WORK PROGRAMME 2013

COOPERATION

THEME 9

SPACE

(European Commission C(2012) 4536 of 09 July 2012)

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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 and scientific community. 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 applications and 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.

The **Treaty on the Functioning of the European Union** (TFEU) has strengthened the European Union's competence in the area of space and confirms the strategic importance of space for the European Union. The Treaty gives the European Union the responsibility to draw up a European space policy and, to this end, to promote joint initiatives, **to support research and technological development**, and to coordinate space related efforts.

Besides its strategic relevance, the space sector provides a stimulus to innovation and growth in the European economy, and thus space research is expected to contribute significantly to the **Europe 2020 priorities**, especially with regard to **Smart and Sustainable Growth** and **Innovation**. Support to the space sector is crucial if the EU wants to remain competitive at global level.

Furthermore, Europe is increasingly dependent on space infrastructure and applications thereof for the daily functioning of our society and proper policy development and implementation at European and national level. Space research thus **supports EU policies** and contributes to **addressing major societal challenges**, e.g. in climate change, resource efficiency, transport, citizen's security, natural and man-made disasters, and health care. Space technologies are supported with a view to generate applications and services that benefit European citizens (e.g. environmental monitoring, security), and to stimulate technology spin-offs that benefit other industrial sectors. Given the size of investments needed to develop these sectors, there is a clear added value of common and coordinated EU-level action.

Addressing Innovation Union aspects

Against the backdrop of the current economic situation and increased global competition, the Union has defined a strategy to support growth and job creation, Europe 2020. The Innovation Union Flagship initiative supports this strategy through specific commitments. Research and innovation are key drivers of competitiveness, jobs, sustainable growth and social progress.

The work programme 2013 aligns with, and contributes towards, the objectives of Europe 2020, the Innovation Union Flagship, and other EU policies. There is a determined focus on fostering new ideas, supporting world class teams tackling significant societal challenges, and on ensuring that the fruits of our investments can be properly exploited.

In this way the work programme provides for a smooth transition towards the new research and innovation programme for 2014-2020, Horizon 2020.

The Innovation Union initiative underlines that research and innovation are key drivers of competitiveness, jobs, sustainable growth and social progress. The work programme 2013 will be designed keeping the implementation of the Innovation Union initiative in mind, and in particular to bring together research and innovation to address major challenges.

This work programme contains innovation measures in support of activities closer to market such as:

- By supporting more topics aimed at generating knowledge to deliver new and more innovative products, processes and services: This is particularly relevant for Activity 9.1 supporting **space based applications**. The focus on development of services, with a goal of reaching self-sustainability, is reflected in the objectives and scope of the specific topics open for participation. A specific focus on innovative products is placed in the context of **SME actions** under Activity 9.3.
- By identifying and addressing exploitation issues, like capabilities for information and dissemination, and by enhancing the use of the generated knowledge: This aspect is taken up specifically in Activity 9.2, Area 1, which addresses **exploitation of European space science and exploration data.**

Underpinning a European space policy

The Commission has adopted in 2011 a Communication on the EU space strategy[1] to state its priorities. These include: safeguarding European access to space, contributions of space to global/societal challenges (e.g. climate change, resource efficiency, energy, health), security in and from space, space exploration, space science, space as a driver for innovation and competitiveness, and the EU's participation in international space projects.

The work programme will contribute to these objectives in the following ways:

- European **access to space** has to be safeguarded through a non-dependence of Europe on critical space technologies. This recurring theme in FP7 annual calls will be supported again in 2013 in Activity 9.2, Area 2, research to support critical space technologies.

[1] COM(2011) 152 final, 4 April 2011, "Towards A Space Strategy for the European Union that Benefits its Citizens"

- Contributions of space to the **global/societal challenges** are addressed through Activity 9.1 of space based applications at the service of European Society.
- Research and development in Activity 9.2 "Strengthening Space Foundations" will address the priorities of **space exploration, space science**, and **foster space as a driver for innovation and competitiveness**.
- As regards the **security of space assets**, and their associated ground facilities, these are sensitive to external events that can endanger their proper functioning, such as space debris, jamming, viruses, natural or man-made electro-magnetic disturbances. Specific research to reduce the vulnerability of such space assets will be addressed.

Global Monitoring for Environment and Security (GMES)

The strategic role of GMES in the development of the EU's role as a global actor has been outlined already in the February 2004 Communication[2] of the Commission, which also identifies the **major EU policies to be addressed by GMES services and the R&D projects** to be undertaken in FP7.

With the entering into force of the Regulation (EU) No 911/2010 of the European Parliament and Council[3] on the European Earth monitoring programme (GMES) and its initial operations (2011-2013), the R&D build-up phase of GMES now will direct research funding to those service domains which have not yet reached the required maturity to be operational, to complete the transition phase to operations.

In order to optimise the available resources (both from the GMES Regulation and from the theme Space of the Specific Programme Cooperation), funding from the GMES Regulation budget will support initially:

- the land monitoring and emergency management themes of the service component of the GMES programme;
- the GMES space component;
- GMES policy measures set out by the Regulation.

In the 2011-2013 period the other four GMES services (marine, atmosphere, climate change and security) are mainly financed by FP7 funds. The total FP7 budget foreseen for the 3-years period for each of these 4 domains is in the order of EUR 20-30 million. Marine, atmosphere and security services have already been prioritised in the 2011 and 2012 work programmes. The 2013 work programme will now continue this build-up objective by prioritising developments which are prerequisites for a **climate change service**.

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, Japan, and the Ukraine. Following bilateral consultations with Ukraine during 2011, topics which are of mutual interest and benefit for European industry and the Ukraine will be highlighted in the call.

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[2] COM(2004)65 final, 3 February 2004
[3] OJ, L 276, 20.10.2010, p. 1.

In general, the participation of countries for which a specific Space dialogue (e.g. South Africa) or S&T cooperation agreements (e.g. Brazil) are in place, or third countries included under the ICPC[4] list, is particularly welcome. The use of space applications can contribute to their economic and social development and support environmental protection.

Furthermore, for GMES to become the main European contribution to the global 10-year implementation plan for the Global Earth Observation System of Systems (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.

SME relevant research

All actions are open to the participation of all space stakeholders: industry, including Small and Medium Enterprises (SMEs), research organisations, universities, as well as public authorities, non-governmental organisations and public and private organisations in the space domain. Considering the objective of increasing the competitiveness of industry, the broad **involvement of SMEs** in consortia is highly encouraged.

As in 2012, and in order to further promote the participation of SMEs in the Space theme, the topic "SME space technology research and technology transfer" (Activity 9.3 – Cross cutting activity) will be reserved for proposals where more than 50% of the requested EU contribution goes to SMEs and where SMEs are present preferably in a leading or coordinating role. This will be implemented as strict eligibility criteria.

Bridging with Horizon 2020

Horizon 2020 emphasises the need to enable European competitiveness, non-dependence and innovation in space. Contributing to Europe's non-dependence from imports of critical space technologies is one of the objectives addressed directly in the 2013 call by calling for specific R&D which has been identified as urgent actions by a Joint task force of EC-EDA-ESA. Such concerted and coordinated action is also in line with the Horizon 2020 objective to prioritise areas that could not be effectively realised by Member States acting alone.

Ensuring more extensive utilisation of space data from existing and future generations of Union space systems is another priority identified by Horizon 2020, which is to be addressed in the 2013 work programme, as are the demonstration and validation of new technologies and concepts in the space and terrestrial analogue environments.

In Horizon 2020, it is expected that all societal challenges and industrial technologies shall contribute in their actions to sustainable development and climate related issues. Apart from actions related directly towards climate change issues, actions should also be relevant to the goal that enterprises are to adapt to a low-carbon, climate-resilient, energy and resource-

[4] 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 to the Work Programme "Cooperation"

efficient economy. In this respect, also research and development towards sustainable products, e.g. "green fuels", which will conform to more stringent environmental standards and regulation, is being taken up in the 2013 work programme.

Approach for 2013

The action plan underlying the Space Work programme is based on the European Space Policy. The Work programme responds directly to policy needs expressed in the Communication on EU Space strategy, the European Space Policy Communication, the Resolutions of the Space Council[5], and follows the recommendations of the Space Advisory Group.

As regards GMES Services, consolidated user requirements established in user consultation processes linked to GMES implementation are also 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. As regards the specific topic of climate and climate change monitoring, space based observations provide a key source of data at global scales of the Earth's environment, climate change, and the provision of climate services. A conference "GMES for climate change" was held in Helsinki on 16 and 17 June[6]. It explored whether there are still any gaps, and which of these need to be addressed by GMES and should be considered as components of a future GMES climate change service. Following this consultation, the call for 2013 has been prepared to address this important thematic service domain of GMES.

As regards Critical Technologies for European Non-Dependence, the joint task force group (EC, ESA, EDA) has reviewed and updated the list of the most urgent critical technologies thus harmonising the response of the three institutions.

Modalities of Implementation: Research Executive Agency, European Space Agency

Calls for proposals under this work programme Theme Space will be implemented by the **Research Executive Agency** (REA) according to the provisions of Commission Decision C/2008/3980 final of 31 July 2008 "delegating powers to the Research Executive Agency with a view to performance of tasks linked to implementation of specific European Union programmes People, Capacities and Cooperation in the field of research comprising, in particular, implementation appropriations entered in the Community budget". The management of all projects to be funded as a result of this work programme will be implemented by REA, with the exception of:

- actions implemented on the basis of calls for tenders
- identified beneficiary actions (being in support of policy)
- other specific topics explicitly identified as being of a strategic nature for the European Commission.

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[5] 4th Space Council Resolutions [also COM(2007) 212 final], 22 May 2007; 5th Space Council Resolutions, 25-26 September 2008; 6th Space Council Resolutions, 29 May 2009; 7th Space Council Resolutions, 25 November 2010

[6] Proceedings of the conference are available at http://ec.europa.eu/enterprise/policies/space/gmes/services/climate_change_conference_en.htm

The **European Space Agency** will not participate in consortia of FP7 proposals submitted under the FP7 "Cooperation" Space Theme to this call for proposals.

Gender dimension

The pursuit of scientific knowledge and its technical application towards society requires the talent, perspectives and insight that can only be assured by increasing diversity in the research workforce. Therefore, all proposals are encouraged to have a balanced participation of women and men in their research activities and to raise awareness on combating gender prejudices and stereotypes. When human beings are involved as users, gender differences may exist. These will be addressed as an integral part of the research to ensure the highest level of scientific quality. In addition, specific actions to promote gender equality in research can be financed as part of the proposal, as specified in Appendix 7 of the Negotiation Guidance Notes[7].

Activities

Two main activities, complemented by a set of cross-cutting activities, will be undertaken to achieve the policy objectives expressed above, and several specific action areas are prioritised within these activities. However, not all specific action areas will be open for specific call topics in the call during 2012, covering commitment appropriations of 2013.

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

The **first activity**, the development of GMES (Global Monitoring for Environment and Security) being central to this activity, covers five main *action areas*:

1. 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 funded GMES Services.
2. Integrated use and application of **satellite communication and satellite navigation solutions with space-based observation systems**, and with related non-space systems.
3. **Support to the coordinated provision of observation data**, both from space-based infrastructure and from in-situ observation systems. [8]
4. Development of **Earth observation satellites**, which relate to the management of the environment and security, and which complement in-situ systems.
5. Continuity of **GMES services,** ensuring complementarity and consistency with the GMES Regulation on the European Earth observation programme (GMES) and its initial operations (2011-2013)[9]

During 2013, **four of the five specific *action areas* above will be prioritised** (namely area 1, 2, 3 and 4), following a strategic approach as follows.

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[7] https://ec.europa.eu/research/participants/portal/page/fp7_documentation

[8] Coordination and Support Actions for these activities are regarded as policy related actions and will not be managed by the Research Executive Agency (REA)

[9] OJ, L 276, 20.10.2010, p. 1.

The Work programme 2011 for the FP7 space theme allocated resources already with high priority to the Marine and Atmosphere domains, resulting in service projects aiming at continuity (action area 5), as well as a number of smaller projects meeting R&D needs in these two domains. The Security monitoring service was the main focus of the work programme 2012 in action area 1. Research and development activities undertaken in the FP7 work programmes 2013 under action area 1 will thus focus thematically on R&D needs for the build up of **climate change monitoring services**, stimulating the development of d**ownstream services and service evolution** and other **earth observation/remote sensing research** to further strengthen the GMES implementation.

As regards **climate and climate change monitoring,** discussions during 2011 and the Helsinki conference have highlighted priorities in the climate change service context. These are to improve Earth System reanalyses to include the hydrological cycle, coupling the ocean and atmosphere, and feedback mechanisms. Issues such as data archiving, integration and access to data through a central clearing house mechanism should also be tackled, as well as implementing a gridded approach to impact indicators. Research topics of the work programme 2013 will be tailored to meet the priorities expressed above.

Support to the coordinated provision of observation data (action area 3) will be addressed in 2013, by making available additional resources through the EC/ESA Delegation Agreement for space data supply to services.

Action area 3 and Action area 4 of development of **Earth observation satellites** will be supported in 2012 and 2013 with a payment transfer from FP7 under the ESA-EU Delegation Agreement.

Activity 9.2. Strengthening the foundations of Space science and technology

For the **second activity**, the strengthening of foundations of Space science and technology, the support is to be maximised through synergies with initiatives of ESA or other European, national or regional entities. This activity comprises three more *action areas*:

1. Support to research activities related to **space science** and **exploration**,
2. New concepts in **space transportation**, and **key technologies** including **critical components**,
3. Research to reduce the vulnerability **of space assets**.

During 2013 **all three specific *action areas*** above will be supported, placing the priorities on topic areas which have seen either a high oversubscription in 2012, or topic domains which have not been covered yet in previous years. Earth-analogue research preparing for space exploration is for instance an important area allowing thorough performance validations to be conducted economically on earth before engaging in costly in-orbit validations. As regards Critical Technologies for European Non-Dependence, this topic has not been covered in the Work Programme 2012. The joint task force group (EC, ESA, EDA) has now reviewed and updated the list of the most urgent critical technologies thus harmonising the response of the three institutions. Regarding the vulnerability of space assets, specifically to space weather interference, particular attention has been given to the upstream research needs of Galileo.

Activity 9.3. Cross-cutting activities

The **third activity** comprises a number of horizontal issues:

1. Activities in **SME relevant research** will be embedded *in all the action areas* mentioned. Applications of GMES and other space infrastructures, including Global Navigation Satellite Systems (GNSS), 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 may be found in the development and/or adaptation of methodologies and tools for services tailored for specific applications. Concerning space science, exploration, space transportation and space technologies spin-in and spin-off activities are encouraged. Additionally to this general approach, collaborative projects will be *specifically supported in 2013* under this action area, which bring together SMEs not traditionally working in space projects with space industry or space research organisations.
2. **International cooperation** with third countries (ICPC) 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, with a view to facilitating wider space research alliances. Candidates for cooperation among other established or emerging space powers include the United States, Russia, Canada, Japan, the People's Republic of China, India, Brazil, South Africa, and the Ukraine. The European Neighbourhood Policy governs 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).

   All projects conducted in the Theme Space are open for such participation of third countries under the normal participation rules, with the topics mentioned above being of particular interest for international participation. Participants are eligible to participate in the context of the Space Theme calls described in this work programme. A specific priority is given in 2013 to cooperation with the Ukraine and China in the specific cross-cutting actions under Activity 9.3.
3. Effective **dissemination actions** are of importance as significant wider benefits are expected to arise from the research projects and actions supported under this programme.
4. **Cross-thematic approaches:** in this work programme, complementarity is ensured with other Themes of the Cooperation Programme. In particular, the topics in Activity 9.1 relating to GMES in this work programme are complemented by work in the Theme 'Environment (including climate change)'. Also the 'Space technologies' topic in this work programme is complemented by activities in the Themes 'Nanosciences, Nanotechnologies, Materials and new Production Technologies', 'Energy', 'Transport' and 'Information and Communication Technologies'.

Actions in order to better understand the opportunities and challenges associated with the **European Space Policy implementation** process will be undertaken, together with road-mapping activities identifying future Framework programme research needs.

II. CONTENT OF CALLS

This section describes all the topics for which proposals will be called in this work programme. This concerns only the content of the calls. For the practical modalities related to these calls, please refer to section III 'Implementation of calls'. For actions not implemented through calls for proposals, please refer to section IV 'Other actions'.

The current planning foresees one call in 2012 covering an annual work programme, for projects to be funded from the 2013 Space theme budget. No further call on these activities is currently planned based on the commitment appropriations of 2013.

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

Area 9.1.1 (Pre-)operational validation of GMES services and products

Three subject areas are being considered, firstly meeting the need to cover the 6th thematic service domain of climate change in GMES, and secondly opening up competition again to downstream service communities.

Towards a GMES Climate change service – preparatory activities

Discussions during 2011 and the Helsinki conference[10] have highlighted priorities in the climate service context, particularly in light of the wide range of climate change relevant activities being supported at all levels, from global to local level. It explored whether there are still any gaps, and which of these need to be addressed by GMES and should be considered as components of a future GMES climate change service. Actions have been prioritised, which are complementary to activities funded by other sources. These are to improve Earth System reanalyses to include the hydrological cycle, a proper coupling between the ocean and the atmosphere, as well as other feedback mechanisms. Issues such as data archiving, integration and access to data through a central clearing house mechanism should be tackled, as well as implementing a gridded approach to impact indicators. The topics proposed in this area support activities leading to the development of initial Climate Change Service elements as identified during the GMES stakeholder consultations and the Helsinki Climate Service conference in 2011.

SPA.2013.1.1-01: Global 20th century re-analysis and coupling methods

[10] Proceedings of the conference are available at http://ec.europa.eu/enterprise/policies/space/gmes/services/climate_change_conference_en.htm

A global 20th century re-analysis covering all components of the earth system is to be undertaken. This will require data recovery and data rescue efforts for early space-based and in-situ observations, as well as the preparation of these observations for inclusion in a climate reanalysis. In parallel, scientific approaches will be favoured, which considerably enhance the description of interactions between different components of the earth system (e.g. atmosphere, land, ocean, cryosphere, carbon cycle, etc). This could be addressed by improving the coupling between some or all components of the Earth system in the background estimates and/or in the analysis step. The goal of the activity is to provide consistent historical climate data records from 1900 until 2012 at improved spatial and temporal resolutions, spanning the satellite and pre-satellite era records in a consistent manner.

Links should be made to existing projects which are improving the quality of in-situ and space-based observational data sets (reprocessing) as well as providing new data from sometimes non-digital sources (data rescue). Reanalysis starting in 1900 has to rely on uncertain input data subject to various data correction schemes, and hence activities must be included to quantify the resulting uncertainty in the resulting historical records, e.g. by using an ensemble approach.

Such a reanalysis will generate an archive containing potentially several petabytes of gridded data, and these must be made easily accessible to a large number of users. Efficient web-based data services and versatile visualisation services will have to be realised.

Proposals will have to include efforts to liaise with other ongoing projects, including those selected under the other topics of this area, and other projects such as the ESA Climate Change Initiative (CCI) and EUMETSAT Central Applications and distributed satellite application facilities network including the climate monitoring Satellite Application Facilities (CM-SAF), in particular in the area of data access, data formatting, and space data processing, in order to avoid duplications and exploit synergies. For the marine area, projects must reinforce and build on standards, protocols and catalogues developed in the ongoing collaboration between the European Marine Observation and Data Network (EMODnet) and the GMES marine service.

- Expected impact:

  The project is expected to significantly contribute toward capacities in the climate change context of GMES by providing consistent datasets of climate relevant parameters on a global scale for all of the 20th century. This 4D data set will support (in combination with climate model predictions) climate change impact and adaptation action assessments, policy development and policy monitoring for global, European and national users. It will also be an important asset for the development of downstream sector specific climate application services.

Funding schemes: One *Collaborative project* with an upper eligibility limit of EUR 7 000 000 requested EU contribution (up to one proposal can be selected).

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

SPA.2013.1.1-02: Ensemble system of regional re-analyses

An ensemble system of regional re-analyses should be developed, together with the necessary tools to statistically assess the information content of resulting probabilities, and how best to utilise this additional information for understanding past climates and climate change.

The ensemble technique is a well accepted simulation approach to quantify uncertainties in atmospheric modelling. It is being used in order to quantify the spread related to uncertainties inherent in historic data sets, which in turn provide an improved set of boundary conditions. At the same time, different regional reanalysis data sets are being developed by European consortia (for example EURO4M and other FP7 projects) and also through national activities. Both are providing a wealth of information reflecting uncertainties, which are crucial for the interpretation of the reanalysis output or derived indicators. An ensemble of regional reanalyses should be developed in order to optimally exploit the results of different regional reanalyses for best describing uncertainties in the historic records at regional levels. Scientific approaches which enhance the description of interactions between different components of the earth system in the individual models are welcomed.

To enhance quality, statistical uncertainty methods need to be developed to improve exploitation and account for sparse observations in the pre-satellite era. Based on the results of uncertainty levels, efforts should also be included on how to quantify uncertainties of impact indicators which are most relevant to the development and assessment of policies.

Overall, such a re-analysis will generate an archive with large amounts of gridded data; these must be easily accessible by a large number of users, for scientific and policy use. Efficient web-based data services, as well as versatile visualisation services will have to be realised.

Proposals will have to include efforts to liaise with other ongoing projects, including those selected under the other topics of this area, in particular concerning data access and data formatting, in order to avoid duplications and exploit synergies.

- Expected impact:

  The project is expected to significantly contribute towards capacities in the climate change context of GMES by providing consistent long term datasets of climate relevant parameters on a regional scale. This will substantially support (in combination with climate model predictions) climate change impact and adaptation action assessments, policy development and policy monitoring for European and national users. It will also be an important asset for the development of downstream sector specific climate application services.

Funding schemes: One *Collaborative project* with an upper eligibility limit of EUR 5 000 000 requested EU contribution (up to one proposal can be selected).

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

SPA.2013.1.1-03: Traceable quality assurance system for multi-decadal ECVs

R&D towards traceable multi-decadal Essential Climate Variable (ECV) records is to be performed. The goal of this activity is to develop rigorous quality assurance methodologies for satellite-derived ECV products. These methodologies, which may be specific to individual ECVs or groups of ECVs, should be based on the concept of traceability as it is used in metrology. Furthermore, the methodologies should be applied to a small number of satellite-derived ECV records, which are to be generated in a consistent manner across timescales close to or exceeding 30 years in length, in order to assess compliance with the Global Climate Observing System (GCOS) quality criteria. Proposals should not duplicate efforts currently addressed by ESA's Earth Observation (EO) programmes or EUMETSAT Central applications and distributed Satellite Application Facilities including Climate Monitoring (CM-SAF). Proposals will have to address both parts of the problem, which are closely interlinked.

1. Developing traceable quality assurance methods for ECVs:

   The reference quality standards for ECVs are formulated (and updated) by the GCOS. Compliance of ECV datasets with these accuracy criteria is crucial and must be verified independently. The goal of this activity is to develop traceable approaches (whether building on modelling efforts or by other means) that allow to evaluate the quality of satellite-derived and in situ-measured ECV products and algorithms – ideally at the level of individual pixels or in situ locations, respectively – via an unbroken chain of comparisons to certified reference standards. Of particular interest here (although not limited to) are ECVs that are the result of a combination of parameters or algorithms rather that being directly measurable with satellite and in situ observations.

   In addition to adhering to sound metrological practices, the proposed quality assurance methodologies should adapt to whatever ECV definitions are being used by satellite and in situ retrieval algorithms. Ideally, they should also be capable to deliver reliable assessments on the merit of a given ECV retrieval algorithm prior to its implementation and the (re-)processing of large volumes of satellite data. Physical measured parameters should wherever possible be traced to reference standards of SI derived units (derived from the International System of Units). As a practical test, the proposed quality assurance methodologies should be applied to the ECV records delivered under item 2 below in order to assess their compliance with the GCOS criteria.

   This activity should aim at providing information on the quality and "fit for purpose" nature of the respective climate dataset as potential important metadata for policy relevant information in the context of the EU Climate Adaptation Platform, Climate-ADAPT (www.climate-adapt.eea.europa.eu).

2. Generating multi-decadal satellite-derived global ECV records:

   Consistent quality-assured satellite-derived global ECV products spanning multiple decades are essential to improve our knowledge about climate change, its causes and consequences, as well as to optimise not well understood process descriptions in models. These climate records may also serve in the validation of models and as basis for the development of reliable impact indicators for policy makers. The goal of this part of the activity is to generate new long-term ECV records on the basis of satellite

observations. As such, proposals should focus on ECVs that fall outside the products generated by ESA's CCI initiative and that are not covered by the EUMETSAT Central applications and distributed Satellite Application Facilities including Climate Monitoring (CM-SAF).

More specifically, historical records of a few quality-assured ECV products should be generated in a consistent manner on the basis of appropriately (cross-) calibrated satellite observations and ideally operational retrieval algorithms that can be customised to multiple space sensors including those of the upcoming sentinels. The generated ECV records should be global in scope and close to (or exceed) 30 years in length. The emphasis of this activity lies with the quality (and not the quantity) of long term ECV data records that are to be generated within the project. The final ECV products and retrieval algorithms should be verified with the traceable quality assurance methodologies described under item 1 above and made available via dedicated web-interfaces and visualisation tools.

Proposals will have to include efforts to liaise with other ongoing projects, including those selected under the other topics of this area, dealing with data access, data formatting and the generation of climate indicators in order to avoid duplications and exploit synergies.

- Expected impact:

Projects are expected to contribute toward the (pre-) operational capacities in the climate change context of GMES, by augmenting the number of currently available quality-assured long term ECV records and by providing methodologies suitable for reliable assessments of the climate quality of ECV products. This will substantially support (in combination with climate model predictions) climate change impact and adaptation action assessments, policy development and policy monitoring for global, European and national users.

Projects are furthermore expected to contribute towards the standardisation aspect of Europe2020, namely by delivering robust and cost-effective quality assurance procedures for satellite-derived EO products and their in situ validation efforts.

Funding schemes: One *Collaborative project* with an upper eligibility limit of EUR 5 000 000 requested EU contribution (up to one proposal can be selected).

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

SPA.2013.1.1-04: Provision of access to simulated and observed climate datasets and climate indicator toolbox

This activity is to perform R&D towards a climate indicator service. The goal of this activity is to develop a web-based platform in support of impact indicator developments, comparisons and rankings on the basis of direct access to in situ, satellite-derived and model-generated data and products. Proposals will have to address both parts of the problem, which are closely interlinked:

1. Provision of access to simulated and observed climate datasets – building on existing efforts and on-going initiatives, an internet based one-stop-shop is required that provides access to model generated as well as satellite and in-situ based INSPIRE-compliant climate relevant data sets. For the marine area, projects must reinforce and build on standards, protocols and catalogues developed in the ongoing collaboration between the European Marine Observation and Data Network (EMODnet) and the GMES marine service. This activity should account for the considerable increase in climate relevant data volumes which are being generated due to better resolutions and the increasing use of ensemble techniques. Such climate data derives from both in-situ and remotely-sensed observations as well as through numerical modelling for all components of the earth system.

   Hence efforts should be made to technically facilitate the access to the observation and modelling results, including data formats, compression techniques, condensed description of ensemble information, and their visualisation. At the same time the activity should provide a knowledge base for the academic world as well as for policy makers in support of mitigation and adaptation, both in terms of system concept and the access provided to data repositories within the time span of the project.

   The final system should allow for climate model output, re-analysis datasets, impact indicators, as well as in-situ and satellite data and products to be extracted from their respective locations via a single interface – containing advanced geospatial and temporal search tools – and made available to the user in a common grid format. The final system should enable the climate indicator toolbox described below. Furthermore, metadata describing the quality or "fit for purpose" nature of information should be included in this activity. In addition, the activity should explore how to best link the wealth of climate data sets to the EU Climate Adaptation Platform, Climate-ADAPT (www.climate-adapt.eea.europa.eu) and provide practical solutions.

2. Developing a climate impact indicator toolbox – the overall goal of this part of the activity is to develop efficient and user-friendly statistics tools for the generation, comparison and ranking of gridded INSPIRE-compliant climate impact indicators at local, regional and European scales on the basis of satellite, in situ and re-analysis datasets, as well as auxiliary (e.g. socio-economic) information (if available in suitable data formats). Software tools for improved characterisations of extreme events (e.g. their likelihood, intensity and change in frequency) should be developed. At the same time it should be possible to build new indicators, compare them to existing ones and identify the strengths and weaknesses of each method. Ideally, these efforts should make use of the uncertainty information associated with the input datasets whether these were obtained from in situ measurements, satellite observations or model simulations/re-analyses. The goal should be to generate, compare and deliver robust indicators - having well documented associated uncertainties - that are relevant for the development and assessment of policies.

The activity should apply the developed tools to indicators defined in the context of existing EU and/or national adaptation strategies, in order to closely link the activity to the demands of policy users. Appropriate provision of this information to the EU Climate Adaptation Platform, Climate-ADAPT (www.climate-adapt.eea.europa.eu) should also be addressed.

Proposals will have to include efforts to liaise with other ongoing projects, both for data access and data format definitions as well as for the generation of climate indicators, in order to avoid duplications and exploit synergies. The overall impact of the system should be measured by users, in particular regarding ease of access, generation of new indicators and the ranking of existing ones.

- Expected impact:

Projects are expected to significantly contribute toward the (pre-)operational capacities in the climate change context of GMES, in particular, by delivering a one-stop-access point to EO products, re-analysis data, climate model output and in situ observations, and thereby enabling the development, generation, comparison and ranking of climate impact indicators. It will also ensure that the expanding climate-relevant data volumes can be readily accessed and processed into higher level information products by a broad interdisciplinary community.

Funding schemes: One *Collaborative project* with an upper eligibility limit of EUR 6 000 000 requested EU contribution (up to one proposal can be selected).

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

SPA.2013.1.1-05: Attribution products

A series of attribution products are to be developed by using a climate model to determine the expected response to a particular climate forcing. Model projections (at regional and/or global level) are to be performed with different climate forcings; i) with natural forcings (solar radiation and geological factors) only; ii) with natural and anthropogenic forcings. Differences in the projections can then be attributed in a probabilistic manner to the effect of anthropogenic forcing. This activity should study a number of historical cases, related to flooding, droughts and storm surge events, and identify as to whether (and what) anthropogenic factors may have contributed to their occurrences. The activity should provide evidence as to whether the risk for a similar event has increased, decreased or remained stable. It should also propose exhaustive diagnostics of climate processes for cases under study and list areas where the science, or observables (their coverage, or precision), are still too uncertain to make a robust assessment of the change in risk. Where there are gaps identified, an identification of the observation concepts required would be valuable.

- Expected impact:

The project is expected to significantly contribute toward the (pre-)operational capacities in the climate change context of GMES by providing information on how likely high impact environmental disasters are attributable to natural climate variability or human-

induced effects. This should enable the growth of a downstream service sector. Additionally, the methodology developed by this project in order to quantify the enhanced risks of extreme climate states and severe weather events is expected to contribute to the development of climate change adaptation strategies, both for commercial activities as well as policy initiatives.

Funding schemes: One *Collaborative project* with an upper eligibility limit of EUR 3 000 000 requested EU contribution (up to one proposal can be selected).

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

GMES service activities

Apart from preparing the ground for a GMES climate change service, the work programme in 2013 further expands the development and evolution activities of downstream services, supporting also the development of up to date remote sensing algorithms and methodologies needed to enable future service products.

SPA.2013.1.1-06: Stimulating development of downstream services and service evolution

Apart from satisfying information needs by policy makers, innovative commercial geo-spatial products and geo-information services are key to economic return on the major space investments made in earth observation, and directly aim at enhancing the competitiveness of European value-adding and geo-information service industries. Creating innovative services not only leads to improvement of European competitiveness, but also enables sustainable development.

Research and development on next generation products and service lines derived from space-borne data in conjunction with in-situ data is to be targeted. Particular attention is to be given to the presence of the GMES investments in the Sentinel satellites expected to be launched on a 2013/2014 time horizon, and the presence of the GMES services in land, marine and atmosphere domains. Exploitation of GMES data should be considered in the widest context, for institutional, commercial or for scientific use.

Existing and validated experimental practices or methodologies need to be turned into operational prototypes in a close interaction and trade-off/validation process with the service users. Projects should be strongly user driven and take into account user needs concerning information and services, quality specifications, 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. For example, activities could target application areas of:

- Agriculture and agri-environment, crop monitoring, precision farming,
- Monitoring of critical infra-structures, vulnerable to man-made and natural hazards,

- Renewable energy production and energy efficiency management,
- Environmental and Climate change impacts and attribution,
- Maritime and other transport activities, including for instance end-to-end maritime supply chain security,
- Health services, monitoring conditions for vector borne diseases or other health risks derived from environmental factors,
- Atmospheric pollution/air quality monitoring and forecast,
- Soil organic carbon monitoring,
- Water cycle monitoring,
- Support to marine monitoring activities (e.g. monitoring of living marine resources) and coastal environment monitoring

Proposals addressing other application areas are also welcome.

Downstream services strive to build up the pre-operational delivery capabilities, and hence proposals must demonstrate:

- **A structural capacity for providing a sustainable service on an operational basis (preferably supported through a proven record).**
- **A clear focus on the operationalisation of services, and thus sustainability of the service during subsequent operations, by defining and further consolidating the economic model for service provision (e.g. through a business plan).**

Therefore, the following elements will be considered in the evaluation of the proposals:

- A demonstration of a user-driven approach, including for instance:
  - A user representation appropriate to the targeted products and user communities, as well as a suitable mechanism to interact with these (participation of users as project's partners would be favourably considered or, as a second preferred option, the set-up of service level agreements could be considered[11]).
  - A process for elaborating requirements closely with the users, including:
    - The specification of quality requirements and tolerance levels (explicit and well-defined precision, reliability, availability and integrity requirements for the products/service).
    - An unambiguous, detailed and realistic list of products to be delivered to the users: product description, time period and geographical coverage, delivery dates.

[11] A template is available as part of 6th SPACE call documents to be found at https://ec.europa.eu/research/participants/portal/page/cooperation

– A process for monitoring how activities (of research, development, demonstration, system implementation, service validation and data provision) trace back to the user requirements.

– A process for feedback from and assessment of the service *by relevant end-users*, which demonstrates both the acceptance level of the products, the prototypical service, as well as a strategy for integration into the users' workflows and resulting decision-making processes.

- A description of the organisation and service architecture, including interface / coordination to be assured with the GMES services providers if relevant.
- A description of procedures for collection of observation data (satellite, in-situ) 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 should be taken of possible mechanisms of coordinated data delivery.
- A description of selected methods for data validation and fusion from multiple sources; techniques for data assimilation into models, validation of space derived products by means of in-situ data.
- A preliminary analysis of the added value of products derived from GMES services,
- A preliminary version of a clear and scientifically sound validation plan including detailed methods for measuring quality of products, their viability[12], and describing the test sites and their selection criteria.
- A description of the approach for achieving 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[13] 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 exchange the information held by distributed public and private bodies;

[12] It should be noted that activities designed to prove the viability of new technologies that offer a potential economic advantage, but which cannot be commercialised directly, **correspond to "Demonstration" activities rather than "Research and Development" activitie**s in the Framework Programme. Proposals should therefore provide a careful separation of these two types of activities in their work plan.

[13] 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".

- establishment of a data policy and appropriate security framework.

Projects should include activities aiming at disseminating knowledge and increasing public awareness of the results achieved through the integration of space technology and in-situ observation systems. Project output could 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.

Space-based observation data necessary for the development of each project will have to be detailed in the proposal. In particular, the proposal should highlight the Earth Observation Data expected to be made available through the EU funded data access mechanisms via ESA[14]. Concerning the latter, proposals should provide an overview of resources needed for space-based observation data, as data requirements beyond the existing agreement between the Commission and ESA will have to be covered by the budget of the project.

With regard to ***in-situ data*** necessary to the development of each service, the proposals will have to foresee dedicated efforts for their provision, allowing for an interface with coordination activities of the European Environment Agency (EEA) in this respect[15].

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 elevation, administrative boundaries, transport and utility networks etc.

In particular in-situ data should meet the immediate needs of the specific proposed service and should cover, inter alia, 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).

Specific needs for dedicated in-situ data for the development of each service should be detailed in the proposals. The proposals should provide an overview of in-situ data requirements and if specific data will have to be covered by the budget of the project.

The participation of SMEs is particularly encouraged for this topic of the call; while not being compulsory, this aspect will be taken positively into account in the evaluation.

- Expected impact:

  The projects are expected to establish innovative new GMES service capacities targeting specified user communities. In the context of already existing capabilities, projects are expected to contribute to the integration of new service lines into service chains of GMES downstream services.

[14] Data Warehouse Requirements Document v1.8 dated 30/05/2011
[15] FP7 project 249327, GMES In-Situ Coordination (GISC)

The proposals are expected to have a demonstrable impact of the proposed service on the operations and capacities of the involved user communities. The resulting projects are expected to show significant uptake of products and to conclude on suitable business models for long-tem operational supply. The developed services are consequently expected to be self-sustainable from an economic perspective when EU funding ends. Strong evidence that the involved user organisations are likely to pay for the service after the end of the project should therefore be given. Significant progress to establishing a directory of users likely to be willing and capable to pay for the service should also be demonstrated.

The evolution and trends of future sensor needs shall be demonstrated. The results obtained shall contribute directly to the sustainability and competitiveness of European value-adding services.

The proposals are expected to enhance the European industry's potential to create and take advantage of important market opportunities and to establish leadership in the field, giving due regard to the impact that the products and services could have in a socio-economic context. The projects are thus expected to reflect the mutual dependency of technology, organisational dynamics, societal issues as well as related legal/economic aspects. Furthermore, projects are expected to ensure sufficient awareness and understanding of all relevant issues for the take-up of their outcome.

Projects are expected to boost downstream service and business activity, to be achieved through close collaboration with representative user communities throughout Europe. To enhance the impact on GMES activities in Europe overall, the projects are expected to take into account and build upon relevant past and ongoing activities in the field. Optimum use of existing products and services or other project results is therefore expected.

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

Funding schemes: *Collaborative projects* with an upper eligibility limit of EUR 2 500 000 requested EU contribution.

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

SPA.2013.1.1-07: Remote sensing methods

Progress in remote sensing applications can be made by improving object based analysis and other automated interpretation processes, and/or combining information from different sensors in novel ways, examples being :

- Improved information extraction and change detection from combined use of different sensors, such as radar, thermal infrared and/or optical imagery (from ultraviolet to shortwave infrared) and infrared and/or optical spectrometry;

- Water cycle monitoring from combined use of different Sentinel data;

In projects dealing with multi-temporal analysis of Sentinel-similar data sets, the ones dealing with improvement of the geometric and radiometric matching between Sentinel data and previously launched similar missions (e.g. Landsat) would be favoured.

The operational availability from Sentinel satellites, expected to be launched on a 2014 time horizon, will be of particular significance in this respect.

Provision of next generation geo-information services and products also benefit greatly from new methods which exploit the physical observables accessible from space. In this respect, radiometry for soil moisture and ocean salinity, or novel use of Lidar measurements could be addressed.

The growing availability of hyper-spectral data allows better environmental observations from space, and activities could target for instance:

- The use of hyper-spectral based information for better ecosystem analysis. Progress has been made in recent years in combining various satellite-borne data for assessing ecosystem quality and functions, but fundamental gaps persist. Research is needed to explore which spectral and assessment methodologies can be successfully combined for receiving hitherto still inadequate information on the type, quality, state, degradation and restoration possibilities of ecosystems, and on how far ecosystem functions can also be assessed via satellite interpretation.

- The use of hyper-spectral information for remote geological analysis of soil quality and soil degradation. Soil spectral libraries are being built at both national and European scales. They contain spectra that are strongly correlated with key soil properties (e.g. carbon and clay content). Research in advanced data processing techniques is needed in order to link these libraries with hyperspectral remote sensing products for the extraction of topsoil properties under varying surface conditions, taking into account spatio- temporal variation in moisture, roughness and vegetation cover. Research could also address the use of hyperspectral imagery in operational Digital Soil Mapping and Digital Soil Assessment.

- The use of hyper-spectral imagery in water resources analysis and inland or coastal water quality characterisation, with particular attention to the proper integration with classification and modelling methods.

- The use of hyper-spectral information for detailed analysis of remote sensing data of natural vegetation and crops. A large amount of forest and crop data has been collected across Europe during the last decades. Furthermore, some airborne initiatives are being used. New hyper-spectral images, combined whenever possible with Lidar data, can be an enormous leap forward if properly modelled using the current “ground truth”.

With some 150 GNSS satellites to be available in the next future, the use of GNSS signals for non-navigation purposes represents a further domain in which novel sensing applications are possible, like GNSS Reflectometry (GNSS-R), GNSS Radio Occultation (GNSS-RO), GNSS tomography etc…., using both space and ground infrastructure. These new applications of GNSS have the potential to be exploited to yield information in many GMES areas, like

marine (e.g. sea-surface roughness, ice characteristics), Climate change monitoring, Land (e.g. soil moisture or biomass content), Atmosphere (e.g. water vapour or carbon hot spots) or even Emergency (e.g. Tsunami detection) etc...

New methodologies or service concepts demonstrating improved performances with respect to existing earth observation methods are particularly welcome.

Proposals are invited which investigate promising new application areas.

- Expected impact:

The projects will be expected to establish a basis for the development of innovative new GMES products or applications combining in a novel manner existing and upcoming sensor data and in-situ data. Projects are also expected to demonstrate that improved service performances are achievable by applying innovative remote sensing methods. Finally, project results are expected to substantiate the needs for new observation techniques to be implemented in the next generation of observation satellites. 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.

Funding schemes: *Collaborative projects* with an upper eligibility limit of EUR 2 000 000 requested EU contribution.

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

Area 9.1.2 Integration of satellite communication and satellite navigation solutions with space-based observing systems

SPA.2013.1.2-01: Integrated downstream service activities and applications

The objective is to support the development of pre-operational services which integrate satellite communication and/or satellite navigation solutions with space based observing systems in innovative products. Therefore, they shall demonstrate:

- A structural capacity for providing a sustainable service on an operational basis (preferably supported through a proven record).

- A clear focus on the operationalisation of services, and thus sustainability of the service during subsequent operations, by defining and further consolidating the economic model for service provision (e.g. through a business plan).

The outcome of the project should be a pre-operational service platform, with the objective of validating the technological concepts and acknowledging the benefits of an integrated communication / navigation / observation infrastructure with the users, for instance in the areas of prediction/early detection of emergencies, alerting populations (e.g. Tsunami warning). The validation of specific prototypes, based wherever possible and appropriate on

real situations, is encouraged. The overall objective is to provide the end-users with all the required information in a seamlessly integrated, timely, secure and user-friendly fashion. Exploitation of GMES data should be considered in the widest context, for institutional, commercial or for scientific use. Thus possible users could be in small companies, national or local authorities and agencies, and universities.

Complementarities 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 space-borne and terrestrial communication (e.g. optical communications) and navigation technologies (in particular relevant developments in the Galileo and European Geostationary Navigation Overlay Service - EGNOS systems). Optimisation and customisation of service platforms and their interface with the Galileo/GNSS system and existing service centres will need to be addressed. The related economics should also be addressed as an integral part of the proposed action. 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. To this purpose, account will be taken of the latest development in relevant communication and navigation technologies as identified before.

Space-based observation data necessary for the development of each project will have to be detailed in the proposal. In particular, the proposal should highlight the Earth Observation Data expected to be made available through the EU funded data access mechanisms via ESA[16]. Concerning the latter, proposals should provide an overview of resources needed for Space-based observation data, as data requirements beyond the existing agreement between the Commission and ESA will have to be covered by the budget of the project.

- Expected impact:

Projects will be expected to contribute to the development of a service platform, aiming at validating the technological concepts and demonstrating the benefits of an integrated communication / navigation / observation infrastructure with the users. Where novel communication technologies are integrated to upgrade existing service lines, significant advances in quick and inexpensive access to real-time EO data for governmental, civil protection management, and commercial end-users are expected. Projects will be expected to highlight the socio-economic impact of such integrated applications, their challenges and their benefits.

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

Funding schemes: *Collaborative projects* with an upper eligibility limit of EUR 2 500 000 requested EU contribution.

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

[16] Data Warehouse Requirements Document v1.8 dated 30/05/2011

Area 9.1.3 Support to the coordinated provision of observation data

This part will **not be open** for specific call topics in 2013.

Area 9.1.4 Development of Earth observation satellites

This part will **not be open** for specific call topics in 2013, as this activity is covered by **the EU-ESA Delegation Agreement.** Specific funding support is provided by the theme Space of the 2013 work programme.

Area 9.1.5: Continuity of GMES services in the areas of Marine and Atmosphere

This part will **not be open** for specific call topics in 2013, as these topics were covered in 2011.

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

Area 9.2.1 Research to support space science and exploration

The Call will focus on two subject areas, namely the exploitation of space based data (space physics, astrobiology, planetary science, astronomy, astrophysics, health …) and Earth-analogue research preparing for space exploration.

SPA.2013.2.1-01 Exploitation of space science and exploration data

Space based observations play a leading role in Earth, Planetary, Universe, Environmental, Physical and Life sciences, providing a privileged vantage point of our planet and objects of the universe, especially when taken in synergy with ground based observations, data analysis and modelling tools and other research in laboratories. ESA has supported many science missions (see in particular data available at the European Space Astronomy Center (ESAC)[17]), but data analysis beyond the execution of the mission remains limited. Collaborative proposals in the field of further data analysis and data exploitation are of particular importance. Missions have produced in the past and are currently producing data sets of immense value for research, and the funding support from FP7 should add to this value through a more comprehensive interpretation.

A focus is to be given to **research, analysis and presentation of data obtained from space missions**, exploiting such space mission data in combination with data collected from ground based observations/data. Research and analysis projects are not only intended to strengthen cooperation on scientific problems, which are relevant to our understanding of space, and advance our ability to perform further activities in space, but could also address earth science issues for which the analysis of space collected data provides breakthroughs.

Proposals should clearly demonstrate how their proposed combination of data sets, from multiple instruments or mission sources, including combinations of space and non-space based data e.g. from terrestrial space observatories like European Southern Observatory (ESO) or the Canary's Islands observatories, leads to strong synergies, and adds value to the data obtained in space.

Projects should enhance the effectiveness and productivity of the European scientific community, and promote the contribution of space assets to scientific and technological knowledge, through:

- mobilising the best expertise, in particular academic researchers and scientists, in various fields of science for the analysis and interpretation of space data, selecting the most innovative and challenging objectives in emerging scientific fields;
- extending the usage of available space data (including archived data), also through comparative benchmarking of existing data collections;
- developing better tools to access, analyse, process, validate, archive and distribute data obtained from different sources such as space observatories;

[17] See http://archives.esac.esa.int/

- supporting the preparation of data exploitation of missions under development, which might need special tools for data acquisition and processing, in light of the wealth and variety of data they will collect, including ground-based auxiliary data where relevant;
- developing comprehensive presentation and visualisation techniques, preferably in 3D, in order to better understand the interrelations between different sources (sensors) and modes (temporally, spatially).

This topic is open to international cooperation and should focus on downstream R&D activities complementing space missions, such as the effective scientific exploitation of existing data. Cooperation with international partners from third countries (ICPC) , or countries which have signed an agreement with the EU covering Science and Technology, as well as other space-faring nations (e.g. US, Japan) will help to expand the use of data, the corresponding data processing and management methods in third countries, and enhance research partnerships with emerging or established space powers. Therefore such international partners will be eligible to participate and to be funded and this aspect will be taken into account in the evaluation.

- Expected impact:

Projects are expected to add value to space missions and earth based observations by significantly contributing to the effective scientific exploitation of collected data. They are expected to enable space researchers to take full advantage of the potential value of data sets. Projects are expected to expand the use of data, and/or contribute to dissemination of space mission data on a global scale, and/or enhance the relations with established international space powers.

Projects are expected to contribute to the much needed coordination and exploitation of existing and future data collections from space missions, and coordination with ground based observatories, and thereby enhancing the possibility to base research on datasets providing comprehensive or full coverage, while at the same time addressing the potential need for further analysis of existing datasets. It is also expected that the projects will facilitate access to, and appropriate use of data for those scientists who were/are not part of the team having obtained the space mission data (e.g. principal investigators).

Furthermore, projects are expected to add value to existing activities on European and national levels, and to raise the awareness of coordination and synergy efforts among stakeholders.

Funding schemes: *Collaborative Projects* (small or medium-scale focused research project) with upper eligibility limit of EUR 2 500 000 requested EU contribution per project.

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

SPA.2013.2.1-02: Earth-analogue research preparing for space exploration

Besides the existing ESA's exploration programmes (International Space Station ISS scientific activities, ESA's robotic exploration missions), research on Earth to prepare for future exploration missions will be fostered in two main areas. This will improve the understanding of feasibility of activities in space:

(1) First, the **validation of systems and components and their functionality in space environments** is a key development step needed in preparing technology for space use. In-orbit testing is however costly and thorough performance validations are conducted as far as possible at an early stage in field tests here on Earth. Environments are chosen that have physical similarities to extreme space environments.

This is particularly applicable for complex robotic systems, where prototype rover configurations are exposed to challenges similar to those faced on planetary environments. Proposals are invited to address specific challenges which could encompass research and development including test facilities on representative fields and field campaigns in representative environments, to address for example:

- Precision landing, thermal shielding, guidance, navigation and control, obstacle avoidance, path planning, stereo vision, advanced optical systems and detectors, autonomous manipulation (e.g. sampling tools, drilling for subsurface samples, containerisation), mother-slave cooperation between orbiters/rovers, robots/rovers or between human/robots, or power efficient motion;

- recycling, waste and water management or regenerative life support systems under simulated mission conditions;

- provision of mission-analogue reference ("Ground Truth") data for the community, stemming from earth-based field campaigns, to enable efficient testing by scientists, mission engineers, academics and students, as well as to verify simulations.

(2) The second aspect of “earth analogue” is related to the **research on life in extraterrestrial environments**, which addresses the possible habitability of extraterrestrial environments, survivability of organisms in such environments and sustainability of life, including humans, beyond Earth.

The long-term response of organisms to environmental parameters such as radiation levels, gravity levels, space vacuum, pressure and temperature, as well as different surrounding chemical compositions can be observed in extreme environments on Earth.

In order to prepare for instance for searches of life to be conducted in space, extreme environments on earth allow:

- definition of limits of life and the habitability potential of organisms in extraterrestrial environments

- refinement of search methodologies and strategies including operational concepts in conditions similar to those expected on distant planets;

- detection of specific adaptations of life forms under extreme conditions to obtain further insights on what could be expected in life forms (including life forms other than those known to exist), or traces thereof, in space;

- search for bio-signatures of non earth-centric life forms;

- recognition of biogeomorphological features in data handling and exploitation.

Proposals focussing on such aspects are invited.

Human performance in space is strongly affected by both biological health and psychological factors. Proposals are invited to be conducted on earth, which look at multidisciplinary aspects such as psycho-physiological parameters determining human performance and well-being in space, and means to monitor these during space missions.

The inclusion of international partners is to be particularly encouraged for this topic of the call, as well as the interdisciplinary nature of the R&D to be undertaken. Cooperation with international partners from third countries (ICPC), or countries which have signed an agreement with the EU covering Science and Technology, as well as other space-faring nations (e.g. US, Japan) will help to enhance research partnerships with emerging or established space powers. Therefore such international partners will be eligible to participate and to be funded and this aspect will be taken into account in the evaluation.

The proposals should show that the research work will have an impact on future or ongoing space activities and whether the experiments could eventually be conducted in real space environment (e.g. on the International or Chinese Space Station).

- Expected impact:

  Projects are expected to contribute to space readiness of technologies and validation of approaches taken for conducting space missions. A further impact is expected through their potential interdisciplinary nature, in bringing together researchers from different disciplines. A valuable impact is the enhancement and broadening of research partnerships, also beyond Europe in an international context. Projects should contribute to forging new research alliances, which could either be with established international space powers, or with other parts of the world offering access to environments with physical similarities to extreme space environments.

  Furthermore, projects are expected to add value to existing activities on European and national levels, and to raise the awareness of coordination and synergy efforts among stakeholders.

Funding schemes: *Collaborative Projects* (small or medium-scale focused research project) with upper eligibility limit of EUR 2 500 000 requested EU contribution per project.

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

Area 9.2.2: Research to support space transportation and key technologies

SPA.2013.2.2-01: Space critical technologies

The space sector is a strategic asset contributing to the independence, security and prosperity of Europe and its role in the world. Europe needs non-dependent access to critical space technologies, which is a conditio-sine-qua-non for achieving Europe's strategic objectives. "Non-dependence" refers to the possibility for Europe to have free, unrestricted access to any required space technology.

Critical Technologies for European Non-Dependence are not restricted only to specific electric or electronic components, but include all those technologies which are surveyed and monitored by the Joint EC-ESA-EDA task force on Critical Technologies encompassing platform, payload and launcher technologies. A number of priority technologies have been identified for FP7 support from which proposers can choose (see table below).

U1	Space qualification of low shock non-explosive actuators
U2	Advanced thermal control systems
U3	Propellant flow and distribution components for chemical propulsion
U4	Advanced materials and material technology for combustion chambers
U5	Alternative to Hydrazine in Europe
U6	Fibre Optic Gyro (FOG) based Inertial Measurement Unit (IMU)
U7	Power amplification: Travelling Wave Tube (TWT) materials
U8	Spacecraft charging analysis tool
U9	Cost-effective high quality Ge-substrates for multi - junction solar cells
U10	Core processors for Digital Signal Processor (DSP) computers
U11	Application Specific Integrated Circuits (ASICS) for Mixed Signal Processing
U12	High capacity Field-Programmable Gate Array (FPGA)
U13	Passive components
U14	Active discrete components
U15	Photonic components
U16	Space qualified GaN components and demonstrators

U17	High density (up to 1000 pins and beyond) assemblies on PCB

Table of urgent actions for R&D of EU dimension

Emphasis for these activities should be on the expected medium term impact for Europe to develop or regain the capacity to operate independently in space, e.g. by developing in a timely manner reliable and affordable space technologies that in some cases may already exist outside Europe or in European terrestrial applications. Nevertheless, projects should strive to go beyond the present state of the art. Clearly identified function and performance targets have been identified for each of the above topics by the Joint EC-ESA-EDA task force[18]. Proposals should address how to access the commercial market with a full range (preload) of recurring products. Proposals that include development activities up to space qualification will be favoured in terms of their potential impact.

Proposals should include a work package dedicated to the development of a commercial evaluation of the technology.

- Expected impact:

The projects are expected, first and foremost, to reduce the dependence on critical technologies and capabilities from outside Europe for future space applications, as identified in the EC-ESA-EDA Critical Space Technologies for European Strategic Non-Dependence - List of Urgent Actions 2012/2013.

In addition, projects should enhance the technical capabilities and overall competitiveness of European space industry satellite vendors on the world wide market. The projects are expected to open new competition opportunities for European manufacturers by reducing the dependency on export restricted technologies that are of strategic importance to future European space efforts. They should enable the European industry to get non-restricted access to high performance technologies that will allow increasing its competitiveness and expertise in the space domain. Projects should improve the overall European space technology landscape and complement the activities of European and national space programmes.

In this context, technological spin in and/or bilateral collaborations should be enhanced between European non-space and space industries and projects are expected to provide advanced critical technologies that are of common interest to different space application domains (e.g. telecom, Earth-observation, science, etc.).

Research funding in this area should have a beneficial economic impact on SMEs in the space sector. A strong participation of SMEs in the project should help to realise this impact.

Funding schemes: *Collaborative Projects* (small or medium-scale focused research project) with upper eligibility limit of EUR 2 500 000 European Union requested contribution.

[18] Critical Space Technologies for European Strategic Non-Dependence List of Urgent Actions for 2012/2013, available as part of 6th SPACE call documents to be found at https://ec.europa.eu/research/participants/portal/page/cooperation.

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

Area 9.2.3: Research into reducing the vulnerability of space assets

SPA.2013.2.3-01: Space-weather events

Solar activity modulated effects on the Sun and in the helio- and magnetosphere affect the entire Earth environment from the magnetosphere down to the ionosphere and even to the lower atmosphere climate system. Space storms (particles, plasma or electromagnetic) are a recognised aerospace hazard and can cause major failures, e.g. onboard aircraft and spacecraft, in electrical power grids, in telecommunications links (satellite, launcher and ground-based) and in navigation systems (e.g. recent peak in the solar activity have disturbed the performance of GNSS and satellite-based augmentation (SBAS) systems).

More accurate modelling and impact assessment on affected systems, in particular GNSS, of disruptive events that are to be expected as part of this cyclical phenomenon are particularly poignant.

Activities could focus on research areas such as:

- Modelling of ionospheric geographical and temporal gradients for different regions of the world (equatorial, mid-latitude and auroral regions), tracking and modelling of ionospheric disturbances such as travelling depletion, solar storms or scintillation, followed by an assessment of effects of ionosphere on navigation signals in the context of single and dual frequency usage and the definition of algorithms able to bound the maximum measurement errors caused by different ionospheric effects.

- Modelling the interaction of satellites with the space environment, especially particle flows (ranging from sub-atomic flows to micrometeoroids and small debris) placing a particular focus on the different physical processes occurring simultaneously or sequentially as a result of impacts (e.g. discharges triggered by impacts).

- Development of mitigation means.

Cooperation with international partners from third countries (ICPC), or countries which have signed an agreement with the EU covering Science and Technology, as well as other space-faring nations (e.g. US, Japan) will help to enhance research partnerships with emerging or established space powers. Therefore such international partners will be eligible to participate and to be funded and this aspect will be taken into account in the evaluation.

- Expected impact:

*Projects are expected to significantly contribute to the European capacity to improve the accuracy and reliability of the Galileo system and to **prevent damage / protect space assets** from space environment events. Projects are expected to significantly contribute to both identify **the impacts** of space environment events in particular on space-based navigation systems, including space- and ground-based infrastructures, and develop concrete solutions to mitigate these risks.*

Funding schemes: *Collaborative Projects* (small or medium-scale focused research project) with upper eligibility limit of EUR 2 000 000 European Union requested contribution.

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

SPA.2013.2.3-02: Security of space assets from in-orbit collisions

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.

Projects shall achieve the objective of performing an in-orbit removal of debris, in a low cost manner, using novel, realistic techniques (e.g. capture techniques like nets, grasping, tethers, harpoons, expanding foam etc… or contactless techniques like ionic beams etc…). Considering the budget allocated to this activity, cubesats, microsats and/or small satellite technology are encouraged to be used to achieve removal of a piece of space debris. Apart from the mission concept, the proposal would include how to deal with issues such as free floating approach and proximity operations, uncooperative docking and manipulation/capture challenges (e.g. tumbling objects), as well as debris capture and de-orbiting using contact and/or contactless techniques such as drag augmentation, sails, micro-propulsion, on-board tethers etc…. Dynamic modelling of the system composed by the satellite and the target debris after capture is an important issue to be considered.

The size of the space debris to be removed from the orbit could be of the size of a cubesat or larger. De-orbiting and mission completion from a low-earth orbit should take place within 1 to 2 years from mission launch.

The objective of this topic is to contribute in the long term to the debris removal of a large range of debris (from small debris to entire satellites). Therefore, debris removal techniques should be designed to be scalable for future use/development, for a range of debris targets to be assessed in the proposal, and scalability will be considered in the evaluations.

Cooperation with international partners from third countries (ICPC) , or countries which have signed an agreement with the EU covering Science and Technology, as well as other space-faring nations (e.g. US, Japan) will help to enhance research partnerships with emerging or established space powers. Therefore such international partners will be eligible to participate and to be funded and this aspect will be taken into account in the evaluation.[19]

- Expected impact:

The project is expected to significantly contribute to the European capacity to detect and protect space assets from space debris. Results are expected to show in real environment technologies and processes ready to be used for future space missions,

[19] See also SPA-2013.3.2-01

preferably with a limited need for continued R&D support for development of technology and processes when EC funding ends. Projects should also contribute to forging new research alliances, and enhancing the relations with established international space powers is regarded to add value to European space activities.

Funding schemes: One *Collaborative Project* (small or medium-scale focused research project) with upper eligibility limit of EUR 7 000 000 European Union requested contribution.

Note: Limits on the EU financial contribution apply. These are implemented strictly as formal eligibility criteria.

Activity: 9.3 Cross-cutting activities

Area 9.3.1: SME specific research

SPA.2013.3.1-01: SME space technology research and technology transfer

Proposals are invited which allow SMEs to develop partnerships establishing their position in supply chains and markets with space related products and services. Newly established SMEs are particularly welcome. Projects should focus on space related research or service provision where SMEs play a central role in the value added chain. Activities can range from spacecraft technology research in various fields such as technology for in-space activities to technology for ground use of space data and to the provision of navigation or geo-information services targeting various areas like environment, agriculture, legal and financial sectors, indoor positioning etc…

Proposals should demonstrate how the projects will lead to SMEs being fully integrated into the related activity area in a sustainable manner.

Proposals should include a work package dedicated to development of a commercial evaluation of the technology/service.

- Expected impact:

Projects are expected to promote the number of SMEs involved in the development of space activities, by initiating and/or reinforcing links between SMEs (not necessarily from the space sector) and other traditional actors in the space sector. SMEs are expected to be fully integrated into the value added chain in a sustainable way through the provision of their core expertise.

The results of research in this topic should clearly be of interest and potential benefit to SMEs. A strong participation of SMEs in the project itself should help contribute to the realisation of that benefit.

The mandatory SME participation is expected to contribute to enhancing the overall SME participation in FP7, and particularly in the Theme Space.

Funding schemes: *Collaborative Projects* with an upper eligibility limit of EUR 2 000 000 requested EU contribution per project. SME[20] participation in these proposals is mandatory, preferably in a leading or coordinating role. More than 50% of the requested EU contribution shall go to SMEs.

Note: Limits on the EU financial contribution apply, SME participation is mandatory. Projects will only be selected for funding on the condition that the estimated EU contribution going to SME(s) is 50% or more of the total estimated EU contribution for

[20] Attention is to be given to the definition of SMEs: SMEs employ fewer than 250 persons and have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. Additional conditions for autonomy apply. More information see: http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm

the project as a whole. This will be assessed at the end of the negotiation, before signature of the grant agreement. Proposals not fulfilling this criterion will not be funded. These criteria are implemented strictly as formal eligibility criteria.

Area 9.3.2: International cooperation

SPA.2013.3.2-01: Cooperation with third countries

Recent developments in dialogues on space cooperation indicate that there is a good opportunity to benefit from **cooperation with the Ukraine.**

In the framework of the Joint working group on EU-Ukraine space cooperation, several activities for development have been identified. R&D proposals are invited which address one of the following three subject areas:

- GMES services for agricultural needs;
- Super light-weight materials and coating technologies for space-based systems;
- Methodologies and technologies for active removal of space debris and/or mitigation of space debris effects.[21]

Participation of one (or more) Ukrainian participant(s) is mandatory for this set of proposed activities. It is expected that proposals provide the opportunity for R&D to the mutual benefit of EU and Ukrainian participants, with a balanced distribution of efforts between the EU and Ukrainian partners.

A further domain of interest for international cooperation is the validation and further refinement of monitoring methods of air-quality globally and at regional levels. In the framework of **cooperation with China,** proposals are invited which address the improvement of monitoring methods of air-quality (combining space and in-situ data), validation, elaboration of indicators and development of a remote-sensing toolbox for air-quality and emissions monitoring. Participation of one (or more) Chinese participant(s) is mandatory for this proposed activity.

- Expected impact:

Projects are also expected to positively impact the international collaboration in this field beyond the timeframe of EC support.

Funding schemes: *Collaborative Projects* with an upper eligibility limit of EUR 2 000 000 requested EU contribution per project.

Area 9.3.3: Dissemination: Transnational and international cooperation among NCPs

[21] Projects on space debris can either be presented under this heading or under heading SPA.2013.2.3-02.

This part will **not be open** for specific call topics in 2013.

Area 9.3.5: Studies and events in support of European Space Policy

This part will **not be open** for specific call topics in 2013.

III. IMPLEMENTATION OF CALLS

For description of the topics of the calls, please refer to section II 'Content of calls'

- **Call title: Space Call 6**
  - Call identifier: **FP7-SPACE-2013-1**
  - Date of publication[22]: 10 July 2012
  - Deadline[23]: 21 November 2012, at 17.00.00, Brussels local time
  - Indicative budget[24]: EUR 126 million

The budget for this call is indicative. The final budget awarded to actions implemented through calls for proposals may vary:

- The final budget of the call may vary by up to 10% of the total value of the indicated budget for each call; and
- Any repartition of the call budget may also vary by up to 10% of the total value of the indicated budget for the call.

- **Topics called:**

Activity/ Area	Topics called	Funding Schemes
9.1.1 Space-based applications at the service of European Society / Pre-operational validation of GMES services and products	SPA.2013.1.1-01: Global 20th century re-analysis and coupling methods	Collaborative Project (Small or medium-scale focused research project)
	SPA.2013.1.1-02: Ensemble system of regional re-analyses	Collaborative Project (Small or medium-scale focused research project)
	SPA.2013.1.1-03: Traceable quality assurance system for multi-decadal ECVs	Collaborative Project (Small or medium-scale focused research project)
	SPA.2013.1.1-04: Provision of access to simulated and observed climate datasets and climate indicator toolbox	Collaborative Project (Small or medium-scale focused research project)

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

[23] The Director-general responsible may delay this deadline by up to two months

[24] Under the condition that the draft budget for 2013 is adopted without modifications by the budget authority.

	SPA.2013.1.1-05: Attribution products	Collaborative Project (Small or medium-scale focused research project)
	SPA.2013.1.1-06: Stimulating development of downstream services and service evolution	Collaborative Projects (Small or medium-scale focused research project)
	SPA.2013.1.1-07: Remote sensing methods	Collaborative Projects (Small or medium-scale focused research project)
9.1.2 Space-based applications at the service of European Society / Integration of satellite communication and satellite navigation solutions with space-based observing systems	SPA.2013.1.2-01: Integrated downstream service activities and applications	Collaborative Projects (Small or medium-scale focused research project)
9.2.1 Strengthening the foundations of Space science and technology / Research to support space science and exploration	SPA.2013.2.1-01: Exploitation of space science and exploration data	Collaborative Projects (Small or medium-scale focused research project)
	SPA.2013.2.1-02: Earth-analogue research preparing for space exploration	Collaborative Projects (Small or medium-scale focused research project)
9.2.2 Strengthening of Space foundations / Research to support space transportation and key technologies	SPA.2013.2.2-01: Space critical technologies	Collaborative Projects (Small or medium-scale focused research project)
9.2.3 Strengthening of Space foundations / Research into reducing the vulnerability of space assets	SPA.2013.2.3-01: Space-weather events	Collaborative Projects (Small or medium-scale focused research project)
	SPA.2013.2.3-02: Security of space assets from in-orbit collisions	Collaborative Project (Small or medium-scale focused research project)
9.3.1 Cross-cutting activities / SME specific research	SPA.2013.3.1-01: SME space technology research and technology transfer	Collaborative Projects (Small or medium-scale focused research project)
9.3.2 Cross-cutting activities /	SPA.2013.3.2-01: Cooperation with third countries	Collaborative Projects (Small or medium-scale

International cooperation		focused research project)

- **Eligibility criteria:**

  - The general eligibility criteria for the different funding schemes are set out in Annex 2 to this work programme, and in the guide for applicants. Please note that the completeness criterion also includes that part B of the proposal shall be readable, accessible and printable.

Funding scheme	**Minimum conditions**
Collaborative Projects	At least 3 independent legal entities, each of which is established in a MS or AC, and no 2 of which are established in the same MS or AC
Coordination and Support Actions (supporting action)	At least 1 independent legal entity established in a MS or AC.

The following additional eligibility criteria and funding constraints apply in this call

- For Activity 9.1, Topic 1.1-01, the maximum eligible EU contribution is EUR 7 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.1, Topic 1.1-02, the maximum eligible EU contribution is EUR 5 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.1, Topic 1.1-03, the maximum eligible EU contribution is EUR 5 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.1, Topic 1.1-04, the maximum eligible EU contribution is EUR 6 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.1, Topic 1.1-05, the maximum eligible EU contribution is EUR 3 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.1, Topic 1.1-06, the maximum eligible EU contribution is EUR 2 500 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.1, Topic 1.1-07, the maximum eligible EU contribution is EUR 2 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.1, Topic 1.2-01, the maximum eligible EU contribution is EUR 2 500 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.

- For Activity 9.2, Topic 2.1-01, the maximum eligible EU contribution is EUR 2 500 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.2, Topic 2.1-02, the maximum eligible EU contribution is EUR 2 500 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.2, Topic 2.2-01, the maximum eligible EU contribution is EUR 2 500 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.2, Topic 2.3-01, the maximum eligible EU contribution is EUR 2 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.2, Topic 2.3-02, the maximum eligible EU contribution is EUR 7 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested.
- For Activity 9.3, Topic 3.1-01, the maximum eligible EU contribution is EUR 2 000 000 per project, proposals requesting in excess will be ineligible. These SME-targeted Collaborative Projects will only be selected for funding on the condition that the estimated EU contribution going to SME(s) is 50% or more of the total estimated EU contribution for the project as a whole. **This will be assessed at the end of the negotiation, before signature of the grant agreement. Proposals not fulfilling this criterion will not be funded.** Only CP are requested.
- For Activity 9.3, Topic 3.2.01, the maximum eligible EU contribution is EUR 2 000 000 per project, proposals requesting in excess will be ineligible. Only CP are requested. Participation from the respective international partner mentioned in the topic is mandatory.
- Only information provided in part A of the proposal will be used to determine whether the proposal is eligible with respect to budget thresholds and/or minimum number of eligible participants.

- **Evaluation procedure:**

  - The standard procedures set out in the FP7 Rules for submission of proposals, and the related evaluation, selection and award procedures, will apply.
  - Proposal page limits: Applicants must ensure that proposals conform to the page limits and layout given in the Guide for Applicants, and in the proposal part B template available through the electronic Submission Services of the Commission.

    The Commission will instruct the experts to disregard any pages exceeding these limits.

    The minimum font size allowed is 11 points. The page size is A4, and all margins (top, bottom, left, right) should be at least 15 mm (not including any footers or headers).
  - The evaluation criteria (including weights and thresholds) and sub-criteria, together with the selection and award criteria for the different funding schemes are set out in Annex 2 to this work programme.
  - For proposals submitted for Activity 9.3, Topic 3.1.01 the following <u>additional</u> aspects will be considered under the evaluation criterion relating to 'implementation':

- Proposals are expected to have a substantial involvement of SMEs. As an indication of the expected level of involvement, evaluators should note that only proposals where at least 50% of the estimated EU contribution goes to SMEs will be eventually selected. This will be checked at the end of any negotiation. As regards a leading role of SMEs with R&D capacities: the coordinator does not necessarily have to be an SME for the project to qualify, but in such cases the participating SMEs should have the decision making power in the project management, and the output should be for the benefit of the participating SMEs and the targeted SME-dominated industrial communities.

- A one-stage submission procedure will be followed.
- Proposals may be evaluated remotely.
- For Activity 9.2, four ranking lists will be established; one for each of the topics (SPA.2013.2.1-01&02, SPA.2013.2.2-01, SPA.2013.2.3-01 and SPA.2013.2.3-02)
- During final ranking, the procedure for prioritising proposals with equal scores described in Annex 2 to the work programme will be modified as follows for the proposals in GMES area 9.1 only:
  - "The following approach will be applied successively for every group of ex-aequo proposals requiring prioritisation, starting with the highest scored group, and continuing in descending order:

  (i) Proposals, that address topics not otherwise covered by more highly-rated proposals, will be considered to have the highest priority.

  (ii) These proposals will themselves be prioritised according to the scores they have been awarded for the criterion **impact**. When these scores are equal, priority will be based on scores for the criterion **scientific and/or technological excellence**. If necessary, any further prioritisation will be based on other appropriate characteristics, to be decided by the panel, related to the contribution of the proposal to the European Research Area and/or general objectives mentioned in the work programme (e.g. presence of SMEs, international co-operation, public engagement).
- (iii) The method described in (ii) will then be applied to the remaining ex-aequos in the group.".

- **Indicative evaluation and contractual timetable:**

This call in 2012 invites proposals to be funded in 2013. The evaluation is to commence within 2 months of the call deadline, with negotiations of successful proposals commensurate with the 2013 budget expected to commence in the first half of 2013.

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.

In order to reduce the time to signature of the grant agreement, participants are requested to also ready themselves for the negotiation phase. Attention should be given to eligibility of the costs expected to be covered, and to provide in the proposal appropriate justification of use of resources including a breakdown of the personnel and other direct costs

per participant. Detailed information should be provided on eventual subcontracting and third parties intended to be included. Furthermore, attention should be paid to correctly define work packages and activities according to the different type of activities: RTD; DEM; MGT[25]; OTHER; COORD or SUPP.

A rapid response of the coordinator in supplying the necessary negotiation documentation will be expected if the proposal is recommended for negotiation.

Details on above indicated issues are included in the Guide for Applicants.

- **Implementation**

Calls for proposals under this work programme Space will be implemented by the Research Executive Agency (REA) according to the provisions of the Commission Decision C(2008)3980 final of 31 July 2008 "delegating powers to the Research Executive Agency with a view to performance of tasks linked to implementation of specific European Union programmes People, Capacities and Cooperation in the field of research comprising, in particular, implementation appropriations entered in the Community budget".

All activities under 9.1 to 9.3 are included in this delegation, only public procurement actions are excluded from this delegation and will be managed by the Commission.

- **Consortia agreements**

The conclusion of a Consortium Agreement is required for any action under the Space Theme.

- **The forms of grants and maximum reimbursement rates** which will be offered are specified in Annex 3 to the Cooperation work programme**.**

- **Third country partners:**

In accordance with Article 29.2(a) of the Rules for Participation[26], for Activity 9.2, topics.2.1-01, 2.1-02, 2.3-01 and 2.3-02, legal entities established in a third country other than an associated country or international cooperation partner country are eligible for funding.

- **Flat rates to cover subsistence costs:**

In accordance with Annex 3 of this work programme, this call provides for the possibility to use flat rates to cover subsistence costs incurred by beneficiaries during travel carried out within grants for indirect actions as outlined in Commission decision C(2009)1942 of 23 March 2009. For further information, see the relevant Guides for Applicants for this call. The applicable flat rates are available on the Participant Portal at: https://ec.europa.eu/research/participants/portal/page/fp7_documents under 'Guidance documents for FP7/Financial issues/Flat rates for daily allowances'.

[25] Management activities cover the management of financial, legal and administrative issues but not scientific coordination of the project

[26] REGULATION (EC) No 1906/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 laying down the rules for the participation of undertakings, research centres and universities in actions under the Seventh Framework Programme and for the dissemination of research results (2007-2013)

IV. OTHER ACTIONS

The following activities will be supported through funding by the Space theme in 2013, but **will not be subject of a call**[27] under the Space theme:

1) Development of GMES-dedicated space infrastructure
2) Support to GMES Initial Operations
3) Communication and Conferences
4) Monitoring, Evaluation, Studies and Impact Assessment
5) Risk-sharing Finance Facility (RSFF).

These activities are supplementary to the activities undertaken as a result of the calls for proposals in the FP7 Space theme. Applicants 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 Commission's co-financing requirements).

Development of GMES-dedicated space infrastructure

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.

Overall, about 47% of the FP7 'Space' budget[28] could be made available for this action over the period 2007-2013. Based on the specific capacities provided by ESA in this domain, the Commission has decided to **delegate to ESA the management**[29] of the implementation of the FP7 funding of the GMES Space Component (GSC) Programme of ESA.

The respective annual financial contributions to be provided from FP7 shall be foreseen in the annual updating cycle of the work programme, taking account of any update or revision of the GSC. For 2013, a contribution of EUR 180 million is foreseen[30].

Financial support from FP7 should contribute to the activities proposed by ESA in the GMES Space Component Programme.

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[27] In accordance with Articles 14, 17 and 27 of Regulation (EC) No 1906/2006 of 18 December 2006 laying down the rules for the participation of undertakings, research centres and universities in actions under the Seventh Framework Programme and for the dissemination of research results (2007-2013).

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

[29] Commission Decision C(2008)563 of 8 February 2008

[30] Subject to the condition that the draft budget for 2013 is adopted without modification by the budgetary authority.

EU funding to ESA will be contingent upon the effective implementation of the GSC programme in the ESA framework and compliance with the administrative and financial regulations applicable to the general budget of the European Union[31] and with the EC/ESA Framework Agreement[32].

With a view to ensuring the efficient and coherent monitoring and evaluation of the implementation of actions carried out by ESA on behalf of the Commission under FP7, an adequate monitoring and control process is put in place. 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. ESA shall also regularly inform the Commission of the overall progress of the implementation of the Specific Programme, as well as on the specific results of procurement actions, and shall provide timely information on allocations proposed or funded under this programme.

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.

It is essential that best use of existing and planned European satellites and ground systems is being made – including those existing in other European agencies and organisations such as EUMETSAT – 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.

In addition to the GSC technical activities covering development of dedicated satellites, ground segment and data access, a number of additional accompanying activities will also be undertaken by ESA, notably to achieve a significant participation of the non-ESA Member States in FP7, stimulating the active involvement of their industries and research organisations, improving visibility, accessibility and understanding of the tender selection procedures of ESA in line with the EU Financial Regulations and FP7 context. For these activities a variety of funding schemes in line with the EU Financial Regulation may be used. Further information on opportunities is available on Space Theme CORDIS website (http://cordis.europa.eu/fp7/cooperation/space_en.html).

Funding scheme: other actions[33] - Delegation Agreement to ESA

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

[32] COM(2004)0085, 11 February 2004. 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.*"

[33] In accordance with Article 53(d) of the Financial Regulation and Articles 35 and 43 of the Implementing Rules.

Support to GMES Initial Operations

Regulation (EU) No 911/2010 of the European Parliament and of the Council of 22 September 2010 on the European Earth monitoring programme (GMES) and its initial operations (2011 to 2013) makes funding allowances for a number of operational objectives, however, support of the research and development funding under FP7 will also be required, and a dedicated support from FP7 by an amount of EUR 43 million over the three year period is foreseen. For the budget year of 2011 and 2012, respective amounts of EUR 10 million and EUR 15 million were set aside for this support and EUR 18 million are being earmarked for the budget year 2013[34].

GMES Initial Operations (GIO) have according to the Regulation the following 5 operational objectives:

(1) emergency response services, based on existing activities in Europe, shall ensure that Earth observation data and derived products are made available for the benefit of emergency response players;

(2) land monitoring services shall ensure that Earth observation data and derived products are made available for the benefit of European, national and regional authorities;

(3) measures to support take-up of services by users;

(4) data access, including support to in situ data collection;

(5) GMES initial operations shall ensure the operations of the GMES space component.

The 2013 Work programme will provide funding for GMES Data Access activities which are supporting these operational objectives and benefit the research community at large. The main objective of such GMES Data Access activities is to provide access to Earth observation data from all GMES Contributing Missions required by the user communities, such as the GMES Services, from the 4th quarter of 2010 until end 2013, and until the end of the commissioning phase of Sentinel-1A, -2A, and 3A:

- as a smooth continuation of the data supply started under the GMES Space Component Data Access EC FP7 grant no FP7-223001 (GSC-DA)
- with a smooth continuation towards the GIO and full operations phase later.

The detailed description of the way ESA will perform these GMES Data Access activities for the period of 4th quarter of 2010 until end 2013is described in a Project Implementation Plan complementing the EC-ESA Delegation Agreement. These activities will be based on technical requirements defined by the EC, aiming at serving with EO data the GMES services both identified in GIO supported through the FP7 programme, and the community implementing GMES at large, and which were elaborated following a user Hearing on Access to GMES Earth Observation Data on 17 December 2009.

Funding scheme: other actions[35] - Delegation Agreement to ESA

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[34] Subject to the condition that the draft budget for 2013 is adopted without modification by the budgetary authority.

[35] In accordance with Article 53(d) of the Financial Regulation and Articles 35 and 43 of the Implementing Rules.

Communication and Conferences

Public events promoting the uptake of activities undertaken within the context of the FP7 Space, as well as fostering the implementation of the European Space Policy and the European Space Programme will also be funded from the FP7 2013 budget.

Support will be given to the organisation of events (conferences, workshops or seminars) related to the implementation of the European Space Policy, European R&D research agendas related to GMES and space technologies, and European space research, development and innovation after 2013. Special attention will be given to events which aim to explore and implement specific initiatives in the field of space for innovation, and the question of how space exploration could contribute to innovation as well as events related to space exploration. These events should support the political debate and consensus building in Europe.

During 2013, it is envisaged to conduct communication actions (such dissemination material) and large events in support of the implementation of the European Space Policy in general, and GMES and European Space Exploration in particular. Support may be given to the organisation of conferences and information events to strengthen wider participation in the programme (including that of third countries), and to disseminate results of European research in the Space sector. It is intended to rely on framework contracts already in place to obtain communication and conference support.

The overall commitment appropriations for this public procurement activity (by using framework contracts and/or calls for tender) will be up to EUR 500 000[36].

Funding scheme: Coordination and Support Action (CSA) – public procurement

Monitoring, Framework Programme Evaluation, Studies and Impact Assessment

The Space Theme will comply with the prevailing requirements for monitoring and evaluating the Framework Programme and its impact, both ex-ante and ex-post. In preparation of the period after 2013, activities will be conducted to prepare the implementation of the European Space Programme.

This may involve studies and surveys as appropriate implemented through public procurement, and/or appointing (groups of) independent experts. It is intended to rely on framework contracts already in place to obtain study support. Implementation through existing framework contracts is preferred in order to further ensure that the Commission is provided with timely analyses, which in turn will facilitate the proper integration of policy studies into the preparation of new policy initiatives.

This activity foresees in particular a specific study investigating the appropriateness of and the modalities for a second procurement source of on-board Galileo clocks.

The overall commitment appropriations for this Activity in 2013 will be up to EUR 500 000[37].

[36] Subject to the condition that the draft budget for 2013 is adopted without modification by the budgetary authority.

Funding scheme: Coordination and Support Action (CSA) – expert contracts and/or public procurement

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 Commission's co-financing requirements, enabling them to finance more (and more risky) projects. It is for such R&D actions that the European Union 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.

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

[37] Subject to the condition that the draft budget for 2013 is adopted without modification by the budgetary authority.

V. BUDGET

Theme Space - Indicative budget

A total of EUR 329.6 million is to be committed from the 2013 European Union budget[38]. The indicative budget allocated to the activities from the 2013 budget is given in the following table:

Activities	2013[39] Budget EUR million[40]	
Call FP7-SPACE-2013-1		59
Activity 9.1 Space-based applications at the service of European Society :		
1.1 Global 20th century re-analysis and future coupling methods	7	
1.2 Ensemble system of regional re-analyses	5	
1.3 Traceable quality assurance system for ECVs	5	
1.4 Provision of access to simulated and observed climate datasets and climate indicator toolbox	6	
1.5 Attribution products	3	
1.6 Stimulating development of downstream services and service evolution	20	
1.7 Remote sensing methods	8	
Call FP7-SPACE-2013-1		
Activity 9.1 Space-based applications at the service of European Society :		
2.1 Integrated downstream service activities and applications	5	
Call FP7-SPACE-2013-1		51
Activity 9.2 Strengthening of Space foundations:		
1.1 Exploitation of space science and exploration data 1.2 Earth-analogue research preparing for space exploration	20	
Call FP7-SPACE-2013-1		
Activity 9.2 Strengthening of Space foundations:		
2.1 Space critical technologies	20	

[38] Subject to the condition that the draft budget for 2013 is adopted without modification by the budgetary authority.

[39] Under the condition that the draft budget for 2013 is adopted without modifications by the budgetary authority.

[40] The Budget figures are rounded to two decimal points

Call FP7-SPACE-2013-1 Activity 9.2 Strengthening of Space foundations: 3.1 Space-weather events 3.2 Security of space assets from in-orbit collisions – mission concepts	 4 7	
Call FP7-SPACE-2013-1 Activity 9.3 Cross- cutting activities 1.1 SME space technology research and technology transfer	 10	16
Call FP7-SPACE-2013-1 Activity 9.3 Cross- cutting activities 2.1 Cooperation with third countries	 6	
ACTIVITIES NOT SUBJECT TO A CALL FOR PROPOSALS: 1 ESA Delegation Agreement (re. 9.1) 2 Space Data Access (via ESA Delegation Agreement) 3 Communication and Conferences, Monitoring, Programme Evaluation, Studies and Impact assessment	 180 18 1	199
OTHER ACTIVITIES 1 FP7 Expert proposal evaluators payments (review, evaluation)	 2	 2
GENERAL ACTIVITIES (CF. ANNEX 4)	2.62	2.62
ESTIMATED TOTAL BUDGET ALLOCATION		329.62

General activities - Indicative budget

Activities	2013[41] Budget EUR million
Cordis	0.411
Eureka/Research Organisations	0.021
COST	2.185
Experts	0.005
Total	**2.622**

All budgetary figures given in this work programme are indicative. The final budgets may vary following the evaluation of proposals.

The final budget awarded to actions implemented through calls for proposals may vary:

- The total budget of the call may vary by up to 10% of the total value of the indicated budget for each call; and
- Any repartition of the call budget may also vary by up to 10% of the total value of the indicated budget for the call.

For actions not implemented through calls for proposals:

- The final budgets for evaluation, monitoring and review may vary by up to 20% of the indicated budgets for these actions;
- The final budget awarded for all other actions not implemented through calls for proposals may vary by up to 10% of the indicated budget for these actions.

[41] Under the condition that the draft budget for 2013 is adopted without modifications by the budgetary authority.