PROVISIONAL* WORK PROGRAMME 2007

COOPERATION

THEME 9

SPACE

(European Commission C(2006) 6839)

* This provisional work programme is subject to formal confirmation following the entry into force of the 7th EC Framework Programme and the Specific Programme Cooperation.

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THEME 9: SPACE

Objective:

The objective of the FP7 space work programme is to support a European Space Policy focusing on applications such as GMES (*Global Monitoring for Environment and Security*), with benefits for citizens, but also other space foundation areas for the competitiveness of the European space industry. This will contribute to fulfil the overall objectives of the European Space Policy, complementing efforts of Member States and of other key players, including the European Space Agency.

I CONTEXT

Policy context

Europe has been active in the space sector for several decades, and activities encompass a wide spectrum ranging from launchers to application satellites. Space activities, through scientific research and especially through their direct applications, are acknowledged as strategic for their contribution to the construction of Europe and the competitiveness of the European Union in the light of the Lisbon-process.

The White Paper on Space[1] defines an action plan for implementing a European Space Policy and underlines that Space is a tool at the service of several EU needs, e.g. in the fields of transport, environment, agriculture, fisheries, telecommunications, security.

Furthermore, the EU considers the space field as a strategic domain as it can directly contribute to the implementation of a large group of policy objectives, such as:

- *Sustainable Development*, (e.g. through information gathering in support of the Kyoto-protocol monitoring and the actions resulting from the Johannesburg Summit on sustainable development).
- *Common Foreign and Security Policy* (e.g. in support of borders control, conflict prevention and crisis management).
- *Lisbon Strategy* (e.g. through better opportunities for Space related industries, improved access to space-based services such as GMES).

A direct support by the EU in the field of Space should act as an incentive to exert leverage on other public players as well as on the private sector, and to encourage them to intensify their investments. Sustaining a competitive industry (including manufacturers, service providers and operators) and providing appropriate services and infrastructures requires new research into new technologies and their exploitation.

The action plan underlying the Space Work programme is based on the recommendations obtained during the consultation period for the White Paper on Space, as well as the intensive dialogue with Member States and major stakeholders during the preparation of the GMES

[1] COM(2003) 673, 11 November 2003'"Space: a new European frontier for an expanding Union"

Initiative[2] and of the European Space Policy. The Work programme follows also the direct recommendations of the "GMES Advisory Council" of Member States, the Space Advisory Group, as well as the User Implementation Groups for the GMES Fast-Track Services. All these bodies will also be instrumental in providing guidance to the Commission in the annual update of the Work Programme and of emerging needs, including for GMES information by policy makers.

The strategic role of GMES in the development of the EU's role as a global actor has been outlined in the February 2004 Communication[3] of the Commission, which also identifies the major EU policies to be addressed by GMES services. These can be summarised as follows:

- Europe's environmental commitments, within EU territory and globally, by contributing to the formulation, implementation and verification of the Community environmental policies[4], national regulations and international conventions;

- other EU policy areas such as agriculture, regional development, fisheries, transport, maritime policy, external relations with respect to the integration of the environmental dimension in the respective domains and their specific requirements;

- Common Foreign and Security Policy (CFSP), including the European Security and Defence Policy (ESDP);

- other policies relevant to European citizens' security at Community and national levels[5], notably the potential that exists for application to, e.g., policies related to Justice and Home Affairs activities of the European Union, such as border surveillance.

A number of GMES services shall contribute to 'achieving by 2008 an **operational** and **autonomous** European capability', as expressed at the June 2001 Gothenburg summit and in a subsequent Council Resolution[6]. In its November 2005 Communication[7], the Commission has confirmed its intention to move *from concept to reality* in supporting a variety of EU policies with geospatial information through GMES, and it has outlined the roles and responsibilities of EU institutions, the European Space Agency (ESA), and their Member States.

The EU will define the priorities and requirements, aggregate the political will and user demand, and ensure the availability and continuity of services. ESA, its Member and Co-operating States will develop space technologies and systems in the scope of the European Space Policy, and will, in particular, support and define the technical specifications of the GMES space component, implement it, coordinating centres of excellence across Europe; and advise the EU on future space component requirements. In this context, Member States may strengthen internal co-ordination of related data collection and management activities and federate national demand, contribute to the implementation of the necessary spatial data

[2] as reported in Final Report for the GMES Initial Period 2001-2003 (final). Cf. web site http://www.gmes.info, see also 2003 Environment Policy review – Consolidating the environmental pillar of sustainable development COM(2003) 745 final

[3] COM(2004)65 final, 3 February 2004

[4] The 6th Environmental Action Plan (2004 to 2010) addressing climate change, nature and biodiversity, environment and health, natural resources and waste

[5] "A secure Europe in a better world–European Security Strategy" Javier Solana 12/12/2003

[6] Council Resolution 2001/C 350/02 (13.11.2001)

[7] COM(2005)565 final, 10 November 2005

infrastructures and in-situ components, and support the implementation of the space component.

As a consequence of the above roles and responsibilities, ESA should manage the development of those space infrastructures which are identified for support under FP7, in accordance with the rules of this programme, integrating these activities with its own in this area. The Commission will manage the development of GMES services supported through FP7 and assure optimal integration of data from in-situ monitoring. After the completion of the ESA GMES Service Element projects, the further development and consolidation of such services will be the responsibility of the EC, as an integral part of its Space programme within FP7.

Crucial to the success of the GMES service component is the compliance with the requirements and the guidelines included in the INSPIRE proposal for a directive[8]. FP7 research and development activities for GMES shall therefore contribute to the ongoing INSPIRE implementation, as far as practically relevant.

Beyond GMES and in line with the European Space Policy other topics will be addressed in the current FP7 Space work programme, in particular in view of strengthening the foundations of European Space science and technology, without which it becomes impossible to develop truly autonomous and efficient applications.

These topics are driven in Europe by entities and agencies at European or national level. For this reason, support to upstream and exploitation actions in these topics will provide enhancement of scientific added value through synergies with the European Space Agency and Member States space agencies initiatives in the field of space science and exploration, space transportation and space technologies.

The use of a Joint Technology Initiative in the specific area of GMES is currently still investigated. Following a dedicated consultation of Member States and key stakeholders through the GMES Advisory Council, further decisions on the implementation and its structure will be included in the Work Programme.

Approach

The following paragraphs define the activities and action areas covered by the Space theme of the Framework programme, and highlight a potential range of topics which could be funded during 2007-2013. The roadmap for the Space theme currently foresees biennial calls (in 2007, 2009, 2011) with a final call in 2013. This may be revised at a later stage. Only some of the research topics mentioned in section I will be part of a call in 2007 – these call topics are specifically elaborated in section II 'Content of calls in 2007', together with specific call topic codes (e.g. SPA.2007.1.1.01). Other potential research topics have already been prioritised for a later call, outlined in section IV, in order to enable applicants to better plan ahead. Calls beyond the 2007 call, however, will still be detailed in annual updates to the FP7 Space work programme. Applicants are advised to keep the overall scope and strategic requirements expressed in section I in mind when responding to specific topics of a call. Furthermore, ethical principles and gender aspects must always be taken into account. The

[8] COM(2004)516 final, 23 July 2004, Proposal for a Directive of The European Parliament and of the Council establishing an infrastructure for spatial information in the Community (INSPIRE); also COM(2006)51 final, 10 February 2006

forms of the grant to be used for the different funding schemes mentioned in the Space theme work programme are given in Annex 3 of the Work Programme "Co-operation" 2007.

Two main classes of *activities* will be undertaken to achieve the above policy objectives:

- Space-based **applications** at the service of the European Society, with **GMES** (Global Monitoring for Environment and Security) being central to this activity;
- Providing R&D support to the **foundations of Space science, exploration, space transportation and space technology** through synergies with initiatives of ESA or other European, national or regional entities.

The support for the **first activity**, the development of GMES, is to be expressed in four main *action areas*:

i. Support to the **(pre-)operational validation of GMES services and products** based on the integration and harmonisation of related observation data (both satellite-based and in-situ, including ground-based, ship-borne and airborne), starting with the Fast Track Services.

ii. Integration of satellite communication and satellite navigation solutions with space-based observing systems, and with related non-space systems, for instance for **prevention and management of all kinds of emergency**.

iii. Support to the **coordinated provision of observation data**, both from space-based infrastructure and from in-situ observing systems.

iv. Development of **Earth observation satellites**, which relate to the management of the environment and security, and which complement in-situ systems.

For the **second activity**, the strengthening of foundations of Space science and technology, the support is to be expressed in three more *action areas*:

i. Support to research activities related to **space science** and **exploration**,

ii. New concepts in **space transportation**, and **space technologies** including **critical components**,

iii. Research into reducing the vulnerability **of space based systems and services**.

The following sections provide more explanation on each action area.

1. Action areas in support of space-based applications (GMES)

1.1 (Pre-)operational validation of GMES services and products

A comprehensive Earth observation system, using space borne and in situ- techniques (land, air and sea based) is needed for the delivery and sustainability of well-defined operational

services, which support the implementation and monitoring of environmental and security policies in the context of sustainable development. Although satellite systems provide a unique and globally available data source for such operational services, their effectiveness depends critically on close integration with terrestrial systems, to exploit the comparative advantage of each. Emphasis will be put on R&D activities, which both

- conduct validation of GMES services and products, and
- achieve integration of terrestrial (in-situ) and space systems into services.

In line with the orientations expressed by the Commission in its latest GMES Communication[9], and the FP7 Specific Programme objectives, the *user-driven development* of GMES services represents the first and foremost responsibility of the EC. Related actions will have to base themselves on and take into account user-orientations and guidelines developed already at European level, for example from previous GMES projects, and advisory bodies created at European level[10]. The overall task in this action will be to develop an extended range of GMES services which both

- meet user requirements, and
- for which the economic and societal benefits justify the investment, with a special regard to justification for investment at European level.

In order to build this strong user base for GMES services, it is necessary that needs be identified and updated, and that the service products developed be reliable and effective for operational supply. Typically, public authorities and other decision-makers at all levels (local, regional, national and international) will be among the primary users in receipt of GMES services and products. At European level, users require support in achieving EU policy objectives, for example in the fields of agriculture, forestry, fisheries, environment, climate change, health, telecommunications, safety, security, and transport. The readiness of such users to incorporate GMES information into their working methods and decision-making processes is essential. Therefore, the support given within this R&D action area will be expected to also address the familiarization of users with new or enhanced GMES services through dialogue and demonstration activities, promoting:

- knowledge exchange including technology transfer of research on environmental processes and on methodologies,
- training and capacity building.

The Commission has already identified three **Fast Track Services** (FTS) for which operational capacities will be in place by 2008: Emergency Response, Land Monitoring and Marine Core Services. These *core* services are specifically focusing on European added value. Moreover, some countries already have a number of established agencies or actions that provide services on an operational basis in related application fields. As novel laboratory techniques and scientific methods are reaching technical maturity, new service capabilities not yet covered or included by these (pre)operational GMES information deliveries become feasible. Therefore, development of upgraded **capabilities for existing GMES Fast-Track Services and related (pre)operational services will be undertaken** to extend the scope of

[9] COM(2005)565, Global Monitoring for Environment and Security (GMES): From Concept to Reality

[10] Overall GMES orientations are part of governance discussions in the GMES Advisory Council. Extensive user requirement analyses have been established in GMES Integrated Projects in several application fields, as well as in ESA GMES Service Elements. Specific Implementation Groups representing user communities at European level have been set up for the three Fast Track Services following the GMES FTS Workshops at the end of 2005. Further information can also be obtained from http://www.gmes.info and the EC services.

such operational services, to integrate and validate these capabilities within enhanced service delivery chains (e.g. through a wider geographical coverage, better spatial resolution, a wider range of information provided and improved time response)[11].

In other application fields, pre-operational services are not yet established, although laboratory techniques and scientific methods are already well advanced[12]. Operational services and end-to-end supply chains remain therefore to be developed and validated. As multi-purpose services, focusing on European added value, *core services* deliver products which are the basis for a wide range of (geographically or thematically) specialized downstream products and services, allowing also the harmonization at European scale of services and products delivered at regional or national scale. FP7 will undertake **development of pre-operational GMES pilot services in new application fields** with the view of providing Europe with such generic multi-purpose services.

N.B. In the course of FP7 implementation, the Commission intends also to assess which services might already have attained a fully operational level, with the full support of the relevant users, in which case they would no longer be eligible for future R&D support.

The three fast track services and additional pilot services to be supported within this action area are expected to provide the development of a wide range of (pre)operational ***core services*** in Europe, starting in 2008 with the FTS, based on mature technologies and service chains. Complementary to these, dedicated ***downstream service portfolios***, tailored for specific user needs, should bring together a large number of industrial players to enable the maximum and efficient use of Earth observation data in support of European public policies, institutional users as well as local and private entities.

Typical examples of such services include some of the *GMES Service Element* projects supported by ESA, which will be further developed and strengthened through this Work Programme. It is foreseen to further **stimulate the emergence and establishment of such downstream services**, to be financially self-supportive at the end of the project, ready to be based on non R&D resources, including commercial revenues whenever appropriate.

Notwithstanding the separate action on support to the coordinated provision of observation data (see section 1.3 below), it will be necessary to provide already within the service developments also the means for more effective ways of data exchange, in a reliable way, encompassing the development of data management infrastructures that support the different services and with a guarantee of long-term continuity, whilst ensuring interoperability. Furthermore, GMES service projects are ideally placed to act as pilot projects for the ongoing INSPIRE Directive[13] implementation. They may therefore act as test-beds for INSPIRE, as far as practically relevant and appropriate.

1.2 Integration of satellite communication and satellite navigation solutions with space-based observing systems

[11] Qualitative/quantitative parameters which track the project objectives should be utilised to assess the impact of supported actions: see also Section II on expected impact.

[12] It should be noted that development and research on specific earth observation and assessment tools, as well as environmental models underpinning future GMES services are undertaken in FP7 theme 6 “Environment (including climate change)”.

[13] COM(2004)516 final, 23.7.2004, Proposal for a Directive Of The European Parliament and of the Council establishing an infrastructure for spatial information in the Community (INSPIRE); also COM(2006)51 final

Large advances have been made in recent years in establishing European autonomous capabilities in the areas of satellite communication, satellite navigation and space based observing systems. The area in which a synergetic use of these space based capacities can bring particular benefits is the support to the prevention and management of all kinds of emergency. In case of multi-use, methodologies may also have to account for the additional complex requirement of space and ground systems to guarantee integrity, confidentiality and data availability. This action will support specific *user-driven* development of such services, combining all relevant space-based systems, and integrating them with related non-space systems.

In this way, the already multifaceted and integrated nature of GMES, which brings together data from a variety of space-based and in-situ measuring systems, will be further enhanced and enriched by complementary space techniques. These techniques will enable fast and effective communication and accurate positioning for events including natural or man-caused disasters in a variety of geographical areas. The overall objective is to provide the end-users - e.g. civil protection agencies, search-and-rescue teams, and other life-guarding bodies - with all the required information in a seamlessly integrated, timely, secure and user-friendly fashion. To this purpose, account will be taken of the latest development in relevant satellite communication and navigation technologies (in particular relevant developments in the Galileo system).

1.3 Support to the coordinated provision of observation data

The third action area represents a major step towards the sustained availability of data that are essential to the implementation of (pre)operational services.

Future GMES services, both during their pilot phase and when fully operational, will require an appropriate supply of input data from both space and in-situ observation systems. It will be necessary to identify the most effective way for doing this, in a reliable way and with a guarantee of long-term continuity, based on a coherent Europe-wide approach. The aim is also to support the future development of an appropriate autonomous European capacity in this context, coupled with a perspective of long-term sustainability.

Until now, most R&D actions that aim at developing GMES services have typically obtained their required input data by directly accessing them from the relevant operators (data providers). This approach, while linking directly data operators with their direct customers, i.e. the services operators, lacks a coherent European and inter-service coordination and inter-operability, and often leads to duplications.

The advantages of a coordinated access to data would include:

- *to the service providers* (and ultimately to the *end users*): a coherent market of data and lower costs, already pre-processed data (e.g. ortho-rectification, digital elevation models) in a coherent way across all other services, and a guarantee of long-term availability of data.
- *to the data providers*: a bulk agreement (rather than separate small agreements), leading to a more stable industrial investment strategy, with better complementarity among different operators.

A coordinated access to data should however retain the capacity to link directly data providers and the service providers, i.e. without creating a centralised operational structure for the distribution of data. It is also expected that this action should provide a functional separation of data providers and data recipients in form of service providers (especially where these two functions may be residing in a single organisation). Giving access to data on equal grounds should give European SMEs participating in the GMES services a real boost to their competitive position.

As far as the provision of *space-based* data is concerned, including from non-dedicated missions (e.g. national or commercial missions), **ESA** is seen as the appropriate coordinator of the supply side during the development phase covered by this Work Programme, in full cooperation with the relevant national and European mission operators.

No call for proposals will be published for the implementation of this action area, for which the funding support approach is outlined further under the section "*Other activities*", below.

For *in-situ data*, the provision should also be coordinated by relevant European bodies (e.g. the European Environment Agency [EEA], JRC)[14]. Besides the many freely available dispersed in-situ monitoring data, there are a number of basic in-situ data that are indispensable across several GMES services to be made available on a more systematic basis, and in some cases in real or near real time (e.g. ocean and atmosphere parameters, meteorological data, vegetation ground control points, elevation data, vegetation characteristics, ground survey data, aerial photos, etc). Ideally, this action should be coordinated at European level by appropriate bodies. Following the identification of such suitable bodies capable of managing an appropriate *Coordination and Support Action* (coordinating or supporting type action[15]) in this context, this action should be covered in the 2009 Work Programme.

In the frame of the present work programme and related call, specific ad-hoc actions for the provision, collection and dissemination of in-situ data relevant to GMES will be the subject of dedicated efforts within the various service-oriented projects (see Section II, Area 1).

1.4 Development of Earth observation space infrastructure

While in the short-term GMES is drawing on existing in-situ and space based observing capacities developed by EU and ESA Member States, the fourth action area addresses the longer-term view and continuity of space-based infrastructures. A new GMES dedicated space infrastructure, to be developed by **ESA** under its *GMES Space Component* (GSC) Programme, is to provide continuity of space data sources in support of GMES services.

[14] This could be based on and/or extend the current Technical Agreement agreed amongst the Group of Four (DG ENV, JRC, ESTAT and the EEA)

[15] Please note, for Coordination and Supporting Actions aiming at supporting research activities and policies the minimum condition shall be the participation of one legal entity. For Coordination and Supporting Actions aiming at coordinating research activities and policies the minimum condition shall be the participation of three legal entities.

No call for proposals will be published for the implementation of this action area, for which the funding support approach is outlined further under the section "*Other activities*", below.

2. Action areas strengthening of foundations of Space science and technology

Projects supported by the Framework programme in this action area are expected to complement the extensive activities already undertaken by ESA and Member States. In accordance with the development rationale of a European Space Policy, projects should demonstrate the benefit of the EU, ESA and national programmes working in a coordinated way. A particular added value is also seen in contributions which the new EU Member States and the international community[16] can make.

2.1 Support to research activities related to space science and exploration,

Space plays a leading role in Earth, Universe, Environmental, Physical and Life sciences as a privileged observation tool for our planet and objects of the universe in synergy with ground observations, data analysis and modelling tools and research in laboratories.

The work programme on space science is open to international cooperation and should focus on upstream and downstream R&D activities complementing space missions, such as the **optimal preparation of scientific payloads** on future space missions, and an **effective scientific exploitation** of their data. Existing missions produce data sets of potentially immense value for research. Projects should enhance the effectiveness and productivity of the European scientific community in terms of usage of this data (including archived data). Increasing **public awareness** of such activities will also be the subject of this Work Programme.

Current space exploration programmes, in Europe and elsewhere, intend to extend the human presence, in a real or virtual way, through missions to the Moon and to Mars or through automatic missions in direction to objects of the solar system. Complementary to these, and in close co-operation with respective activities undertaken by ESA and national space agencies in this domain, the work programme is open to international cooperation and will support upstream research aimed at improving the capability to **access planets surfaces**, to **move**, to **select** and **collect** and finally **return samples** to Earth.

2.2 New concepts in space transportation, space technologies and critical components

In the context of ensuring European access to space, a new generation of advanced space transportation systems, innovative propulsion structure and energy concepts could reduce in particular the space transportation costs. In addition, space exploration could benefit from the progress made in this area. To that aim the work programme is open to innovative upstream research on **consolidating new space transportation technologies** (such as, e.g. new

[16] See list of ICP Countries in Annex 1 of the Work Programme "Cooperation" 2007

generation solid, electric and cryogenic propulsion and associated components technologies, new space energy generation systems and advanced composite structures).

Innovation in space systems requires long term vision and development of new technologies. Some of them may evolve quickly, requesting continuous research efforts to preserve competitiveness of the European space industry. In addition, the European space sector is dependent on technologies subject to stringent export-control regulations.

The work programme will particularly support research activities related to **critical components** (e.g. microwave components for telecommunication and navigation, digital components for data processing and payloads, space borne fibre optic technologies and field-programmable-gate arrays), which are essential for **non-dependence** aspects in the development of space missions of all kinds.

2.3 Research into reducing the vulnerability of space assets

In recent years our reliance on space-based systems has grown to include different fields: satellite communication and earth observation are ubiquitous, as is satellite navigation. A serious threat is posed by the **alarming growth of space debris**, left from launch activities, break-ups in space and obsolete space objects. In response, activities will be undertaken to assess the associated risks, monitoring debris, reducing debris production by preventing generation of new debris and de-orbiting upper stages and spacecraft after mission completion. Additionally, better protection of spacecraft against damage caused by debris collision should be actively researched. The work programme will particularly support coordination activities aiming to **structure research efforts undertaken internationally and at European level**, and research assessing vulnerabilities and their amelioration.

Space weather gives us displays of the aurora, or northern lights. However, at its worst, it is a natural hazard which can catastrophically disrupt the operations of many technological systems, thus causing disruption to people’s lives and jobs. **Space storms** (particles or electromagnetic) are a recognised aerospace hazard and can cause major failures, e.g. onboard spacecraft, in electrical power grids, in telecommunications links (satellite, launcher and ground-based). Being a cyclical phenomenon, more accurate prediction, assessment and early-warning capabilities of disruptive events are particularly poignant during the current approach of the next solar maximum (around 2011).

The work programme will support European coordination activities both to ensure the open exchange of information on emergencies that may have been caused by space weather events, with the goal of structuring international and European research efforts. The goal will be to both **improve the forecast and prediction of events**, by improved monitoring of the solar activities that are the main cause of space weather, and to identify **best practices to limit the consequences** to space-based (and certain strategic ground-based) infrastructures.

3. Cross-cutting activities

3.1 SME relevant research

Activities in this domain will be embedded *in all the action areas* mentioned in the previous sections above. Applications of GMES and other Space infrastructures typically require very sophisticated, state-of-the-art processing, which are often the result of research and developments done in specialised academic organisations and commercial spin-offs. Typical opportunities for SME participation in GMES are to be found for instance in the development and/or adaptation of methodologies and tools for services tailored for specific applications (including socio-economic dimensions), especially in areas such as land management, urban planning, coastal environment, land and marine resources, air quality. GMES service projects are expected, for instance, to actively integrate such capacities along the entire end-to-end service chain as well as networking actors distributed in the different Member States. The use of service provider/User networks within projects is encouraged.

Concerning the space science, exploration, space transportation and space technologies spin-in and spin-off activities could be encouraged.

3.2 International Cooperation

In the context of International cooperation, a diversified approach is a key element in Europe's space policy. Candidates for cooperation among other established or emerging space powers are the United States, Russia, Canada, People's Republic of China, India, and Ukraine. The European Neighbourhood Policy covers relations with Eastern and Southern neighbours (i.e. Black and Caspian Sea region) and countries of North Africa and the Middle East (i.e. Mediterranean region). The use of space applications can contribute to their economic and social development and support environmental protection.

International cooperation with third countries (ICPC)[17] will be supported in view of expanding the use of earth observation data, and the corresponding data processing and management methods in third countries, and enhancing the relations with established space powers.

In the framework of the European Development Policy space applications such as Earth observation or satellite communications have been recognized as a central tool to support Africa in its sustainable economic and social development.[18] Furthermore, for GMES to become the main European contribution to the global 10-year implementation plan for the GEOSS, FP7 GMES projects will also provide opportunities for data exchange with international partners, in the area of environment monitoring (especially in areas such as global climate change), and will encourage the increased use of Earth observation, as well as the development of a system of worldwide observation systems.

[17] International Cooperation Partner Country (ICPC) is a third country which the Commission classifies as low-income, lower-middle-income or upper-middle-income country and which is identified as such in the work programmes, see list in Annex 1 of the Work Programme "Cooperation" 2007

[18] COM(2005) 489 final, 12 October 2005, "EU Strategy for Africa: Towards a Euro-African Pact to Accelerate Africa's Development"

All projects conducted in the Theme Space are open for such participation of third parties under the normal participation rules, with the topics mentioned above being of particular interest for international participation. In order to enhance international participation further, a topical call may be considered at later stages, particularly to build on the achievements of FP6 projects dedicated to international cooperation. Specific cooperation actions dedicated to ICPC under the SICA participation rules[19] **are not foreseen**.

3.3 Cross-thematic approaches

The objective of the ERA-NET scheme is to step up the cooperation and coordination of research programmes carried out at national or regional level in the Member or Associated States through the networking of research programmes, towards their mutual opening and the development and implementation of joint activities. It is foreseen to apply, in a limited number of areas, this model of cooperation, in particular between European regions and small or medium-sized member States, to the implementation of long-term programmes such as Global Monitoring for Environment and Security (GMES).

European regions and local authorities count in fact among the most frequent, or potential, users of GMES services, in particular in the context of public policies of local interest (e.g. urban development, civil protection, environmental monitoring).

The ERA-NET approach in this context can help coordinate relevant user related actions across different parts of Europe and consolidate user requirements. Likewise, local authorities can aggregate their activities as a way of leveraging increased public support for GMES related developments (e.g. through appropriate infrastructure).

Specific ERA-NET calls will be foreseen as integral part of the Space Theme **at a later stage**, in close conjunction with appropriate GMES service topics.

3.4 Dissemination actions

Activities in this domain will be embedded in all the activity areas mentioned in the previous section above. In particular, activities aimed at promoting the uptake of GMES services and related technologies will be an essential part of all major cooperative projects. Apart from these technological knowledge transfer actions, the GMES Advisory Council as well as a network of National Contact points (NCP) are seen as instrumental in promoting dissemination to national public authorities and citizens alike. A suitable *Coordination and Support Action* (coordinating type) support in order to achieve better cross-border dissemination and trans-national cooperation could also receive funding. Effective dissemination measures are also of importance as significant wider benefits are expected to arise from the research projects and actions supported under this programme, contributing for instance towards science education and general outreach.

Coordination and Support actions (supporting type) examining the implications of technological developments in Space for the European Space Policy, its further implementation, and the benefits for citizens will also be undertaken.

[19] 2+2 participation rule, used in calls for Specific International Cooperation Actions (SICA) conducted by the FP7 programme of International cooperation activities

4. Activities implemented but not subject of a call

The following activities will be supported through funding by the Space theme, but **will not be subject of a call** under the Space theme:

1) Coordinated provision of space-based observation data for GMES,
2) Development of GMES-dedicated space infrastructure, and
3) Risk-sharing Finance Facility (RSFF).

They are regarded to supplement the activities undertaken as a result of the calls for proposals in the FP7 Space theme. Participants are invited to take benefit of these as appropriate in their proposals (for instance make use of access to the coordinated provision of observation data for GMES, or include the possibility of EIB loans to fulfil the Commissions co-financing requirements).

4.1 Coordinated provision of space-based observation data for GMES

As elaborated above in the section 'Approach', GMES service development, validation and operational scenario demonstration requires a comprehensive supply of data from space-based observation systems.

The following paragraphs describe how this access to spaceborne data and their long-term continuity will be implemented. Data should meet the immediate needs of the three FTS services and the other FP7 service oriented projects (within the Space Theme as well as other FP7 Themes). The objective is to facilitate the provision of data, thereby enabling easy access for relevant research projects to necessary data. The funding should cover provision for a duration of three years (after which a revision of the action will be undertaken in view of further support), and could cover needs of a specific or several service sector(s).

In particular, data access under this action area will include at least the following items:

- A variety of sensors, including operational and historical (archived) sensors, second generation sensors or new sensors which are to be deployed in the near future. Special attention needs to be given to integrate data from new commercial, national and dual-use sources (for example Cosmo-Skymed, Pleiades HR, Rapid-Eye, SPOT5, Seosat, TerraSAR-X, TanDEM-X, etc.), as well as other sources able to fill the gap, as necessary, until new sources are available;
- A data offer covering the full range of resolutions and radiometry;
- Various processing levels need to be included: from raw and pre-processed data (e.g. system corrected including calibration) to post-processed data (e.g. validated basic products), in close concertation with the GMES service provider needs;
- There should be a special focus on the provision of near-real-time data (timeliness requirements varying from hourly to daily to weekly).
- The proposed provision schemes and their corresponding delivery interfaces (FTP, other internet protocols, dedicated communication schemes and security measures);

- The geographic coverage of the proposed data and products should address at least EU25[20] and neighbouring regions, and preferably also provide data needed for addressing questions at the international and global scale. Contribution of/to international or global measurement networks or systems should also be addressed.

The above work is expected to complement and integrate, in a coherent way, existing data provision agreements for which FP7 project participants are eligible (for example the ESA Earthnet harmonised access to ESA and non-ESA missions, the Commission Framework contracts for the supply of remote sensing data – established by the Joint Research Centre - and their image portals), avoiding duplication of procurement. Similar arrangements concerning the provision of in-situ data should also be taken into account and integrated.

Innovative processes for the selection of data users and for data provision modalities are encouraged. The direct involvement of stakeholders with ability to assess and manage the demand side (including image acquisition and user request management), as well as those coordinating and selecting the required supply, is expected.

Due to its outstanding experience in assuring access to relevant space data for GMES, ESA is seen as the best choice for coordinating this pilot action of 'bulk data procurement' for those FP7 projects that will develop and validate GMES services. ESA (together with those other relevant data providers that ought to be associated to this action) should clearly indicate the chosen processes for selection of data users and for arranging data provision, including:

- The mechanisms put in place for publication of availability of data for potential data users (among FP7 projects);
- The mechanisms put in place to manage data user requests, linking users with suppliers, and to report on user demand evolution (users will be expected to report back on the use made of the data within a reasonable time according to guidelines established by the Commission services);
- The approach for providing a data supply, taking into account alternative sources in case of data source unavailability;
- The mechanism to guarantee sufficient data supply to meet GMES service development needs in FP7 case-by-case or service-by-service (whilst all service oriented FP7 projects are regarded eligible, a priority focussing in the first instance on FTS supporting projects, followed by other service projects in this Work Programme, and then other GMES and GEOSS relevant projects elsewhere in FP7 should be applied);
- The approach used to deal with Intellectual Property Rights (IPR) issues, especially as regards sharing of data among different data users and multiple licensing;
- The repartition of roles between ESA and the private sector.

In the long-term, this action area may be seen as a preliminary test-bed - indeed a *pilot action* - for all the relevant stakeholders to gain experience in the very complex issues involved in any long-term scheme to ensure space-borne data continuity, which is key for the provision of operational GMES services. Such data may be currently available also through non-European missions, through national missions or through missions which have a predetermined life expectancy.

[20] Soon to become EU-27.

Sustainable operational GMES services will require additional measures, implemented in a step-wise approach and following careful user requirement analysis addressing all current and planned missions both at European and national level. The objective will be to ensure data access from European assets or through international cooperation if applicable. This approach is expected to foster also a closer partnership with the imagery manufacturing and distribution industry.

Overall, of order 8% of the FP7 'Space' budget[21] could be made available for this pilot action over the period 2007-2013. Based on the specific capacities provided by **ESA** in this domain, ESA (together with additional national and international organisations to be selected through competitive calls, organised by ESA according to the applicable rules and procedures of FP7) would be the direct beneficiary for this funding, through *Coordination and Support Action(s)* (supporting type)

EC funding to ESA will be contingent upon the effective implementation of the intended action in the ESA framework and conclusion of a grant agreement (or a series of grant agreements) in compliance with the administrative and financial regulations applicable to the general budget of the European Communities[22] and with the EC/ESA Framework Agreement[23]. Notwithstanding the status as pre-defined grant beneficiary for this action, ESA will have to comply with reporting obligations to the EC in line with FP7 rules.

First financial support from FP7 is foreseen in the 2007 budget line (see section III, below), for a preliminary pilot action with a volume corresponding to about 48M€ over a three year period. Based on the experience gained, further funding for the continuation of this pilot action would be the subject of future work programme updates.

Further guidelines on provision modalities will be obtainable from the EC. In particular, this *Coordination and Support Action* (supporting type[15]) could make use of unit costs for access to specific categories of data. The costs connected with making the data available to the research teams of FP7 should cover also preparatory work and specific training courses for new users, where appropriate. Community support will also cover the costs required in establishing and strengthening a close direct interaction between data providers and data users, including travel costs where necessary.

A similar approach for the coordinated provision of *in-situ data* is not excluded in next work programmes and related calls. For the time being this activity will be covered by efforts within the various service oriented projects (see Section II, Area 1).

N.B. Community support for this action will exclude all contributions to the capital investments of the data source infrastructure.

4.2 Development of GMES-dedicated space infrastructure

[21] Including the corresponding share of support to the horizontal support to cross-cutting activities, as well as of the relevant administrative expenses.

[22] Council Regulation (EC,Euratom) No 1605/2002 of 25 June 2002 and Commission Regulation (EC,Euratom) No 2342/2002 of 23 December 2002

[23] COM(2004)85. The EC/ESA Framework Agreement specifies, inter alia (Art.5.3) that: "*Any financial contribution made by one Party in accordance with a specific arrangement shall be governed by the financial provisions applicable to that Party. Under no circumstances shall the European Community be bound to apply the rule of "geographical distribution" contained in the ESA Convention and specially in Annex V thereto.*"

As stated in the GMES Communication of 2005, FP7 funding is foreseen to provide a significant part to the *GMES Space Component* (GSC) Programme of ESA, in particular regarding the development of GMES-dedicated space-based infrastructure. The issues of security of space infrastructure (e.g. in terms of encryption of data transmission, where necessary) and optimised data relay solutions (e.g. inter-satellite and satellite-to-ground transmission technologies) should also be examined in this context.

Overall, of order 45% of the FP7 'Space' budget[24] could be made available for this action over the period 2007-2013. Based on the specific capacities provided by **ESA** in this domain, ESA (together with additional national and international organisations to be selected through competitive calls organised by ESA according to the applicable rules and procedures of FP7) would therefore be the direct beneficiary for this funding, through *Coordination and Support Action(s)* (supporting type).

EC funding to ESA will be contingent upon the effective implementation of the GSC programme in the ESA framework and conclusion of a series of grant agreements (taking into account the future availability of annual commitment budgets) in compliance with the administrative and financial regulations applicable to the general budget of the European Communities and with the EC/ESA Framework Agreement. Notwithstanding the status as pre-defined grant beneficiary for this action, ESA will have to comply with reporting obligations to the EC in line with FP7 rules.

First financial support from FP7 should be foreseen in the annual updating of the Work Programme during 2008, taking account of any update or revision of the GSC Programme by ESA. It is in fact assumed that the GSC Programme continues to be developed by ESA in a way that is demonstrably coherent with the emerging user requirements being aggregated by the Commission.

It is assumed that best use of existing and planned European satellites and in-situ systems – including those existing in other European agencies and organisations such as EUMETSAT – is being made in order to efficiently ensure the continuity of data necessary to the establishment of GMES services on an operational basis - to the development of which this Work Programme is aimed.

N.B. Other FP7 funding instruments, e.g. based on a JTI , are not excluded in this context, but can only be the result of decisions adopted by the Council and the European Parliament (or by the Council in consultation with the European Parliament).

4.3 Risk-sharing Finance Facility

The preparation of operational service capacities, as well as development of the GMES space components correspond to large undertakings and projects, involving long-term investments, with considerable risks for participating industries. Promoters need access to additional cash-flow to fulfil the Commissions co-financing requirements, enabling them to finance more (and more risky) projects. It is for such R&D actions that the Community will improve the access to private sector finance by contributing financially to the 'Risk-Sharing Finance Facility' (RSFF) established by the European Investment Bank (EIB). The Space theme is contributing to this funding facility, from its budget, and participants are invited to make use of this FP7 supporting scheme.

[24] Including the corresponding share of support to the horizontal support to cross-cutting activities, as well as of the relevant administrative expenses.

The Community contribution to RSFF will be used, by the Bank, in accordance with eligibility criteria set out in the Work Programme 'Co-operation' (horizontal issues). RSFF support is not conditional on promoters securing grants resulting from calls for proposals described herein, although the combination of grants and RSFF-supported financing from EIB is possible.

In accordance with the Specific Programme 'Co-operation', which stipulates that the Community contribution to RSFF will be funded by *proportional contributions of all Themes, except Socio-economic Sciences and the Humanities,* the Commitment Appropriations for this Theme to RSFF in 2007 will be 4.522M€. This amount will be committed entirely in 2007.

The use of the Community Contribution from the Specific Programme 'Co-operation' will be on a 'first come, first served' basis and will not be constrained by the proportional contribution of Themes.

Further information on the RSFF is given in the Annex 4 of this work programme.

II CONTENT OF CALLS IN 2007

Activity: 9.1 Space-based applications at the service of European Society

Area 9.1.1: Pre-operational validation of GMES services and products

SPA.2007.1.1.01 Development of upgraded capabilities for existing GMES Fast-Track Services and related (pre)operational services

Recent developments through EU, ESA and national programmes have resulted in (pre)operational services in several application fields, in particular the three **Fast Track Services (FTS)** in the following three domains:

- Land Monitoring
- Marine Core Service
- Emergency Response.

Furthermore, some countries already have a number of established agencies or actions that provide services on an operational basis. As novel laboratory techniques and scientific methods are reaching technical maturity, new service capabilities not yet covered or included by these (pre)operational GMES information deliveries become feasible. As a result, the FTS and other European level services can be improved through operational integration of new techniques, methods and service chains.

Activities should aim to integrate, in a coherent way and in complex system scenarios, these research results into the **existing (pre)-operational service chains**, in particular **those that underpin the three FTS**[25].

Existing and validated experimental practices or methodologies need to be turned into operational prototypes in close interaction and trade-off/validation process with the service users. Projects should be strongly user driven and take into account their needs concerning information and services, and orient themselves along existing guidelines established in previous GMES projects and by advisory bodies at European level. Successful integration into current user practices and their working environment need to be demonstrated.

To build up the pre-operational capabilities, the following topics must be appropriately addressed in the activities proposed:

- Data validation and fusion from multiple sources; techniques for data assimilation into models, validation of space derived products by means of in-situ data .
- Observation data (satellite, in-situ) collection and delivery, under consideration of both organisational aspects, as well as technical solutions offered by state-of-the-art communication methods (via terrestrial or satellite communication channels). Account

[25] Implementation of these three FTS will be based on the conclusions of the three GMES User Workshops on Core Monitoring Services for Europe at the end of 2005 and the resulting documents on implementation of GMES Pilot Services by 2008. Further information on the FTS implementation can be obtained from http://www.gmes.info and the EC services. Overall GMES orientations are expressed also within governace discussions in the GMES Advisory Council.

should be taken of possible mechanisms of coordinated data delivery, as outlined in section I under '*Other activities*'.

- Interoperability and interconnection of the data processing and delivery systems, taking into account harmonisation policies, directives such as INSPIRE, and standardisation initiatives. (While demonstrating interoperability capabilities, also gaps and shortcomings may be identified which have then to be integrated in ongoing INSPIRE efforts. Furthermore, the impact of harmonisation and the INSPIRE implementation on the sustainability of the services could be examined). To facilitate efficient acquisition and exploitation by both service providers and users, activities will have to include R&D[26] for:
  - improved accessibility to long-term data archives, implementation of meta-data standards, actions to facilitate information retrieval and dissemination;
  - improved accessibility to in-situ systems;
  - adoption of open standards for data documentation, data models and services;
  - integration of tools and services allowing anybody to query, view access and trade the information held by distributed public and private bodies;
  - establishment of a data policy and appropriate security framework.
- Organisation and service architecture, including the direct involvement of those GMES stakeholders that can provide core-services, in particular relevant public organisations (both national and international).
- Feedback from relevant institutional end-users, which demonstrates both the acceptance level of the prototypical service, as well as scenarios for integration into the user working methods and resulting decision-making processes.
- Exploration of suitable modalities for agreement processes (e.g. on Quality Assessment) between service mandating authorities, service providers and end-users.

Project proposers could consider the option of widening their partnership through a call for partners in the course of the project, in order to further enhance the service capabilities in response to emerging user needs. This mechanism could for instance also be used to offer opportunities for SMEs to join at a later stage. An open selection process (e.g. call for participation) in accordance with FP7 rules should be followed in such a case.

Projects should include activities having the goal of disseminating knowledge and increasing public awareness of the results achieved through the integration of space technology and in-situ observation systems. Project output should include an assessment of the type of data and level of spectral, spatial and time resolution expected from the next generation of satellites and in-situ data sources.

The geo-data and information resulting from the projects – in particular as concerns 'core services' – should be made accessible, without charges, and on a non-discriminatory basis to activities of public authorities and downstream service providers when such activities involve developing, implementing and monitoring community policies related to the environment and security through research or operational activities. Projects should implement procedures requiring and allowing the public authorities and downstream service providers benefiting

[26] It should be noted that specific development and research on ICT for environmental management as well as mechanisms for rapid adoption of standards, protocols and open architectures are undertaken in FP7 theme 3 "Information and Communication Technologies" under Challenge 6 "ICT for Mobility and Environmental Sustainability".

from this access to provide feedback on the use of the provided geo-data and information and the related social and economic impact and benefits. Where appropriate, the geo-data and information should become a public good as far as possible, and should also be made accessible to international initiatives such as GEOSS under similar terms.

Space-based observation data necessary to the development of each service will have to be detailed in the proposals[27]. The majority of these data will be made available to the projects by ESA on the basis of a coordination action financed by the current work programme (details in Section I, Chapter 4.1).

With regard to *in-situ data* necessary to the development of each service, the proposals will have to foresee dedicated efforts for their provision.

In general in-situ data could include:

(i) data collected by networks of sensors deployed on land, sea, water and in the atmosphere aimed at measuring and providing a complete description of the Earth system.

(ii) surveys aimed at collecting socio-economic data, land cover and land-use data, geology, soil conditions, bio-diversity information and other topographic or geographical data such as for example elevation, administrative boundaries, transport and utility networks etc.

In particular in-situ data should meet the immediate needs of each service and should cover, for example, the following requirements:

- Timeliness, in function of the service requirements.
- The provision schemes and their corresponding delivery interfaces (FTP, other internet protocols, dedicated communication schemes);
- The geographic coverage of the proposed data and products should address at least EU25 and neighbouring regions, and preferably also provide data needed for addressing questions at the international and global scale in function of specific service requirements. Potential contribution of/to international or global measurement networks or systems should also be addressed.

The specific needs for in-situ data will have to be specified in the proposal

Preference will be given to separate projects which address each of the three FTS application fields. Projects should take into account existing capacities and services, adding European value to the service and products, for the benefit of European and member states users, key services and other downstream services.

Moreover proposals should demonstrate their ability to develop generic and modular capacities. Further to the above requirements which are central to turn pilot capabilities into operational service chains, there are also specific requirements which proposals have to fulfil when addressing land monitoring, marine core services or support to emergency response.

A: Land Monitoring service developments:

The underlying objective of the Land Monitoring Core Service (LMCS) is to improve through an integrated in-situ/space based approach, the timely monitoring of land state, land use and land cover state and changes at regional, European and global levels (hereafter referred to as Land Information). The LMCS will add value to the national and

[27] To be based on the conclusions of the three GMES User Workshops on Core Monitoring Services for Europe at the end of 2005 and the resulting documents on implementation of GMES Pilot Services by 2008. Further information on the FTS implementation can be obtained from http://www.gmes.info and the EC services.

regional monitoring efforts in this area by fostering higher degrees of interoperability and harmonisation, considered a pre-requisite for regulatory reporting under the environmental *acquis* and international conventions. The LMCS is in addition of extreme importance in providing input data for the modelling and environmental assessments provided by the other GMES FTS and future runner-up GMES service pilots, such as those on Atmosphere.

At the European level, the LMCS will deliver EU25+2 land use and land cover state and changes with a frequency and spatial resolution adequate for serving the monitoring and implementation of the environmental *acquis* and other community and Member States'policies related to the environment (cohesion, agriculture & forestry, water management soil protection, sustainable urban development, transport, etc.). The LMCS implementation will require the involvement of organisations legally mandated to collect Land Information in the Member States.

The LMCS will link to "downstream services" by developing for specific themes and areas, ranging from EU25+2 to 'hot spots' (e.g. urban zones, nature sites, areas subject to rapid changes or high environmental risks such as landslides, erosion etc.) land specific geophysical and biophysical information as a "core service"[28]. To this end, the LMCS will have access to space-based observations, as described in section 4.1 and will implement as part of the core service systematic EU25+2 in-situ observations (area frame sampling surveys or similar approaches for land-use – including forestry, urban and agriculture – soil conditions, and biodiversity) as an integral part of the LMCS (required both for satellite data classification validation and integrated spatial analyses).

The LMCS will, as part of its "core service", include, as appropriate, the coordinated provision and access to geographic 'framework' in-situ topographical data, and contribute to the delivery of a pan European digital elevation model[29].

At the global level, the LMCS will deliver bio – and geophysical parameters derived predominantly from space based observations in support to Community development and collaboration initiatives and the implementation and monitoring of international conventions.

Although activities can draw on considerable experience gained through previous EC and ESA funded research activities[30] on the land cover mapping in Europe in an 'off-line' production mode, proven **near real time operational processes, and change mapping remains an important goal**. The service capabilities should cover or facilitate provision of large to small-scale/multiple-use maps, statistics, trends, over different land cover objects with the appropriate periodicity, and at regional, European and global levels.

[28] Conclusions of the "GMES User Workshop on a Land Monitoring Service for Europe" of October 2005 and the document "Implementation of a GMES Land Monitoring Pilot Service by 2008 – result of a discussion process and a user workshop", final issue of 17 March 2006, Available from http://www.gmes.info and the EC services

[29] As indicated in Annex to COM(2005)565 p3.

[30] Notably FP6-projects such as "Geoland" and "BOSS4GMES" as well as ESA's "GSE Land" and "GSE Forest Monitoring"

In this context a major challenge will be to increase the spatial resolution of the information base as identified in ref.[30] (thereby adapting newly available data sources[31]), while at the same time enhancing the degree of automation in order to keep production costs (per km²) low to render more frequent updates affordable for public users.

An accurate assessment of spectral discrimination capability and signatures identification should be performed by validation campaigns based on ground data collection and multitemporal hyperspectral airborne survey, thereby validating existing satellites derived products and define optimal spectral bands for future payload elements of the GMES Space Component.

B: Marine Core service developments:

The underlying objective of the Marine Core Service (MCS) is to improve EU capacities for monitoring and predicting the marine environment with an integrated capacity to provide data and information required by a range of downstream service providers relating to the global oceans and the European regional seas (e.g. the Arctic and North Atlantic Oceans and the Baltic, Black and Mediterranean Seas). The MCS will deliver regularly monitored and validated information on three-dimensional ocean state, dynamics and ecosystems, sea-ice with the spatial resolutions and timeliness of delivery chosen to meet downstream service requirements. Nowcasts, forecasts and analyses covering a period of 20-50 years which will be produced and used to monitor and understand the changes in the state of the ocean. Indicators which summarise this knowledge will be developed.

The MCS will focus on adding European value to services and products, for the benefit of European and national key marine services and other downstream services.

The demonstration and validation of the MCS will require consolidation of its dedicated components particularly the *in-situ* and satellite thematic assembly centres, global and regional modelling and data assimilation centres, and the core service general information system.

Regarding the evolution of the MCS and its downstream services, specific attention should be given:

- Over the open ocean and shelf seas, to the characterization and modelling of the ecosystems and of their links and couplings with the ocean dynamics, through the validation and further development of appropriate ecosystem models and of ocean data assimilation techniques for physics and biology; the improvement of the physical models; assessments of the reliability of the forecasts; improvements to the robustness of the service delivered; and consideration of the fitness for purpose of the service delivered. Improvement of the forcing fields and use of new satellite data sets (e.g. GOCE and SMOS) should also be considered.
- In coastal zones, to the forcing of open ocean on coastal circulation and ecosystems, the development of data assimilation in coastal regions; the characterisation of river discharges and their link with sediment transports should also be considered.

The links between the MCS and downstream services (e.g. storm surge forecasting, maritime safety and fisheries management), as well as with Integrated Coastal Zone

[31] E.g. imagery from upcoming very high resolution satellites such as 'TerraSAR-X'/2006, 'COSMO-Skymed'/2007, 'Rapid Eye'/2007, 'Pleiades'/2008, 'TanDEM-X'/2009, 'Seosat'/2010

Management, coastal engineering and other maritime activities (e.g. security of maritime traffic) should be considered.

C: Emergency response support developments:

The underlying objective of the Emergency Response Support Service (ERSS) is to reinforce the European capacity to respond to emergency situations associated with meteorological-driven hazards (e.g. storms, fires, floods), geophysical hazards (e.g. earthquakes, tsunamis, volcanic eruptions, landslides and subsidence), deliberate and accidental man-made disasters (e.g. urban fires, chemical incidents on industrial sites) and humanitarian disasters.

In the long run, the proposed service will guarantee that Europe can provide adequate information capabilities to support early warning, urgent assistance, relief operations, humanitarian aid, reconstruction activities.

In the short- to medium-term, the Emergency Response Service will be focused on strengthening preparedness and response capabilities of a range of institutions at national, EU and international levels. This requires in particular a rapid mapping capability after disastrous events occur and preparatory services to collect and map spatial and socio-economic data in areas at risk. To this end, the operational timely integration of satellite, airborne and ground survey will be essential.

The demonstration and validation of the Emergency Response Support Service will be focussed on methodological, functional and organisational issues linked to the provision and delivery of reference maps and damage maps required for management and ground intervention in emergency situations.

Service evolution should also require:

- To better document the risk vulnerabilities, especially through mapping of sensitive areas with risk level nomenclature. Over Europe, provision of comprehensive documentation should be considered and structured, while outside Europe priority should be given to the most critical areas. Specific approaches according to the type of risk should be developed for the elaboration of suitable risk maps, including potential vulnerability and damage e.g. on water basins, coastal areas, …
- To design and streamline early warning and preparedness systems and methodologies for the various types of hazards, taking into account their specificities and especially their location (inside or outside Europe)

For any one of these three application areas, preference will be given to a *Collaborative Project,* with a strong and larege-scale integration of different players and functions along the service chain. Mobilisation of significant volumes of resources is expected.

Funding of a *Support and Coordination Action* accompanying Collaborative Projects jointly in this area could also be considered in order to achieve: (i) coordination or improvement of *in-situ* data collection and dissemination mechanisms, and (ii) effective dissemination of results across the three FTS to the public (e.g. via information seminars, audio-visual aids, exhibitions).

- *Expected impact:*

Projects will be expected to result directly in an integration of new product lines into existing (pre)operational service chains of the GMES fast-track services, and significantly extend their portfolios. Validated scenarios for services meeting GMES user needs will be established, and further insights into the uptake of products, possible business models for operational supply, and the evolution and trends of future sensor needs will be demonstrated. The results obtained will contribute directly to the sustainability and competitiveness of European value-adding services. These services will help providing Europe with the capacity which allows it independently to evaluate its policy responses in a reliable and timely manner. Data harmonisation and standardisation improvements will contribute to the establishment of a European Spatial Data Infrastructure.

The long term strategic goal is the emergence of a technically robust and sustainable infrastructure in Europe in the form of core services, able to supply both source and interpreted data in order to boost downstream service activity and business.

As regards the current establishment of the three FTS, close collaboration with representative (geographically and thematically) user communities throughout Europe is a primary goal. FP7 projects are expected to take into account relevant inputs from the respective Fast Track Service Implementation Group established by the Commission, to show a measurable impact on the above long-term goals, as well as the research challenges which have been identified in the case of the three FTS already.

*In the specific case of the **LMCS** major social, scientific, technologic and economic impacts can be expected:*

- *The timely delivery of precise estimates onland state, land cover and land use changes will allow for more efficient planning and assessment of land-use and other environmental risk mitigation measures from regional to global scales. It provides thus adequate and innovative tools to deal with the increasing pressure on territorial resources.*

- *It will improve the integration of environmental concerns in the Community policies on cohesion, agriculture & forestry, soil protection, sustainable urben development and transport, by an improved capacity to anticipate and assess their impacts on the environment.*

- *The availability of pan-European harmonised and interoperable land information will render the implementation and monitoring of various environmental policies (air quality, water directives, nature directives, etc.) more efficient and cost-effective through economies of scale and cross-border coherence.*

- *Land information is required as input data for other GMES FTS and pilot services, and will therefore also impact positively on the sustainability of the other GMES services.*

- *The availability of precise and timely land information will be a major asset for the development by the private service industry of location based services for citizens and public authorities in combination with GALILEO global positioning information. Hence it will simultaneously strengthen the competitiveness of the European service industry (mostly SMEs) on the world market for geographic content..*

- *The global LMCS will provide essential input to the worldwide efforts made for understanding and assessing climate variability, changes and impact in the context of international conventions (e.g. the Kyoto.Protocol, UNFCCC, UNCCD).*

The global land information will improve the efficiency of agricultural crop yield forecast systems, thus saving lives and with considerable benefits to aid and development programmes.

*In the specific case of the **Marine Core Service** some major impacts could be expected:*

- *The validation of MCS feasibility and performances could pave the way to the development or the improvement of services in applications such as ship routing, offshore activities, search and rescue, pollution monitoring, fisheries, medium range meteorology. This could have a significant economic impact and could improve the competitiveness of EU maritime and other user industries.*
- *A significant European added-value could be found in the integrated approach for preparing the MCS delivery, and especially the sharing of activities at European level (no unnecessary duplications of capacities and resources), their complementarity and nesting.*

The coordinated R&D approach applied to MCS, especially through a consistent development of sea state models and use of observation data, will improve the capitalisation of results and the availability of toolboxes at EU level: it will allow to continuously upgrade and improve the MCS quality level, and to streamline and speed the MCS evolution and its impact on downstream services and on application areas.

*In the specific case of the **Emergency Response Support Service** it is envisaged to reach:*

- *An optimisation of the EU capacities in this area, and especially sharing and mutualisation of service infrastructures and resources, and a streamlining of process allowing to reach a consistent and guaranteed service level.*
- *A possible improvement of intervention efficiency, through an improved structure of the emergency information service and direct and operational links with the intervention bodies both inside and outside Europe.*
- *An efficient use of new space systems, and especially high and very high resolution imagery missions, and of associated methodologies, for supporting emergency situations and their real-time requirements.*

The impact of the validated system should also be demonstrated through pilot tests and exercises, based both on simulation data and on real events, when possible and appropriate.

SPA.2007.1.1.02 Developing pre-operational GMES pilot services in new application fields

Three fast track services are now expected to start their operational validation phase in 2008, based on mature technologies and service chains. However, also in other application fields, **core service** models are beginning to emerge, in which generic service layers form the basis for more (geographically or thematically) specialized downstream products and services. Capacities are converging in a synergetic way, to provide European core services, for pan-European application, justifying the strategic investment at EU level.

Against this evolving backdrop, it is foreseen to fund *Collaborative Projects* which stimulate the development of further *GMES core services*, in particular in the two areas: (i) Atmospheric composition and dynamics monitoring, and (ii) Information services for Security related activities.

N.B. **Pilot services in other areas** will also be considered in future calls, e.g. for water and glacier resource management, polar zone and sea ice monitoring, etc.

A: Atmospheric composition and dynamics monitoring

The proposed project should demonstrate a suitable structure **at European level** for implementation of a core service, its sustained operation and availability. Scenarios and developments of capabilities to deliver the following pre-operational services need to be targeted:

- **European air quality**, with the objective to provide:
  - Improved routine real-time forecasts of air quality through the incorporation of information from the global service on long-range trans-boundary air pollution (including gases and particulates),
  - Historical information from which trend analysis and impact of the implementation of directives and protocols could be assessed,
  - A modelling platform enabling the analysis of future scenarios
  - Inverse modelling to improve emission estimates
- **Regional sources and sinks of CO_2, CH_4 and related tracers**, especially through integration of operational collection of *in-situ* and remotely sensed (satellite based) concentration measurements and use of atmospheric transport models.
- **Availability of renewable energy sources**, in order to provide services for the selection of optimal sites for renewable energy power plants and the optimisation of production and management thereof.

It should provide standard European data on which further downstream service development (such as provision of local integrated air quality index, local air-quality-related alerts, personalized skin-type specific UV information ….) can be based.

At ***global scale***, an operational capacity is required to monitor (for climate purposes) and to forecast (for regional air quality purposes) the emissions, presence and hemispheric/global transport of atmospheric trace gases including reactive gases (e.g. stratospheric and tropospheric ozone, nitrogen dioxide, carbon monoxide, sulphur dioxide, formaldehyde), man-made and natural aerosols, clouds, and long-lived greenhouse gases. In particular, it should monitor the long term recovery of stratospheric ozone, including its day-to-day fluctuations and related ozone depleting components, and will forecast UV radiation at ground.

Specific attention could be given to R&D activities linked to service evolution, and especially to:

- The improvement of air quality monitoring and forecasting from European to local scales, including model nesting (upscaling / downscaling effects, boundary conditions, etc.) and assimilation of ground-based and, when available, satellite data. Ensemble

forecast systems should be also developed and implemented in the operational forecasting system.

- The improvement of the forecasting and monitoring of the global atmospheric composition, especially in the troposphere (ozone, oxidising capacity). Special attention should be given to the quantification of the long range transport in order to evaluate the trans-continental transfers of photochemical pollutants.
- Ensuring the continuity of the monitoring of the stratospheric ozone content at the global scale by combining the ground-based networks and satellite data. Improvement of the forecast of UV radiations at ground level.
- Improvement of greenhouse gas transport and source/sink location through integration of cycles at global and regional scales

B: Information services for Security related activities

The European Security Strategy endorsed by the European Council in Brussels on 12 December 2003 has defined the main threats that needed to be addressed, among them:

- the terrorist threat, and its linkages with international organised crime;
- the proliferation of Weapons of Mass Destruction (WMDs), addressed inter alia through verification of the provisions of the Treaties;
- the regional conflicts and their consequences.

Reliable information is the basis for early warning, which is itself the condition for early action and conflict prevention. Its dissemination has to take appropriate security measures into account. Continuously updated information on proliferation activities, movements of population including illegal immigration, all kinds of trafficking, the status of critical infrastructures, and many other elements which constitute the warning factors of major threats, can be essential for conflict prevention and fight against all less visible threats to European security such as terrorism and organised crime. Environmental based crisis indicators (related to e.g. status and use of water resources, large scale pollution) are also of high relevance. Moreover, the EU needs to achieve an adequate level of operational capabilities and readiness to conduct Crisis Management Operations.

In this context, GMES services will contribute to respond to EU needs for improved early warning and crisis management tools, based on timely Earth Observation data (*rapid mapping and tailored geo-information products*) combined with ground information, secure and reliable communications as well as navigation systems where relevant. Reliable and complete reference data (*asset mapping*) of potential target areas and hotspots will also be a crucial ingredient in achieving an efficient service.

Although this security pilot service addresses specifically global issues, any information generated also relevant to internal EU civil security should be ready to be integrated in activities of the four missions described in the “Security” Theme of FP7.

A pre-requisite for such European pilot services covering further GMES application areas are, amongst others, the maturity of user uptake, availability and possible European integration of infrastructures and resources, data and information which are contributing to the provision of sustainable services. Projects should demonstrate how they orient themselves along existing

guidelines established in previous projects, by appropriate advisory bodies representing users, and be able to take into account the ongoing evolution of formulation of user requirements at European level and the activities of Member State Agencies and Services that already provide operational and pre/operational products.

The objective is therefore to set up such pilot-phase activities demonstrating operational scenarios, allowing the sharing of infrastructures and putting in place practical arrangements for the common use or exchanges of data, products and core services, and to demonstrate the feasibility of a long-term perspective for the services required by the end-users.

The pilot service proposals should address:

- The availability of those upstream data sources and key infrastructures that are essential to the long-term viability of the GMES pilot service. Account should be taken of possible mechanisms of coordinated data delivery, as outlined in section I under '*Other activities*'.
- Organisation and agreements for utilisation of operational infrastructures and service supply chains, if possible even across different GMES application fields;
- Organisation and service architecture, including the direct involvement of those GMES stakeholders that can provide core-services, in particular relevant national and international authorities;
- Service quality acceptance documents with the relevant institutional end-users, which demonstrate both the acceptance of the service quality, as well as integration into the user working methods and resultant decision-making processes.
- Interoperability and interconnection of the data processing and delivery systems, taking into account harmonisation policies, directives such as INSPIRE, and standardisation initiatives. (While demonstrating interoperability capabilities, also gaps and shortcomings may be identified which have then to be integrated in ongoing INSPIRE efforts.). To facilitate efficient acquisition and exploitation by both service providers and users, activities may have to include R&D[32] for:
  - improved accessibility to long-term data archives, implementation of meta-data standards, actions to facilitate information retrieval and dissemination;
  - improved accessibility to in-situ systems;
  - development of open standards for data documentation, data models and services;
  - development of tools and services allowing anybody to query, view access and trade the information held by distributed public and private bodies;
  - establishment of a data policy framework.

In the long-term, these pre-operational capabilities should become appropriately resourced autonomous operational services, enabling evaluation of EU policy needs and their impacts. The development of scenarios for sustainable operations is therefore expected to be part of the project.

[32] It should be noted that specific development and research on ICT for environmental management as well as mechanisms for rapid adoption of standards, protocols and open architectures are undertaken in FP7 theme 3 "Information and Communication Technologies" under Challenge 6 "ICT for Mobility and Environmental Sustainability".

Projects should include activities having the goal of disseminating knowledge and increasing public awareness of the results achieved through the integration of space technology and in-situ observation systems. Project output should include an assessment of the type of data and level of spectral, spatial and time resolution expected from the next generation of satellites and in-situ data sources.

The geo-data results should become a public good as far as possible, and if appropriate, should be made accessible to international initiatives such as GEOSS.

As for the three Fast Track Services, *Space-based observation data* necessary to the development of each service will have to be detailed in the proposals. The majority of these data will be made available to the projects by ESA on the basis of a coordination action financed by the current work programme (details in Section I, Chapter 4.1).

With regard to *in-situ data*, the proposals will have to foresee dedicated efforts for their provision.

Preference will be given to *Collaborative Projects,* with a strong integration of different players and functions along the service chain. Mobilisation of significant volumes of resources is expected. Experience with previous projects of this nature shows that an average duration of 3-4 years could be appropriate. For topics which are not yet mature enough for a strong Collaborative Project, a *Network of Excellence* to prepare the state of research and integration between players could also be considered.

- *Expected impact:*

Validated service scenarios meeting specific GMES user needs will be established. Further insights into the uptake of products, possible business models for operational supply, and the evolution and trends of future sensor needs will be obtained. The results obtained will contribute directly to the sustainability and competitiveness of European value-adding services. These services will help providing Europe with the capacity which allows it independently to evaluate its policy responses in a reliable and timely manner. Data harmonisation and standardisation improvements will contribute to the establishment of a European Spatial Data Infrastructure.

Activity: 9.2. Strengthening the foundations of Space science and technology

Area 9.2.1: Research to support space science and exploration

SPA.2007.2.1.01 Space Science

Space plays a leading role in Earth, Universe, Environmental, Physical and Life sciences as a privileged observation tool for our planet and objects of the universe in synergy with ground observations, data analysis and modelling tools and research in laboratories.

The work programme on space sciences is open to international cooperation and activities should focus on upstream research for preparing European space science missions, on downstream research aiming at the optimal scientific exploitation of their data and for the improvement of the public awareness by:

- Developing tools to archive, access and process data obtained from different sources,,
- Mobilising the best expertise for the analysis and interpretation of space data, selecting the most innovative and challenging objectives in emerging scientific fields,
- Promoting the contribution of space assets to the scientific and technological knowledge and foster its transfer to educational bodies.

Project proposals must targeted specific space science domains in which a strong need for further scientific analysis of data can be demonstrated. Proposers should clarify how advantage is taken of existing infrastructures at European (ESA) or national level, thereby adding to their value for Europe.

Preference will be given to *Coordination and Support Actions* (supporting or coordinating type) as well as targeted research in *Collaborative Projects* with significant mobilisation of resources. Experience shows that for targeted research an average duration of 2-3 years could be appropriate.

- *Expected impact:*

Improvement of the scientific results that can be obtained from collected space data by supporting the scientific community and European networking (including in EU countries that are not ESA members) in order to reach a level of at least 80% of available data to be processed. Enhancing the awareness of general public on the contribution of the space investigations to our knowledge on the earth, universe and environment by performing at least once a year a public event and publish at least four papers in specialized press.

Area 9.2.2: Research to support space transportation and key technologies

SPA.2007.2.2.01 Space technologies

Innovation in space systems needs development of new technologies which may evolve quickly, requesting continuous research efforts to preserve competitiveness of the European space industry. In addition, the European space sector is dependent on technologies subject to stringent export-control regulations.

In the short-term, the work programme will support upstream research activities related to critical components[33] for Non-Dependence aspects, including studies for the utilisation of commercial components in innovative special architectures suited for space use. In particular:

- Digital components at the heart of data processing tasks for critical operations on every spacecraft, with a focus on dep sub-micron technology, high capacity reprogrammable gate arrays, high speed digital/analogue and analogue/digital converters and high speed serial links.
- Microwave components as used in telecommunication and payloads, navigation satellites and earth observations/science instruments such as radars, with a focus on Gallium Nitride

[33] With critical components being defined as enabling Europe to be capable of responding to its own needs in space and to remain competitive in the global market

technologies, Schottky diodes for high-frequency applications, ferrite latched circulators technology as used in radar and radiometer instruments.

Projects are expected to demonstrate their complementarity with existing ESA road-maps[34], especially as regards existing analyses in the identification of critical technologies. A particular added value is also seen in contributions which the new EU Member States and the international community[35] can make.

Preference will be given to *Coordination and Support Actions* (coordinating or supporting type) with strong integration of specialised actors. A *Collaborative Project* can also be considered, if it integrates specialised actors mobilising high level skills in order to cover in a complementary way the addressed domains, which are not undertaken by actors at national or European level.

- *Expected impact:*

To progress towards the sustainable provision of technologies needed by the European space to become non-dependant (space radiation hardened deep sub-micron technology, high capacity gate arrays and Schottky diodes are not produced yet in Europe). Examples of improvement include e.g. the increase of chip integration level by a factor of four, reduction of power consumption by a factor of four, increase of converter speed by a factor of four, increase of serial link speed by a factor of ten, optimisation of the economical aspects of critical components procurement.

SPA.2007.2.2.02 Space transportation

In the context of preparing new generation of advanced space transportation systems, innovative propulsion concepts are necessary to reduce in particular the space transportation costs. In addition, space exploration could benefit from the progress made on this area. To that aim research should focus on novel techniques or on consolidating new technologies such as heliothermic propulsion, new generation of solid, electric and cryogenic propulsion and associated components technologies. International cooperation with existing and emerging space powers may be considered when necessary, appropriate and possible. A particular added value is also seen in contributions which the new EU Member States and the international community[36] can make.

Preference will be given to conceptual studies through *Coordination and Support Actions* (coordinating or supporting type), as well as targeted research in Collaborative Projects that gather the best expertise and mobilises a significant amount of resources.

- *Expected impact:*

To consolidate the long term sustainability and to improve the economical aspects of a domain known to be demanding in terms of reliability by experimenting novel techniques and methodologies.

[34] See also the Strategic Research Agenda of the European Space Technology Platform, http://www.estp-space.eu
[35] See list of ICP Countries in Annex 1 of the Work Programme "Cooperation" 2007
[36] See list of ICP Countries in Annex 1 of the Work Programme "Cooperation" 2007

Activity: 9.3 Cross-cutting activities

Area 9.3.2: Cross-border co-operation (and European Research Area Networks)

SPA-2007.3.2.01 Trans-national co-operation among NCPs

Reinforcing the network of National Contact Points (NCP) for the Seventh Framework Programme under Space theme by promoting trans-national co-operation. The action will focus on identifying and sharing good practices. This may entail various mechanisms such as benchmarking, joint workshops, training, and twinning schemes. Practical initiatives to benefit cross-border audiences may also be included, such as trans-national brokerage events. The specific approach should be adapted to the nature of the theme and to the capacities and priorities of the NCPs concerned.

Special attention will be given to helping less experienced NCPs rapidly acquire the know-how accumulated in other countries.

Proposals are expected to include all NCPs who have been officially appointed by the relevant national authorities. Other participants from the EU and associated countries are ineligible. If certain NCPs wish to abstain from participating, this fact should be explicitly documented in the proposal.

The action may also involve official FP7 contacts from third countries and the international cooperation partner countries.

The Commission expects to receive a single proposal under this heading.

It is expected to fund *Co-ordination and support actions* (coordinating type), and a funding of 2 M€ could be envisaged. It is expected that the project should last for a maximum of 5 years, and should in any case finish before March 2013.

- *Expected impact:*

An improved NCP service across Europe, therefore helping simplify access to FP7 calls, lowering the entry barriers for newcomers, and raising the average quality of submitted proposals. A more consistent level of NCP support services across Europe. More effective participation of organisation from third countries, alongside European organisations, in line with the principle of mutual benefit.

Indicative budget to be allocated as a result of calls and other activities

A total of 88 M€ is to be committed from the 2007 Community budget (subject to its adoption by the relevant budgetary authorities), and an additional amount from the 2008 Community budget is expected to be added to this call for the activities not funded from 2007 budget (a new finance decision to cover the budget from that year to be requested at the appropriate time). Indicative budget allocated to the activities from the 2007 budget are given in the following table (allowing transfer to other topics addressed in this call):

	2007* M€
Call FP7-SPACE-2007-1 Activity 9.1 Space-based applications at the service of European Society : 1 Development of upgraded capabilities to existing FTS and related (pre)-operational services[37]	32.5
Call FP7-SPACE-2007-1 Activity 9.1 Space-based applications at the service of European Society : 2 Developing pre-operational service capabilities in new application fields	0
Call FP7-SPACE-2007-1 Activity 9.2 Strengthening of Space foundations	0
Call FP7-SPACE-2007-1 Activity 9.3 Trans-national co-operation among NCPs	2
ACTIVITIES NOT SUBJECT OF A CALL: 1 Access to Space-based observation data (**ESA**)	48
OTHER ACTIVITIES 1 FP7 Expert evaluators payments	0.5
GENERAL ACTIVITIES (CF. ANNEX 4)	**5.7**
ESTIMATED TOTAL BUDGET ALLOCATION	**88.7**

* Under the condition that the preliminary draft budget for 2007 is adopted without modifications by the budget authority.

[37] Including the provision of necessary in-situ data.

Overall, the following indicative budget allocation between areas of this call is envisaged:

- An indicative 50% to 75% for GMES Activity 9.1 topic SPA.2007.1.1.01
- An indicative 12% to 18% for GMES Activity 9.1 topic SPA.2007.1.1.02
- An indicative 16% to 21% jointly for the Space foundations Activity 9.2 topics SPA.2007.2.1.01, SPA.2007.2.2.01, SPA.2007.2.2.02

Summary of budget allocation to FP7 general activities for 2007 (cf. Annex 4)

Cordis	0.175 M€
Eureka	0.020 M€
COST	0.750 M€
ERA-NET	0.250 M€
RSSF	4.522 M€
Total	**5.718M€**

These general activities will not be administered by the Space Theme, but through the proposed horizontal mechanisms described in Annex 4.

III IMPLEMENTATION OF CALLS

- Call identifier: FP7-SPACE-2007-1
- Date of publication[38]: 22 December 2006
- Deadline[39]: 19 June 2007, at 17:00, Brussels local time
- Indicative budget[40]: 34.5 million € from 2007 budget

[38] The Director-general responsible for the call may publish it up to one month prior to or after the envisaged date of publication

[39] At the time of the publication of the call, the Director-general responsible may delay this deadline by up to two months.

[40] Under the condition that the preliminary draft budget for 2007 is adopted without modifications by the budget authority. An amount from the 2008 budget is expected to be added to this call for which a new financing decision to cover the budget for that year will be requested at the appropriate time.

- Topics called:

Activity/ Area	Topics called	Funding Schemes
[Activity/area number and title]	*[Topic number and title]*	*[Collaborative projects, NoEs, CSAs etc]*
9.1.1 **Space-based applications at the service of European Society** / Integration, harmonisation, use and delivery of GMES data	SPA.2007.1.1.01 Development of upgraded capabilities to existing FTS and related (pre)-operational services[41]	Collaborative Projects[42], Coordination and Support Action (supporting or coordinating[43])
	SPA.2007.1.1.02 Developing pre-operational GMES pilot services in new application fields	Collaborative Projects[42], Network of Excellence[44]
9.2.1 **Strengthening of Space foundations**/ Research to support space science and exploration	SPA.2007.2.1.01 Space Science	Collaborative Projects[42], Coordination and Support Action (supporting or coordinating[43])
9.2.2 Strengthening of Space foundations / Research to support space transportation and key technologies	SPA.2007.2.2.01 Space technologies	Collaborative Projects[42], Coordination and Support Action (supporting or coordinating[43])
	SPA.2007.2.2.02 Space transportation	Collaborative Projects[42], Coordination and Support Action (supporting or coordinating[43])
9.3.2 Cross-cutting activities / Crossborder co-operation	SPA.2007.3.2.01 Trans-national co-operation among NCPs	Coordination and Support Action (coordinating[43])

- Evaluation procedure:

- The evaluation criteria (including weights and thresholds) and sub-criteria, together with the eligibility, selection and award criteria for the different funding schemes are set out in Annex 2 to this work programme
- Participants in SPA.2007.3.2.01 must be National Contact Points in order to be eligible for funding
- A one-stage submission procedure will be followed.

[41] Including the provision of necessary in-situ data.

[42] For Collaborative Projects the minimum condition shall be the participation of at least 3 independent legal entities, each of which is established in a MS or AC, and no two of which are established in the same MS or AC.

[43] Please note, for Coordination and Supporting Actions aiming at supporting research activities and policies the minimum condition shall be the participation of one legal entity. For Coordination and Supporting Actions aiming at coordinating research activities and policies the minimum condition shall be the participation of three legal entities, each of which is established in a MS or AC, and no two of which are established in the same MS or AC.

[44] For Networks of Excellence the minimum condition shall be the participation of at least 3 independent legal entities, each of which is established in a MS or AC, and no two of which are established in the same MS or AC.

- Proposals may be evaluated remotely.

- Co-ordinators of all Collaborative project proposals in GMES topic SPA.2007.1.1.01, Collaborative project proposals and Networks of Excellence in GMES topic SPA.2007.1.1.02, that pass all the individual evaluation thresholds will be invited to a *hearing*.

- Indicative evaluation and contractual timetable:

This call in 2007 invites proposals to be funded in 2007 and 2008. The evaluation is to commence within 2 months of the call deadline, with negotiations of successful proposals commensurate with the 2007 budget expected to commence in the latter half of 2007.

N.B. The remaining successful proposals not funded from the 2007 budget will be carried over to be negotiated in early 2008.

Proposals recommended for funding, which cannot be financed from the available budget will be put in a reserve list after evaluation, to allow for later funding in case of availability of additional budget or failure to complete negotiation of a proposal recommended for funding.

- Consortia agreements

The conclusion of a Consortium Agreement is required for any action under the space topic.

- Particular requirements for participation, evaluation and implementation:

- The minimum number of participating legal entities required, for all funding schemes, is set out in the Rules for Participation. Please note, that for Coordination and Supporting Actions, different minimum participation rules apply depending on whether they are aiming at supporting or coordinating research activities and policies.
- The forms of grant which will be offered and maximum reimbursement rates are specified in Annex 3 to the Cooperation work programme.

IV INDICATIVE PRIORITIES FOR FUTURE CALLS

The work programme evolution is foreseen to include follow-on activities from the current FP7 call, with the objective to

- strengthen further GMES service developments;
- integrate satellite communication and satellite navigation solutions with space-based observing systems fostering the convergence of these space-based capacities;
- widen the international cooperation activities started at the end of the previous Framework Programme, as well as preparing GMES as the European contribution to GEOSS.

Following on from the NCP specific action in the first call, further dissemination actions are envisaged to

- promote the uptake of GMES services amongst users;
- promoting science, education and general outreach;
- examining the implications of technological developments for the European Space Policy.

The following potential topics have been identified already for possible future calls starting in late 2008 or 2009:

Activity: 9.1 Space-based applications at the service of European Society

Area 9.1.1: Pre-operational validation of GMES services and products

Development of further GMES core services (follow-on activities)

Pilot services in areas other than those foreseen for the 2007 Call will also be considered, e.g. for water resource management, polar zone monitoring, etc .

Stimulating the development of *downstream* GMES services

Three fast track services and additional pilot services are expected to provide (pre)operational core services in Europe in 2008, based on mature technologies and service chains. As generic multi-purpose services, core services deliver products which are the basis for (geographically or thematically) specialized products and services. Complementary to these, dedicated **downstream service portfolios**, tailored for specific user needs, bring together a large number of political and industrial players to enable the maximum and efficient use of EO data in support of European policies.

This part of the Work Programme should also aim, through appropriate R&D actions, at continuing and strengthening the actions already supported under **ESA's 'GMES Service Element' Programme**. Care will be taken to take into account all relevant earlier achievements, as well as remaining gaps, if any.

Area 9.1.2: Integration of SatCom with GMES for prevention and management of emergencies

Integration of SatCom and SatNav with GMES for prevention and management of emergencies

The objective is to integrate satellite communication and satellite navigation solutions with space based observing systems for prevention and management of all kinds of emergency. The target should be a service platform, with the objective of validating the technological concepts and acknowledging the benefits of an integrated communication/

navigation/observation infrastructure with the users. Complementarity of the satellite capabilities with terrestrial capabilities, where appropriate, should be assessed on the basis of a medium to long term view based on the foreseeable evolution of telecommunication technologies, the related economics and addressed as an integral part of the proposed action. The validation of specific test-beds, based whenever possible and appropriate on real situations, is encouraged.

Activity: 9.2. Strengthening the foundations of Space science and technology

Area 9.2.1: Research to support space science and exploration

Current space exploration programmes, in Europe and elsewhere, intend to extend the human presence, in a real or virtual way, through missions to the Moon and to Mars or through automatic missions in direction to objects of the solar system. Complementary to, and in close co-operation with respective activities undertaken by ESA and other interested national agencies in this domain, the FP7 Space work programme will support research aimed at improving the capability to access planets surfaces, to move, to select and collect and finally return samples to Earth in the frame of space exploration activities.

New generations of space missions (science and exploration)

The work programme on space sciences and exploration should focus on space missions upstream activities for the strengthening of the technological base.

The R&D activities are crucial for the development of new capacities (vehicles, platforms, instruments) responding to the new generation of space missions. The research objective here is to maintain the network of expertise in order to consolidate the enabling technologies, in particular:

- The technologies allowing new types of observation missions: formation flying, satellite autonomy, interferometry systems, measurement and relative positioning control, measure and transmission of high precision timing.
- New sensors for the different spectrum windows for astronomy.
- The technologies and measurement methods for the future Earth observation missions: specific laser sources, low frequency radars, synthetic aperture optics for observation from geostationary orbits.

Area 9.2.2: Research to support space technologies

Space transportation (follow-on activities)

Research should focus on new concepts for emerging strategies such as direct injection to geo-stationary orbit by means of cryotechnic or heliothermic propulsion, advanced structures and new energy generation systems.

Reducing economical risks requires strong simulation capacity and technology validations. Consequently the research activities should address the modelling of combustion and complex fluid movements, behaviour of specific materials for launchers and propulsion, shock analysis, dynamics of the payloads, system integrity monitoring. Due to the technological complexity of the domain, in relevant cases, international cooperation may be considered.

Space technologies (follow-on activities)

To address the strategic challenges on space technologies, FP7 intends to complement current efforts of the space community and to contribute to the European Space Programme.

In the medium and long term the work programme will provide research support in the following areas:

- Multiple-use and Spin-in – Synergic actions with the non-space sector in areas of embedded systems, photovoltaics, fuel cells, nano-technologies and robotics.
- Enabling technologies – support the implementation of EU policies

In addition, support to Multiple-use/spin-in should be done through cooperation with other Technology Platforms in related thematic areas and incorporating space needs in related calls and support to Enabling Technologies will be done via related application lines (e.g. Security, GMES and Galileo).

Area 9.2.3: Reducing the vulnerability of space assets

Security of space assets from on-orbit collisions

Reducing the vulnerability of space assets starts with the activity of space monitoring in order to better identify the objects on orbit around the earth. For that reason it is necessary to anticipate the atmospheric re-entries, to estimate the on-orbit collision risks, and finally the permanent knowledge of the situation in space. For these purposes it is necessary to dispose of a permanently updated catalogue of objects and the associated means for tracking of the relevant objects. Preliminary studies could be performed on the capabilities that could render possible the achievement of a European system. New services such as concepts for cleaning space debris on functional orbits and the removal of satellites at their end of life could be considered also in international cooperation under this topic.

Furthermore, space assets, and their associated ground facilities, are sensitive to other external events that can endanger their proper functioning. These events might have transient effects that can be recovered or have permanent effects leading to the non-functioning of the asset and consequently of its expected services. The research should focus on techniques for the identification, inventory, monitoring and early warning of events (space phenomena, debris, other actions,…) that could affect the space assets.

Activity: 9.3 Cross-cutting activities

Area 9.3.1: International cooperation

International co-operation in GMES

Proposals will be sought which develop activities to disseminate and implement outside the European Union (e.g. Latin America, and especially in developing countries) products and services derived or customised from current GMES development activities, for instance for risk management, resource management and land planning, marine and atmospheric environment monitoring, and in the domains of management of water resources and security. Proposals addressing Early Warning Systems linked to natural disasters, food security or disease prevention are also encouraged.

Priority will also be given to proposals to study the potential for current and foreseen GMES services to provide the building blocks for the EU contribution to GEOSS. Proposals should assess current services and information products against the GEOSS requirements, identify service/data gaps and barriers such as restrictive data use and re-use policies, and suggest actions.

Area 9.3.2: Cross-border cooperation (and European Research Area Networks)

ERA-NET (plus) for GMES

Local and regional authorities form a mainstay of the GMES user communities. The potential for GMES to be at a service to these important user segments has not yet been fully exploited. For full service implementation awareness and support by local and regional policy makers are needed. Furthermore, only localised implementation of several services will un-lock the synergy potential identified for GMES core services and INSPIRE interoperable contents. The main objective is to demonstrate the feasibility of a federated service capacity and it’s applicability to regional users.

Activities developed within the ERA-NET scheme consisting of Coordination and Support Actions networking research programmes carried out at national or regional level, are also regarded particularly attractive in opening the development and implementation of such joint activities.