

**RESEARCH PROGRAMME FOR EARTH
OBSERVATION "STEREO II"
(Support to Exploitation and Research in Earth
Observation)**

2006-2013

CALL FOR PROPOSALS

INFORMATION PACKAGE

January 2011

CLOSING DATES:

Expressions of interest (mandatory): 07 February 2011 before 5 p.m.

Research proposals: 04 April 2011 before 5 p.m.

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FOREWORD

- This document features the information required for teams wishing to take part in the call for research proposals in the context of the "STEREO II" programme ".
- Proposals dealing with validation are encouraged.
- Applicants are required to observe the rules laid down in this information package, otherwise their proposals cannot be taken into account by the Belgian Federal Science Policy Office.
- This call is addressed to Belgian universities, public scientific institutions, non-profit research institutions and specialised consultancies. Consultancies qualify for a maximum 25% of the required project budget and may not coordinate a project.
- The programme is also open to teams from the Grand Duchy of Luxembourg on the basis of co-financing.
- In the event of a partnership, it is important to aim for an interdisciplinary relationship via cooperation with teams operating in other fields apart from earth observation. However, project coordination should be the responsibility of a team with earth observation-related expertise.
- Cooperation with foreign scientific partners is an advantage. A maximum of 10% of the STEREO budget may be earmarked for foreign teams per project. STEREO provides 50% of the funding, whereas the foreign partners themselves have to produce the remaining 50% under the parallel funding arrangement. The foreign partner(s) complement the Belgian/Luxembourgian teams and make a substantial scientific contribution to the project.
- Belgian /Luxembourgian companies, national and international administrations and NGOs headquartered in Belgium/Luxembourg may take part in projects for developing products and services; provided they contribute min. 25% of the total project budget by way of staff, data, equipment ... (The programme does not finance these partners).
- For the development of products and services, three-way collaborations between research institutions, public administrations and private companies are also possible. In such a partnership, the company contributes min. 25% of the total project budget while the contribution of the public administrations is min. 10%.
- The project may require outside expertise in the form of subcontracting. But subcontracting may not account for more than 25% of the budget allocated for the project partner requesting it.
- Expressions of interest and proposals should be presented in English.

- Expressions of interest (mandatory) must reach the Belgian Federal Science Policy Office no later than 7 February 2011 at 5 PM (via electronic on line form).

- Digital as well as a printed and signed copy of the proposals must reach the Belgian Federal Science Policy Office no later than 04 April 2011 at 5 PM.

For further details about the programme and this call please get in touch with:

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1. PRESENTATION OF THE PROGRAMME

1.1 INTRODUCTION

The Council of Ministers announced on 3 February 2006 the go-ahead for the multiannual research programme for earth observation STEREO II.

Covering the period from 2006 to 2013 the programme has a total budget of €25.85 M, €21.12 M for projects.

1.2 PROGRAMME BACKGROUND

The analysis of the national, European and international context where various entities are active in the field of the environment and sustainable development, the assessment of the most recent technological developments in earth observation capacity and the development of products and services: these are the factors that provide a means of identifying the challenges and opportunities that should act as a guide for Belgian earth observation research activities.

Under this heading special attention is paid to the contribution Belgium can make to the process of defining and implementing the GMES programme. GMES or **G**lobal **M**onitoring for **E**nvironment and **S**ecurity is a joint initiative of the ESA and the European Union.

1.2.1 The national context

- Earth observation research may provide a tremendous amount of scientific information for environmental research, more specifically for the Science Policy research programme "Science for sustainable development" (2005-2013), covering the following areas: energy, transport and mobility, agri-food, health and the environment, climate, biodiversity, atmospheres and marine and terrestrial ecosystems.
- Belgium is required to align its environmental policy with a number of European Directives (such as Habitats, Natura 2000, Water Framework Directive) and international agreements (such as Agenda 21 and the Kyoto Protocol) pertaining to the environment and sustainable development. Moreover, operating at the interface between economic and sustainable development, the Common Agricultural Policy is increasingly reliant on the Member States' support to ensure rural open spaces are managed in an environmentally friendly way. On the basis of all these aforementioned examples, earth observation represents a valuable tool for helping administrations at various levels to map out and follow up their policies.

1.2.2 The European context

The European Union

- Against the background of the EU's 2020 strategy, 3 % of the EU's GNP is to be invested in R&D and innovation. The aim of Europe 2020 is for Europe to become a smart, sustainable and inclusive economy.

The *Seventh Framework Programme* for research and technological development (FP7) is the main instrument for funding research on a European level. FP7 (2007-2013, 53.2 billion euros) is the natural successor to the *Sixth Framework Programme* (FP6, 2002-2006, 17.883 billion euros). The broad objectives of FP7 are to strengthen **Cooperation, Ideas, People** and **Capacities** to promote and encourage the creation of European poles of (scientific) excellence in the main areas of EU research policy. One of the key aims is supporting research activities to reinforce cross-border cooperation, ranging from collaborative projects and networks to the coordination of research programmes managed by national funding agencies. More specifically, research in earth observation will be mainly covered by the high level themes of Environment and Space within the FP7.

- The European Commission adopted on 11 November 2003 a "White Paper on the European space policy". The Commission opted for two key programmes: GALILEO (Global Positioning) and GMES (Global Monitoring for Environment and Security). Cooperation with the European Space agency (ESA) was strengthened as a result of concluding an ESA/EC Framework Agreement, creating a "Space Council", a joint secretariat and a "High Level Space Policy Group".
- On 13 September 2010 the European Parliament and the Council have adopted a Regulation on the European Earth monitoring programme (GMES) and its initial operations (2011-2013), meaning GMES becomes an operational EU-programme with its own budget (107 M€).

GMES

Global Monitoring for Environment and Security (GMES) is an EU Earth monitoring programme. It was originally a joint initiative launched by EU and ESA in 1998 and is one of the key stimuli within Europe for earth observation developments. The programme has the ambition to create an independent, sustainable, European operational monitoring capacity for the environment and (civil) security at regional level and global level in support of the European policy.

The thematic areas within the GMES service component comprise:

- land, marine and atmosphere information – ensuring systematic monitoring and forecasting the state of the Earth's subsystems at regional and global levels;

- climate change information – helping to monitor the effects of climate change, assessing mitigation measures and contributing to the knowledge base for adaptation policies and investments;
- emergency and security information – providing support in the event of emergencies and humanitarian aid needs, in particular to civil protection authorities, also to produce accurate information on security related aspects (e.g. maritime surveillance, border control, global stability, etc.).

GMES will start to deliver operational services from 2011 onwards. . Depending on the thematic area the services are covered by the GMES Initial Operation (GIO) budget or by the FP-7 space budget. To meet the need of the operational GMES services for crucial earth observation data, ESA is preparing the so-called Sentinel missions in collaboration with its member states and EUMETSAT (i.e. GMES Space Component)..

Several Belgian partners are involved in the preparation of the GMES services and the satellite missions. In the future the role of the member states within the GMES programme is likely to increase. E.g. one of the key ambitions of Belgium thin this GMES initiative is to maintain and enhance the Centre for Image Processing which distributes, among others, images and derived products acquired by the VEGETATION instruments.

Additional information: www.gmes.info.

Specific ESA programmes

As a member of ESA, Belgium participates in the “*Living Planet*” earth observation programme. This programme has following relevant subdivisions:

- **EOEP (*Earth Observation Envelope Programme*)**
The Earth Observation Envelope Programme (EOEP) is the backbone of ESA activities in the field of Earth observation. It presents a stable planning environment within which new types of environmental sensing technologies and the missions that will fly them are prepared. EOEP consists of specific elements such as:
 - **DUE (*Data User Element*)** aimed at developing user-oriented earth observation products;
 - **VAE (*Value Adding Element*)** is the continuation of EOMD (Earth Observation Market Development). This programme lends support to the European industrial EO services sector in exploring new markets;
 - **STSE (*Support To Science Element*)** offers scientific support to current and future missions.
- **Earth Watch**
This programme includes the “*Global Monitoring of Essential Climate Variables*” element, which will use valuable archived mission data sets in order to determine essential climate variables.

- GMES Space Component
ESA prepares several so-called Sentinel satellite missions to meet the need for earth observation data of GMES.
- PRODEX (*PRO*gramme de *D*veloppement d' *EX*périences *SC*ientifiques).
Prodex is the programme where Belgian research projects in the field of atmosphere chemistry and climatology, plus the development of instruments, are funded.

Additional information:

<http://www.esa.int/du>

<http://www.esa.int/eomd>

<http://www.esa.int/stse>

<http://eopi.esa.int/esa/esa>

http://www.belspo.be/belspo/res/rech/spatres/prodex_en.stm

1.2.3 International and bilateral context

GEO

GEO or the “*Group on Earth Observations*” was launched in July 2003 at the instigation of the United States. The consortium comprises some 80 countries and 50 organisations. At the GEO Summit on 5 November 2010 in Beijing, the midway point in GEO’s 10 year plan (2005-2015) for establishing the Global Earth Observation System of Systems (GEOSS) has been reached. GEOSS aspires to provide scientists and policy-makers with comprehensive relevant, high-quality information about the *Earth* system in the long term. Europe is a driving force within GEO as a result of its experience with the development of the GMES initiative. During the GEO Summit, Belgium emphasised its role in the context of GMES, it approved the activities already brought to a successful conclusion by GEO and undertook to play an active part in the development of GEOSS.

UNESCO

The UNESCO earth observation programme seeks to investigate how satellites for earth observation and geographical information systems may be deployed for preserving natural and cultural World Heritage Sites.

On 21 November 2006, a new cooperation agreement (2007-2011) was signed between Belgian Science Policy Office and the UNESCO World Heritage Centre. Under this agreement the Belgian Science Policy Office will mobilize Belgian scientific expertise in using space technologies to assist State parties to the World Heritage Convention in acquiring the necessary capacity for managing World Heritage sites and in advanced technologies for restoration and rehabilitation techniques for cultural and natural sites. Under this new agreement, pilot projects are finished or on-going focusing on developing a 3D temporal geographical information system for Calakmul in Mexico and working on the cartography of the Silk Road.

Multilateral SPOT and Pleiades programmes

Belgium has been involved with the French SPOT programme since its inception in 1986. More specifically, Belgium is financing the *Centre de Traitement d'Images VEGETATION* (CTIV), the ground installation that has the exclusive responsibility for all activities involved in processing, archiving and shipping VEGETATION products. The CTIV is accommodated by the Flemish Technological Research Institute (VITO) and has gained an enviable reputation owing to its professional approach. Pursuant to a decision the Council of Ministers took on 6 February 2009, Belgium guarantees funding for the CTIV until the end of 2012 and seeks to use the existing infrastructure and expertise for products from other sensors.

To ensure continuity in data delivery after 2012, Belgium has decided to build a small satellite mission based on the successful PROBA expertise and using state of the art technology. This mission, called PROBA-V ("V" standing for Vegetation) will redress the data gap and will fulfil, - even on its own -, all of the specifications of the Vegetation user community. In that way, it will be a complement to the Sentinel 3 satellites to be launched after PROBA-V.

The launch of the sensor is foreseen in 2012 and the mission will ensure a daily monitoring of the entire terrestrial surface. While the spectral and radiometric remain the same, the mission will offer improved SNR, geolocation and spatial resolution. Data products will be made available at a resolution of 1000 m (VNIR and SWIR), 600 m (SWIR) and 300m (VNIR).

In a bid to guarantee earth observation data is constantly available on a European-wide basis, France has decided to develop two satellites comprising ultra high resolution optical sensors. The first Pleiades satellite is scheduled to be launched in mid 2011, the second one in 2012. The Pleiades system complements the Italian Cosmo-SkyMed radar system which is also under development. Together they form the ORFEO system: *Optical and Radar Federated Earth Observation*. Pursuant to a decision by the Council of Ministers on 26 May 2004, Belgium is taking part in the development of the Pleiades system and the preparatory programme for the use of ORFEO data. Covering a six-year period, the programme is aimed at preparing the community of users for the deployment of data from the ORFEO system via the development of new image processing methods and new operational products. The Belgian scientific earth observation community is involved in five thematic work groups (Agriculture, Cartography and Land Planning, Marine and Coastal Environment, Civil Protection and rapid response). Six Belgian fundamental research projects have formed part of the Methodology component of this preparatory programme.

1.2.4 Technological developments

An alternative EO capacity

Apart from SPOT-type conventional satellites, in the future a great deal of attention will be paid to more flexible, cheaper options, where Belgian will play a part.

Three trends are taking shape:

- The development of autonomous light-weight satellites such as the PROBA-V satellite (see above);
- The development of high-performance sensors for assembling in manned or unmanned planes for the preparation and validation of satellite instruments. One of the sensors is the imaging hyperspectral spectrometer, an instrument recording the entire reflected solar spectrum in over 300 continuous spectral bands in the visible light, the near infrared and the thermal infrared. In this context, a Belgian-Swiss consortium has been built the APEX (*Airborne Prism Experiment*) instrument for the ESA. The Belgian partners in this project were VITO and OIP;
- The construction of *High Altitude Long Endurance Unmanned Aerial Vehicles* (HALE UAVs), which can fly at a great height for a very long time to obtain high-resolution earth observation data and information. VITO's PEGASUS project is an example of this.

1.3 GOALS

STEREO II's **strategic goal** is to develop an autonomous Belgian earth observation expertise of an international standard as a contribution to the knowledge economy.

This is reflected in the following aims:

- consolidating Belgium's EO potential. This has to be achieved by:
 - ensuring Belgium can produce and deploy independently information that is crucial for its policy-making (at federal, regional and municipal level) and meeting its international commitments
 - putting Belgium definitely on the map as an international centre of competence in a number of niches
 - consistently deploying earth observation as a common technique in the greatest number of disciplines, organisations, companies and social realms
- Promoting innovation
- Creating the capacity Belgian organisations need to ensure they are involved as much as possible in international research programmes and European and international EO activities
- Lending support to the Belgian EO infrastructure
- Developing an extensive form of interaction with users

1.4 THEMATIC PRIORITIES

The thematic research priorities are as follows:

- Global monitoring of vegetation and evolution of terrestrial ecosystems
- Environmental management (water, soil, forests, agriculture, coastal areas, urban areas and suburban areas)
- Health and humanitarian aid
- Security and risk management

The intermediate programme evaluation of 2008 confirmed the validity of these research priorities, but recommended to give additional attention to some of which two still are relevant for the 2011 call:

- **the study of changes in ecosystems due to climate change by means of long term time series of low resolution imagery archived in Belgium;**
- **the study of security and risk management.** Ideally this topic should be extended to include risks related to human activities (e.g. various types of polluting activities).

The research themes atmospheric chemistry and climatology are covered by ESA's PRODEX programme.

The research synergies among these key themes will be promoted where they help:

- to investigate joint cross-cutting issues;
- to develop general tools; or
- provide a means of adopting an integrated approach to environmental issues so as to understand the intricate relationships between ecosystems, highlight the effect natural or man-induced disturbances have on a series of ecosystems, and assess the environmental implications of various provisions and measures.

These themes are considered in detail below by way of example. The lists of subjects proposed under each theme should not be regarded as restrictive.

1.4.1 Cross-cutting themes

Certain issues are covered by several programme themes, or even all of these themes. A variety of disciplines sometimes has to be brought into play to study these issues from several thematic viewpoints. In this case, cooperation between one or more scientific teams with no remote sensing expertise is strongly recommended.

The following are examples of cross-cutting issues that could be considered:

- Quantitative remote sensing;
- Development of tools to create long-term multi-sensor homogenous time series to study long-term mechanisms and processes of environmental change;
- Integration of remote sensing data in real time and near-real time forecast models;
- Integration of remote sensing and socio-economic data in order to understand and model human-environment interactions on a global, regional and local scale;
- Assessment of environmental policies' impacts and development of appropriate tools to do so;

- Study of the environmental continuum across scales, time, space and ecosystem range to make its complexity more comprehensible;
- Meet the needs of international agreements, national and regional authorities (management and decision tools). This requires development of tools in a generic approach (multi-data / multi-sensors / multi-disciplines / multi-scales), which is applicable for various themes.

1.4.2 Global monitoring of vegetation and evolution of major terrestrial ecosystems

Vegetation and the major terrestrial ecosystems are regarded as the lungs of the planet, sources of raw materials, life supports and environments. They provide the general framework for the development of our societies and activities. The human footprint is making an ever-increasing impact on the status of terrestrial ecosystems, which in turn increasingly drive the process for determining the quality of life for current and future generations.

Helping to answer myriad strategic and social questions, one of the key scientific challenges is to make a contribution to the effort to gain a better understanding of the status of the global environment on the basis of a continuing and independent system of monitoring (for example, an inventory of CO₂ sequestration or emission zones, the ability of ecosystems to withstand human activities on a sustainable basis, availability of and access to natural resources).

The research applies in particular to:

- The evaluation of the state of the vegetation and the ecosystems;
- Quantification of the impact on ecosystems of natural and man-induced pressures linked to global change in terms of rates, response time, extent, intensity, fragmentation, phenology, affected species and regions;
- Differentiation between effects due to natural variations (seasonal and annual) and variations induced by human activities;
- The evaluation of the impact of these global changes on local and regional environments, agricultural yields and the risk of extreme meteorological conditions;
- Resistance, adaptation, resilience and vulnerability of ecosystems;
- Ecosystems integrated approach (e.g. monitoring of ecotones, impacts of ocean on continental areas);
- Development of tools to have a near-real time knowledge of natural resources availability;
- Support to measures for a sustainable development at a global scale: development of indicators, integration of new algorithms into operational processing chains;
- The development of constant global multi-sensor image synthesis products;

1.4.3 Management of the local and regional environment

Human perceptions of the environment are obviously mediated at local and regional levels, where the environment plays a comprehensive role in economic activities,

thereby underpinning the economic sector. The environment also provides a framework for recreational activities and well-being. Moreover, it makes a contribution to the cultural identity of local and regional communities and strengthening the feeling of social allegiance. Consequently, one of the challenges that has to be met involves investigating the spatial and temporal management of the local and regional environment in the light of its three economic, ecological and socio-cultural functions and the various environments and ecosystems they cover.

The environment is constantly changing as a result of myriad biological, physico-chemical, metrological, climatic and man-induced factors. The environment in turn makes an impact on human beings and their activities. This intricate dynamic process must be understood and monitored so as to guarantee the environment is managed in a responsible way. Modelling can help anticipate developments driven by local or regional management and planning policies. Remote sensing is a key source of data towards this end. Central to the research activities is the development of exploitation-specific methods and tools.

As environmental challenges do not stop at national borders, research has to be undertaken into cross-borders environmental issues or a comparison has to be made of how the impact of environmental policies differs from one country to another.

Here are a few examples to illustrate the potential lines of inquiry in the various components of the environment:

Coastal areas

- Integrated management and monitoring of North Sea (transnational approach recommended),
- Health of specific coastal ecosystems: evaluation, monitoring and warning systems,
- Eutrophication information services: near-real time high level and high quality products,
- Early warning systems of algae blooms and impact on trophic chains,
- Impact of offshore activities on sediment movements (dredging, windmill farms).

Fresh water and soil

- Soil sealing and soil erosion (linked to hydrological cycle and meteorological conditions and impact on the hydrological cycle),
- Assessment of soil organic matter (soil management, CO₂ cycle),
- Quantification of heavy metal soil pollution,
- Hyperspectral remote sensing based soil cartography using Munsen's soil colour charts,
- Geological monitoring of alluvial areas integrated in hydrological basin management,
- Water quality: mapping areas at risks of diffuse pollution,
- Water balance and drought stresses,
- Integrated management of hydrological basins (sediments, floods, impervious surfaces),
- Transnational management services of catchment areas.

Forestry and biodiversity

- Impact of climate changes on forests and their biodiversity,
- Greenhouse gas reporting and C stock statistics,
- Forest inventories (species, stem volumes, health),
- Environmental and biodiversity indicators (fragmentation, dispersion, diversity, degradation),
- Identification of biophysical parameters for the evaluation of the status of local and regional forest ecosystems,
- Migration indices of fauna and flora,
- Monitoring of invasive species,
- Tools to manage Natura2000 areas and protected habitats,
- Mapping and biomass estimation of trees outside forests.

Agricultural areas

- Yield monitoring, evaluation and forecasting (integration or assimilation of meteorological and atmospheric conditions, e.g. ozone),
- Food security around the Great lakes in Africa,
- Dynamic modelling of production systems,
- Support to precision farming: content of soil organic matter, soil moisture, crop nitrogen content,
- Geo-traceability and food safety,
- Pests and diseases control for plants and animals,
- Development of tools for agricultural ministries: agri-environmental indicators: surface control, early warning systems (frost, flood, drought, pest, famine), tools for farmer compensations (damage assessment),
- Land-use changes modelling in Eastern countries related to the CAP,
- Sustainable management of natural resources in rural areas.

Urban and peri-urban areas

- Urban sprawl and degree/rate of dispersion,
- Quality of life in urban areas: density of population, quality of infrastructure and green areas,
- Identification of man-made structures,
- Identification of materials (nature, alteration due to time and meteorological conditions),
- Tools for planning of works and evaluation of environmental quality (thermal balance, impact on atmospheric pollutants cycle),
- Reconstruction of real 3D views of building frontages (floors, windows),
- Development of management tools for local and regional authorities.

Cartography

- Assessment of the actualization status of cartographic databases,

- Short term LUCC monitoring for a strategic updating of spatial databases,
- Error modelling and error propagation in GIS and in image processing chains,
- Quality control and validation of cartographic data,
- Mapping the availability of natural resources,
- Mapping natural and man-made hazards.

1.4.4 Health and humanitarian aid

The way the environment affects human and animal health is not easy to show, primarily because it affects isolated subjects. The environment is first and foremost a framework for the development of or concentrations of pollution, pathogenic agents or their vectors. Consequently, the aim is to investigate the connection between the development of these agents' ecological niches and the trends highlighted by epidemiological studies, formulate systems for following up and mapping risks and forge decision-making tools in the event of a potential epidemic.

The communities faced by crises or emergency situations are often living in remote areas and are particularly vulnerable. Remote sensing research boosts the facilities for making a fast assessment of devastated areas and gaining access. The research seeks to tap into the widest possible of images that may be available. Remote sensing will also be used to become involved in the sustainable development of economically developing nations.

Against the background of rapidly changing economic, political and environmental situations in the world, the ever-increasing number of areas suffering from dire living conditions is forcing people to migrate. In order to help these people, relevant areas have to be identified and an assessment made of the scale of the problem.

The following research fields should serve to illustrate the theme:

- Quantifying and mapping population exposure to atmospheric pollution, industrial risks, noise,
- Monitoring of recurrent industrial plumes, volcanic plumes and dust storms,
- Decision support systems to develop control strategies for major livestock and zootonic diseases in Africa,
- Epidemiological patterns and chimioresistance due to changes in bio-physical and environmental parameters,
- Impact of large epidemics on land use and on agricultural practice,
- Development of tools to increase the capacity to respond to crises and emergencies associated with natural and anthropogenic disasters,
- Development of generic crisis management tools using new RS data and satellite constellations,
- Development of tools to increase the capacity to assess the damages (rapid mapping capability) and to mitigate the populations.

1.4.5 Security and risk management

Irrespective of whether they are the result of natural or man-induced causes, the risks may be managed to some extent via Earth observation systems, monitoring hot spots on a daily basis and developing reliable and effective early warning and communication systems, relating to security and civil protection.

Within this context, research could be developed to focus on:

- Vulnerability maps (risk assessment),
- Identification of areas with conflicts of interest regarding land use due to global change,
- Preparation of spatial and socio-economic data to be used as reference inventory in areas at risks,
- Early warning systems for meteorological and natural hazards (floods, forest fires, storms),
- Long-term monitoring and early warning systems of areas at risks of geological hazards (subsidence, landslides, seismic movements),
- Long-term monitoring and early warning systems of areas at risks of man-made disasters or industrial and military incidents (forest fires, SEVESO sites, mine fields).

1.5 PROGRAMME STRUCTURE

The four-part programme comprises:

- Actual scientific research
- Development of products and services
- Scientific support
- Exploitation and promotion

1.5.1 Actual scientific research

The scientific research covers two types of projects: *thematic projects* and *satellite projects*.

Research groups from Belgium, supplemented with Luxembourgian and foreign teams or otherwise, qualify for these projects.

Data - Study areas - Methods - Results

The proposals will deal with scientific or methodological issues focused on the themes referred to in point 1.4.

These research activities will not be confined to learning about or monitoring a process. They will also seek to model it and forecast its developments.

They will be based in particular on biophysical indicators and parameters originating from data provided by Earth observation via satellites or aircraft instruments.

The image requirements (including the need to organise airborne campaigns) have to be clearly determined. The models developed will be calibrated and validated via representative field data.

The programme provides incentives for the deployment of a wide range of satellites and instruments, with special emphasis of the use of hyperspectral imagery, while underscoring the need to combine remote sensing data with socio-economic or historical data (old maps, monographs, censuses).

The programme does not place any restrictions as a rule on the choice of the areas to be studied. The comparison of an environmental issue in Belgium with the situation in other countries and continents is strongly encouraged.

The research activities will be developed as much as possible according to a general multi-instrument, multi-data, multi-theme approach or alternatively independent of the space dimension. Against this background, steps will be taken to guarantee the interoperability of the acquisition and processing systems and the standardisation of the

methods, techniques and algorithms.

The results and products derived from the research will be backed up with comparative tests, quality and reliability tests. The methods, models and services developed will have been validated and subjected to sensitivity analyses. They have to be firmly based and replicable in other study areas and be part of an unfolding process as much as possible.

Thematic projects

This refers to major projects covering **3 to 5 years** aimed at basic research and the development of applications. The research is conducted via **partnerships involving 2-5** research teams (from Belgium and Luxembourg), whether or not rounded out by (an) international team(s).

Satellite projects

This involves small-scale projects, associated with thematic projects, covering **12-24 months** for **individual research teams or partnerships**, comprising of 2 research teams from Belgium and Luxemburg whether or not rounded out by an international team. There are four types of satellite projects:

- *Spin-off projects* take a closer look at a specific problem or a new line of inquiry that emerged from a thematic project, a centre of expertise from the current or previous STEREO programme, a VG, an ORFEO project or a SSD project featuring earth observation;
- *Innovation projects* allow expert knowledge to be built up on the basis of new methods, technologies and instruments. Emphasis is on risky projects that do not necessarily have to yield an immediate positive result. Cross pollination with other technologies such as telecommunication or computer vision is a plus;
- *Support for the development and exploitation of “Belgian” instruments* (APEX, Pegasus, ...) , e.g. via dedicated airborne campaigns;
- *Shared-cost activities* allow Belgian project partners, partners who have been selected on the basis of an external assessment for national, international or bilateral programmes, to be co-funded.

1.5.2 Development of products and services

This refers to three types of projects aimed at the transfer of technology and knowledge for the development of **pre-operational** products and services:

- *partnerships* between *scientific partners* and Belgian, Luxembourgian or international (such as UNESCO) *administrations*, or *NGOs* headquartered in Belgium or Luxembourg;
- *partnerships* between *scientific partners* and *companies* in Belgium or Luxembourg;

- *partnerships between scientific partners on the one hand and Belgian, Luxembourg or international administrations, or NGOs headquartered in Belgium or Luxembourg together with companies in Belgium and Luxembourg on the other hand.*

Towards this end, interested administrations, NGOs and companies may choose one or more scientific partners and define and submit a proposal. **The programme pays solely for the scientific partner(s). The non-funded partner contributes at least 25% of the total project budget via staff, information and equipment for the first two types of partnerships. For the latter type the private company should contribute at least 25% and the public administration at least 10% of the total project budget.**

In terms of content, the proposals must have a bearing on the four priority research themes decided upon for scientific research. **A maximum of three scientific teams**, solely from Belgium or Luxembourg, are responsible for the implementation of the project for a period of **12 to 24 months**.

The projects develop and/or improve the prototype of services or products enabling public or private stakeholders to enhance their activities (cheaper, faster, more accurate...), or create new activities. This may involve full-scale testing, validating in various eco-geographical or social-economic environments, making user-friendly, incorporating research results into a specific operational environment, ...

In the case of partnerships with administrations and NGOs the projects have to meet the need for an information product or service.

For partnerships with companies, potential end users also have to be involved with the project for defining and testing the finished product. Projects may be designed as 'pre-operational', thereby implying further fine-tuning paid for in full in a subsequent phase by the company itself, in the light of the assumed market outlook.

1.5.3 Scientific support

The last two components of the STEREO programme are primarily coordinated by the earth observation helpdesk, the *EODesk*.

The scientific support comprises:

- services to the community of users via the EODesk;
- maintaining and extending the *Belgian Earth Observation Platform* (<http://eo.belspo.be/>) and *EOEdu* (<http://eoeu.belspo.be/>) websites. The *Belgian Earth Observation Platform* offers the expert user of earth observation data relevant and up-to-date information. Together with the educational EOEdu site, it helps familiarising potential users with the fast growing world of remote sensing;
- buying and archiving remote sensing data for the Belgian Science Policy Office's research programmes (such as, STEREO, Sustainable development,...);
- developing two Belgian test sites, for which targeted EO data and other measurement results are collected, on behalf of the Belgian and international

research communities, and which may be used as calibration and validation sites for new EO missions, data and products;

- lending support to the adaptation of Belgian operational services;

1.5.4 Exploitation and promotion

The exploitation and promotion of remote sensing is the second cornerstone of the services offered by the EODesk:

- developing and distributing its own teaching products, primarily intended for the higher secondary education sector;
- participating in production development by third parties (school text book, atlas, artistic projects,...);
- making EO opportunities, based in particular on the results of research projects within the STEREO programme, known to a wide public and with the help of contemporary media systems

1.6 PROGRAMME PLANNING

Table 1 offers a representation of the various STEREO programme calls planned, plus the budgets available for the various types of projects.

Table 1: Plan for the STEREO calls

<i>budget available (€ thousand)</i>	2006	2007	2008	2009	2010	2011	2012	2013
RESEARCH	TOTAL 13,700							
Thematic projects	7,400			3,400				
Satellite projects								
<i>Spin-off projects</i>	300		300		300		300	
<i>Innovation</i>	300		300		300		300	
<i>“Shared-cost” projects</i>	C							
DEVELOPMENT OF PRODUCTS & SERVICES	TOTAL 4,760							
Partnerships with public administrations	595		1,190		1,190		595	
Partnerships with the private sector	595						595	
SUPPORT FOR RESEARCH AND SERVICES	TOTAL 2,659							
<i>“Airborne campaigns ”</i>	on-going							
<i>Support for operational services</i>	C							
<i>Experimental sites</i>	on-going							

*:

C: continuing presentation of proposals for funding possible

1.7 INTERACTIONS

During the implementation of the programme special attention is to be paid to effective interaction between:

- the 4 programme components
- the various types of projects
- STEREO II and other activities of the Belgian Science Policy Office

The STEREO II programme seeks a close form of cooperation primarily with:

➤ *Science for sustainable development*

This programme covers the following priority research fields:

- Energy
- Transport and mobility
- Agri-food
- Health and the environment
- Climate (including Antarctica)
- Biodiversity (including Antarctica and the North Sea)
- Atmosphere and terrestrial (including fresh water) and marine ecosystems (including Antarctica and the North Sea)
- Cross-cutting research : in order for the sustainable development concept to be reflected/made operational more effectively within and between the priority areas

Further details about this programme are available from the following address:
<http://www.belspo.be/ssd>.

➤ *Activities of the Department for International, Inter-federal and Inter-departmental Coordination*

This covers research that is consistent with:

- the Federal Government's research obligations in the context of international organisations,
- bilateral science and technology agreements.

Further details about this programme are available from the following address:
http://www.belspo.be/belspo/res/coord/coord_en.stm.

This cooperation first of all involves providing earth observation data and support to the research teams on the basis of mutual exchanges of information. It may also take the form of joint project funding, where appropriate.

This type of cooperation may be extended to other relevant programmes run by the Belgian Federal Science Policy Office, if need be.

● STEREO II and other earth observation programmes;

The focus is first of all on the ESA PRODEX programme where the thematic emphasis for scientific earth observation projects is on climatology and atmospheric chemistry and where use is made, as a matter of priority, of EO data originating with ESA satellites.

Further details about this programme are available from the following address:
http://www.belspo.be/belspo/res/rech/spatres/prodex_en.stm.

1.8 EVALUATION CRITERIA

- Compliance with the guidelines of this call and the programme aims
- Scientific quality of the project proposal:
 - scientific originality of the proposed research
 - the innovative character of the anticipated outcomes
 - clarity of the aims and the tasks
 - relevance of the methodological approach
 - positioning of the proposed research vis à vis on-going research in the field in question
 - strengthening existing expertise
- Calibre of the applicant(s)
 - relevant expertise of the laboratory
 - international contacts of applicants
 - peer reviewed publications: number and impact
- The quality of the proposed partnership and the added value of cooperation in networking:
 - complementary relationship of the partners
 - interdisciplinarity of the collective expertise, incorporation of “new” teams
 - distribution of tasks
 - balanced distribution of the resources among the partners
 - cooperation methods (joint activities, exchanges of researchers, joint publications, ...)
 - international cooperation
 - added value of the international partner
 - organisation and management of the network and the management capability of the coordinator
 - the potential role of the network and the various partners at European and international level
- Feasibility of the proposal
 - realistic preparation of the work plan (including SWOT analysis)
 - realistic assessment of the resources required (duration, budget, staff)
- Exploitation
 - plan for disseminating project results, visibility given to the project
 - training courses for scientists
 - training for pre-doctoral researchers (for research projects only)

Further criteria for proposals for the programme line “Development of products and services in cooperation with administrations”

- innovative character of the proposal (improved or new product, system or service)
- role of the non-financed partner
- need for product or service
- user-friendly character of the proposed product or service
- implementation plan
- contribution to recurrent use of satellite imagery in Belgium

Further criteria for proposals for the programme lines “Development of products and services in cooperation with the private sector” and “Development of products and services in cooperation with the private and public sector”

- innovative character of the proposal (improved or new product, system or service)
- need for product or service
- role of the non-financed partner
- user-friendly character of the proposed product or service
- exploitation of earlier activities and research results
- credibility of the market assessment (including knowledge about European competitors or existing cooperation with European industrial stakeholders in this area)
- possible contribution to increasing Belgian industrial competitiveness
- user involvement
- business plan

1.9 IMPLEMENTATION OF THE PROJECTS

- The selected project proposals are covered by an **agreement** between the Belgian Federal Science Policy Office, the relevant scientific institutions and, where appropriate, the private or public partner or NGO.

For eligible Luxembourgian teams, a contract will be drawn with the Luxemburg National Research Fund (FNR). The contracts of FNR and the Belgian Science Policy Office will relate to one another.

- The practical requirements for the project implementation process are described in the **technical annex** of the agreement. The agreement describes in particular the part played by all the parties, the funding, the project follow-up procedures, the ownership rights concerning the project the data and project results, the input of all the parties and the legal provisions in the event of disputes.
- The following principle applies to the **ownership of the results**:

- The results developed in the context of the project shall be the property of the partner responsible for these results. The State shall nonetheless reserve the right to use these results for its own needs without any charge and on a non-exclusive and irrevocable basis.
- In the case of the programme line “Development of products and services” the ownership right for the products developed may accrue to the private partner, subject to the consent of all the submitting parties.

The apportionment of property rights between Belgian en Luxembourgian partners will be elaborated in the contracts with FNR and the Belgian Science Policy Office.

- The network concludes an **internal agreement** for the management and the internal organisation procedures of the project and the ownership of the results.
- Each project selected enjoys the support of a **Steering Committee**.

The Committee should include at least:

- 2 international scientific experts
- 2 potential end users of the project results (does not apply for partnerships with the public sector)
- Representatives of the Belgian Federal Science Policy Office and the Programme Committee

It is tasked with:

- Assessing the progress of the project
- Adjusting the objectives and activities of the project via a binding opinion in the light of the scientific, technical and methodological demands of the project and the intermediate achievements
- Assessing the impact of the partnership/project and the synergy between the various tasks and partners
- Assessing and guiding exploitation activities and disseminating the results nationally and internationally
- Drawing attention to problems within the partnership/project resulting in the termination of the agreement

The Committee meets once a year. The **costs** for organising and paying foreign experts are **disbursed via the project** and reimbursed via the programme up to a maximum sum of €4,000 per Committee session.

1.10 PROGRAMME COMMITTEE

A **cooperation agreement** is concluded with the Regions and Communities about the implementation of the programme.

The Belgian Federal Science Policy Office is responsible for managing the programme.

The Belgian Federal Science Policy Office is assisted in this task by a **Programme Committee** comprising representatives of the relevant public administrations of the federal, regional and municipal authorities and the *Luxembourg National Research Fund* (FNR).

The Follow-up Committee is responsible for:

- overseeing the consistency of all the activities being carried out
- delivering advisory opinions about the activities undertaken
- overseeing the effective transfer of the research results

2. CONTENT OF THE CALL

2.1 OBJECT AND BUDGET OF THIS CALL

This call applies to 3 types of projects (see 1.5.1 and 1.5.2):

- Spin-off projects
- Innovation projects
- Partnerships with the private sector and/or public administrations.

The **budget** for this call is **1.790.000 EUR** allowing the founding of approximately 10 projects

2.2 TIMETABLE

- | | |
|--|--------------------|
| ▪ Submission of expressions of interest | 7 February 2011 |
| ▪ Submission of proposals | 4 April 2011 |
| ▪ Conclusion of written external reviews | Mid June 2011 |
| ▪ Oral defence of proposals | September 2011 |
| ▪ Selection of proposals by Steering Committee of STEREO programme | End September 2011 |
| ▪ Start of contracts | January 2012 |

3. PROFILE OF THE PROPOSALS

3.1 BELGIAN AND LUXEMBOURGIAN TARGET GROUPS

- The following may qualify for funding under the programme and this applies to **all types of projects**:
 - Universities
 - Public research institutions
 - Non-profit research institutions
 - Consultancies with unique knowledge:
 - Share of a STEREO project budget may not exceed 25%
 - May not be a project coordinator

- Those entitled to take part in the **project line “Development of products and services”** on a **self-funding** basis are:
 - Private companies
 - Public administrations
 - NGOs headquartered in Belgium or Luxembourg
 - The partner contributes minimum 25% of the total project budget being deployed from internal resources, in the form of staff, data and equipment. For 3-way cooperations between research institutions, public administrations and private companies, the company contributes min. 25% of the total project budget while the contribution of the public administrations is min. 10%.
 - The non-financed partner takes the initiative for the proposal, submits the proposal and is responsible for the scientific and administrative coordination of the project. Other tasks required are described in the project proposal, subsequent to consultations between the submitting parties.

3.2 FUNDING OF LUXEMBOURGIAN PARTNER

The funding of Luxembourg teams by the STEREO programme is maximum **10%** of the budget requested from the **STEREO programme**. The **Luxembourg National Research Fund** minimally matches this amount. For further details about the available budget and the requirements for co-funding, Luxembourg applicants should get in touch with Carlo Duprel (carlo.duprel@fnr.lu, Tel: +352 26192537, www.fnr.lu).

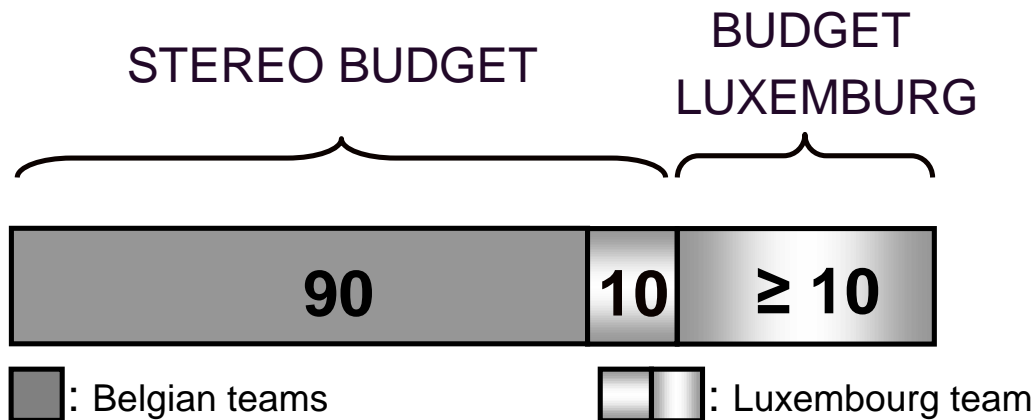


Fig. 1: Funding of Luxembourg partner.

3.3 INTERNATIONAL COOPERATION

A maximum of 10% of the STEREO budget may be earmarked for foreign teams per project. STEREO provides 50% of the funding, whereas the foreign partners themselves have to produce the remaining 50% under the parallel funding arrangement. However, the project has to be coordinated by a Belgian/Luxembourg research team.

Figure 2 illustrates the funding of such a foreign partner under the STEREO programme.

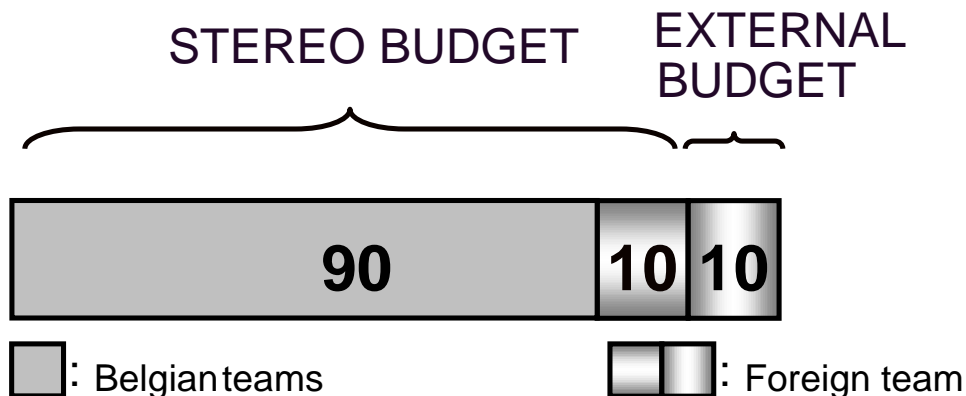


Fig. 2. Funding of foreign partner

3.4 RECOMMENDATIONS

- Partnerships should include teams in their network that perform well thematically or in other technical fields but therefore do not necessarily have any experience with earth observation.

- The teams are urged to forge a partnership with a foreign scientific institution, offering either remote sensing or thematic expertise.
- It is recommended to publish in thematic journals.
- It is recommended to involve a **user partner** in the projects, primarily but not solely for the project line *Development of products and services*, and particularly for defining and validating the technical specifications for the service or product to be developed. The user partner may be reimbursed for this via the "Subcontracting" budget category (see section 3.5.5)

3.5 BUDGET BREAKDOWN

3.5.1 Staff

- The staff costs cover: index-linked gross salaries, employer's social security contributions and statutory insurance charges, plus any other legally due compensation or payments as amounts added to the salary.
- Scholarship students and post-doctorate scholarship students who enjoy exemption from tax liability and are covered by the social security system in accordance with the Royal Decrees of 5 July 1996 and 26 March 2003 concerning employees' social security may be appointed only exceptionally subsequent to permission being granted by the President of the Belgian Science Policy Office.

3.5.2 Coordination

This covers all the staff and/or operating costs involved in the scientific, technical and administrative coordination of the network. The total amount for this item may not exceed 2.5% of the overall project staff and operating budget (solely for the coordinator) and may be disbursed solely to a member of staff whose name is mentioned in the contract, who is actually involved with coordination. This should ideally be a post-doctoral researcher.

The coordinator is also required to oversee the cooperation with and the funding of the foreign partner.

3.5.3 Operating

Lump sum limited to 15% of the staff item, prorata distributed over the period covered by the project (evidences are not required). This part covers standard necessities and products for the laboratory, the workplace and office; documentation, travelling and accommodation (including allowances for guest researchers); use of ciphering equipment; common software; machine and

appliance maintenance and operation; data costs (costs for using large ciphering equipment, conversion of large datasets for further analysis, buying data, surveys, ...); exploitation costs (costs incurred for the planned exploitation activities, not including staff and operating costs) and, more generally, consumables.

3.5.4 Equipment

- It is recommended to buy equipment to be used jointly by network partners.
- Budget available for purchasing and installing scientific and technical appliances and instruments, including computer and office automation equipment.
- The equipment must be bought during the first half of the project

3.5.5 Subcontracting

Subcontracting operations for each partner may not exceed 25% of the partner's STEREO budget.

3.5.6 General expenses

General expenses ("overheads") account for a maximum 5% of the total staff, coordination and operating costs.

3.5.7 Earth observation data

Earth observation data is not chargeable to the project but to the programme.

The EODesk can provide researchers with satellite images from its image archive, in accordance with the agreements with the distributors of the photographic material. New imagery may be bought if this appears necessary for the implementation of the project and if the planned photographic budget so permits

4. PROCEDURES

4.1 SUBMISSION

Submission is a two-stage process: first the submission of an expression of interest and then the submission of a research proposal.

Solely those who submit an expression of interest are entitled to submit a comprehensive proposal later on.

4.1.1 Expressions of interest

- Expressions of interest should be submitted solely via the form intended for this purpose, which is available online, on the Internet site of the Belgian Federal Science Policy Office (<http://www.belspo.be>).
- Expressions of interest should be submitted in English and will be used by the Belgian Federal Science Policy Office to select foreign experts for the assessment of the research proposals, and, where appropriate, to help coordinators in the search for an additional partner.
- The expression of interest has to reach the Belgian Federal Science Policy Office no later than:

7 February 2011 at 5 PM

(via on-line form)

- The Belgian Federal Science Policy Office will disregard any expressions of interest that are submitted after the closing date.
- Solely those who submit an expression of interest are entitled to submit a comprehensive proposal later on.

4.1.2 Proposal

- Proposals should be submitted solely via the form intended for this purpose, which is available online, on the Internet site of the Belgian Federal Science Policy Office (<http://www.belspo.be>).
- Applicants are required to meet the conditions set forth in this document.
- Enclosures with the submission file will be disregarded during the assessment and selection procedure.
- Proposals should be submitted in English.

- The institutions of foreign partners should express their agreement in writing to the co-funding arrangement equal to 50% for participation in the STEREO project.
- A **printed and signed copy**¹ of the proposal should be submitted to the Belgian Federal Science Policy Office no later than:

04 April 2011 at 5 PM

- One copy needs to be sent to the following address:

Belgian science Policy Office
Programme STEREO II
 Louizalaan, 231, avenue Louise
 B-1050 Brussels

- It is also mandatory to send the proposal in **pdf format** **electronically** to **SRII@belspo.be**.
- The Belgian Federal Science Policy Office may disregard any proposals that are submitted after the closing date.
- Each proposal should cover the following sections:

Section 1 - Administrative data of the applicant(s)
 Section 2 - Description of the proposal
 Section 3 - Qualification and experience of the partners
 Section 4 - The foreign partner's declaration of intent

4.2 ASSESSMENT AND SELECTION

- The proposals that are submitted are evaluated external level by foreign scientific experts who are qualified in the relevant research field.
- The assessment criteria used are featured in section 1.8.
- Solely complete submission files are presented for an evaluation.
- The projects are selected in the light of the budget available and on the basis of the advisory opinion delivered by the Programme Committee (see 1.10).

¹ Scanned signatures are allowed