marine monitoring, Land monitoring, Atmosphere monitoring, and Emergency Response.

5. Regulation (EU) No. 911/2010 of the European Parliament and of the Council of 22 September 2010 on the European Earth monitoring programme (GMES) and its initial operations (2011 to 2013).

6. Such as EDA, FRONTEX, EUSC, EMSA, JRC or EEA.

7. Such as the European Centre for Medium-range Weather Forecasting (ECMWF).

8. European Parliament, Directorate General for Internal Policies. « The EU Programme for Global Monitoring for Environment and Security (GMES) : governance and financing. », PE 429.985, December 2009. pp. 39-43.

9. These are: the Initial Period (2001-03), Implementation Period (2004-08), Pre-operational phase I (2008-11), Pre-operational phase II (2011-13) and GMES operational phase (2014-).

10. European Parliament. Directorate General for Internal Policies. op. cit. pp. 36-37.

11. These are the GMES Committee, the User Forum and the GMES Partners Board.

12. Aschbacher, Josef and Maria P. Milagro Pérez, op. cit. p. 197.

13. European Parliament. Directorate General for Internal Policies. op. cit. p. 52.

14. Aschbacher et.al., op. cit.
15. The breakdown is the following: €268 million at the 2005 ESA Council, €522 million through a subscription by ESA Member States in 2007, €626 million through the EC's FP7 in 2008/09 and €831 million at the 2008 ESA Council.
16. Aschbacher et.al., op. cit. p. 28.
17. Regulation (EU) No. 911/2010, op. cit.
18. The breakdown is the following: €70m for the in-situ component, €149m for the service component and €600m for the GSC (development, launch and operation of the Sentinel satellites).
19. European Commission. GMES Bureau. « EU financial needs for the GMES Programme beyond 2013. » PB-02-DOC03. October 2010.
20. Aschbacher et.al., op. cit. pp. 28-29.
20. European Commission. « Mid-term review of the European satellite navigation programmes. » COM(2011) 5 final, 18 January 2011.
21. Thanks to their respective areas of expertise, EADS was awarded the contracts to build the optical Sentinel 2 A/B and TAS is manufacturing the SAR Sentinel 1 A/B and the ocean observation spacecraft Sentinel 3 A/B.
22. Aschbacher, Josef and Maria P. Milagro Pérez, op. cit. p. 198.
23. de Selding, Peter B. « Funding Issue Throws GMES Continuity Plan in Doubt » Space News, 9 September 2010.
24. European Parliament. Directorate General for Internal Policies. op. cit. p. 52.
25. EUMETSAT. « EUMETSAT contribution to discussion on governance of space activities in Europe. » EUM/SIR/REP/10/0371 v10, 12 July 2010.
26. European Parliament. Directorate General for Internal Policies. op. cit. p. 63.
27. German Federal Ministry of Transport, Building and Urban Affairs. « The Way to the European Earth Observation System GMES – The Munich Roadmap. » 17 April 2007.
28. European Parliament. Directorate General for Internal Policies. op. cit. p. 63.
29. Ibid.
30. Regulation (EU) No. 911/2010, op. cit.
31. Aschbacher et.al., op. cit. pp. 27.
32. « The Security Dimension of GMES. » Position Paper of the GMES Working Group on Security, 29 September 2003.
33. Council of the European Union. « A Secure Europe in a Better World. European Security Strategy. » Brussels, 12 December 2003.
34. European Commission. « Communication. Global Monitoring for Environment and Security (GMES): Challenges and Next Steps for the Space Component. » COM(2009) 589 final, 28 October 2009.
35. European Parliament. « Resolution on Space and Security » 2008/2030(INI). 10 July 2008.
36. European Parliament. Directorate General for Internal Policies. op. cit. p. 28.
37. European Commission. GMES Bureau op. cit.
38. Council of the European Union. « 7th Space Council Resolution. Global Challenges: Taking Full Benefit of European Space Systems » Brussels, 25 November 2010, para. 19 and 20.
39. OECD. « Space 2030. Tackling Society's Challenges. » 2005, p.101.
40. Council of the EU. « 7th Space Council Resolution. Global Challenges: Taking Full Benefit of European Space Systems. » 25 November 2010.