

## INTAS THEMATIC CALL ON EARTH SCIENCES AND ENVIRONMENT 2006

IN CO-OPERATION WITH THE EUROPEAN SPACE AGENCY

### INFORMATION PACKAGE - ANNEX 2

### ESA GMES SERVICES ELEMENT (GSE)

#### 1. Background on ESA GMES Services Element (GSE)

GSE is the first programme fully dedicated to GMES. It focuses upon the delivery of policy-relevant information services to end-users, primarily (but not exclusively) from EO sources. The GSE services represent an important part of the portfolio defined in the GMES Initial Services agreed by the GMES Advisory Council. In addition, key elements of these services will form a foundation for the Fast Track or GMES Pilot Services due to be started by the European Commission in 2007. Further information on the ESA GMES activities can be found at: <http://www.esa.int/esaLP/LPgmes.html>.

The service portfolios within GSE that are of direct relevance to the 2 thematic areas of this INTAS Call on the environment are as follows:

INTAS Environment Call 2006 Thematic areas	ESA GSE Service portfolios
Water management and quality	<ul style="list-style-type: none"><li>• Marine and coastal environmental information services,</li><li>• Polar environment information services,</li><li>• Land cover and Land use change information services,</li><li>• Forest monitoring information services.</li></ul>
Global climate change focussing on carbon stocks	<ul style="list-style-type: none"><li>• Land cover and Land use change information services,</li><li>• Forest monitoring information services,</li><li>• Polar environment information services,</li><li>• Atmospheric pollution information services.</li></ul>

These GSE service portfolios are now entering a *scaling-up* phase of activities, each led by an industrial team under contract to ESA. The *scaling-up* phase starts in early 2006 and continues for a duration of 3 years. The main objectives of this phase are :

- Demonstrate progress towards long-term sustainability for a set of GMES services,
- Deliver services and benefits to users on progressively larger scales,
- Establish a durable, open, distributed GMES Service Provision Network,
- Establish common standards and working practices for GMES Services.

## 2. Requirements for proposals to be of relevance to ESA GMES Services Element (GSE)

In order for proposals to be best supported within the framework of the GMES initiative, the proposals shall offer **Research partners** from NIS countries to conduct scientific research in areas of relevance to the ESA GSE services. The specific elements of the existing ESA GSE service portfolios of relevance to the INTAS environment thematic areas are given in Annex.

**Research partners** shall contribute mainly to the development and evolution of existing or new elements of a GSE service portfolio. Specifically, this could consist of testing and evaluation of new research results, newly validated algorithms, new modelling and assimilation techniques, newly qualified processing technologies, and use of new operational data sources (both EO, in-situ and socio-economic).

Examples of **Research partners** include academies of science, universities involved in atmospheric and biosphere research or forest studies, climatic/environmental/ecology research institutes, oceanography institutes, etc.

ESA will select proposals that are relevant to the GMES Services Element on the basis of:

- Relevance to international environmental policies and directives,
- Scientific excellence.

## 3. Benefits of co-ordination and support within the GMES framework

The main benefit is that the proposals would be fully integrated and networked directly into a significant GMES services initiative taking place now within Europe, in which many of the leading industrial and scientific expertise are involved.

Practical examples of the types of support that can be provided to selected proposals through the existing ESA GSE activities include:

- Access to ESA missions data through the existing Category-1 scheme in place serving the current GSE industrial consortia (ie free or at cost of reproduction)
- Full access to the knowledge and documentation suite produced as a result of the 10 consolidation activities. The documentation set consists of 42 documents for each of the 10 activities and represents the most complete knowledge at European level regarding What information is needed and why ? What services can be provided ? What are the benefits for European citizens ? Do the benefits justify the costs ? Of particular relevance are : Policy foundations review, Science review, User standards handbook, Service portfolio specifications, Service validation protocol, Operational scenarios.
- Co-ordination and technical transfers (algorithms, software, data) with ongoing research projects that are of specific relevance for the services being delivered and validated by the service network,
- Participation in service validation activities. Groups in NIS could get access and can contribute to service validation and quality control methodologies.
- Participation and contribution to the service network co-ordination (service partnerships, service level agreements, service expansion),
- Participation in regular GSE progress meetings, workshops and co-location working meetings,

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- Possibility that ESA organise dedicated workshops / events within the NIS countries to further the GMES activities.
- ESA promotion of the results via the ESA EO portal and ESA presence at numerous European GMES events
- ESA technical contract management of the GSE activities.

This support can be provided to selected proposals through the existing ESA GSE contracts via a contract change notice (with no exchange of financing between NIS and ESA GSE partners) that specifies the types and levels of co-operation and support agreed between the ESA GSE contractors and the NIS research partners. The costs of providing the required support will be covered by the existing resources within the ESA GSE contracts and represents ESA's contribution to this call. ESA cannot make financing directly available to proposals submitted under the INTAS call on the environment.

## Annex

### Further details of specific elements of the ESA GSE service portfolios of relevance to the INTAS environment thematic areas

#### 1) *Marine and coastal environment information services*

Requirements relating to oil slick monitoring and statistics, targeting the Black Sea and Caspian Sea

These services are relevant to the following international environmental policy sectors :

- **MARPOL/London Dumping Convention** (Enforcement of the prevention of oil and chemical discharges into the marine environment from ships)
- **Black Sea or Bucharest Convention** (for sea pollution and water quality in the Black Sea)

Potential types of users:

- Organisations interested by HAB or oil spills at international level (such as EEA or EMSA in Europe),
- national/regional level (Ocean institutes, environmental agencies, Fisheries, Coast-guards, Public Health institutes),
- local level (Port authorities),
- industrial level (oil companies, aquaculture operators)

Relevant elements of the complete GSE services portfolio are:

- **Oil spill routine surveillance:** Oil spill occurrence notification, position, extent, possible source. Performances (Update time and delivery time, False Alarm Rate, Probability of detection and location accuracy) should meet identified user's need. Delivery time of 30 minutes from satellite overpass, no longer than 60 minutes; zero false alarms rate; probability of detection better than 80% for minor spills in wind speeds up to 12 m/s, and better than 90% for major spills in wind speeds up to 12 m/s; Location accuracy better than 150m.
- **Oil spill drift forecasting:** time frame and grid size according to identified user's need. Typically: time step of 6 hours to 96 hours; grid size of 5km X 5km for complete area of interest and 1km X 1km for inshore areas; Forecast available within 3 hours of slick being detected.
- **Oil slick occurrence statistics:** Annual cumulative count of oil spill occurrence per sea basin: Total number of detected slicks; Breakdown of slicks by source (ship, platform...), by size; Estimated total volume of oil spilled; Estimated total volume by source.
- **Oil spill impact assessment:** Oil spill evolution forecast combined with user specified data layers (including: Sensitive habitats and ecosystems, High value asset locations) at scales of 1:50000 up to 1:200000.
- **Water quality monitoring and HAB Alert Routine monitoring (Black Sea, Caspian Sea).** Measurement of: chlorophyll concentration, HAB occurrence

(identification of HAB, delineation of extent); Water clarity (Information to be provided twice weekly with daily updates during HAB events). Resolution of at least 1 km.

## **2) Land cover and Land use change information services:**

Requirements relating to Inland water quality and contamination.

These services are relevant to the following international environmental policy sectors:

- **Ramsar Convention** (<http://www.ramsar.org>) on the conservation and wise use of all wetlands
- Possibly, the **UN Convention to Combat Drought and Desertification (UNCCD)** <http://www.unccd.int>. This Convention aims to promote effective action on preventing drought, land degradation and desertification.

Potential types of users:

- Organisations interested in environmental or agri-environmental monitoring or water contamination/consumption at international, national/regional/local level
- Public bodies (Environmental agencies, Natural Resources ministries, Public Health agencies, river/basin authorities);
- Private bodies (agricultural associations)

Relevant elements of the complete GSE services portfolio are:

- **Inland Water Quality / Contamination.** Provision of a GIS embedded set of information related to water quality in NIS hydrographical basins. The provided information includes a generic land use / land cover layer from remote sensing integrated with statistical and in-situ data into models to quantifying nutrient and phosphorus emissions into lakes and river systems. Typical requirements: Scale: 1:25,000; Overall thematic accuracy: >90% ; Geometric accuracy: < 30m; Minimum mapping unit 1 ha
- **Irrigation / Agricultural Water Consumption.** The service provides a GIS embedded set of information, which includes irrigated surfaces and irrigation volumes. Irrigation volumes will then be compared to available water resources. Typical requirements: Scale: 1:100,000 to 200,000; Overall thematic accuracy: >90% ; Geometric accuracy: < 150m ; Minimum mapping unit 25 ha.

## **3) Polar Environment Information Services:**

Requirements relating to : River ice maps, Sea ice thickness charts, Near-shore ice complex maps, Lake ice-maps, snow cover maps, climate change monitoring.

These services are relevant to the following international environmental policy sectors:

- UN Convention on the Law of the Sea (**UNCLOS**) - Responsibilities of coastal states to ensure safety of navigation within their Exclusive Economic Zones
- International Convention for the Safety of Life at Sea (**SOLAS**, 1974). Establishment of international cooperation for iceberg surveillance in the North Atlantic and transmission of information to merchant shipping.

- **Regulations of the International Maritime Organization** [imo.org] Requirements for international safety code & assessment (e.g. Code for Polar navigation)

Potential types of users:

- Organisations interested in Ice Monitoring, Sea-state forecast, environmental or climate monitoring in arctic regions at international, national/regional/local level
- Public bodies (Maritime bodies, Meteorological Institutes, National Ice Services, River/basin authorities; Municipalities at high latitudes; Energy supply agencies; Environmental agencies);
- Private bodies (hydropower companies; oil companies with offshore plants).

Relevant elements of the complete GSE services portfolio are:

- **River ice maps.** Information content: ice front location; ice classification (including Open water, Rough ice, Smooth ice, Shore fast ice). Typical service performance requirements: Classification accuracy better than 80%; location accuracy better than 100m.
- **High-resolution ice charts.** Information content: Sea ice classification compliant with WMO format for reporting sea ice conditions. Performance requirements: complete coverage of region of responsibility of each user. Typically: ice conditions classification posting on 300m X 300m grid spacing; standard projection for each sea area.
- **Sea-ice thickness charts.** Information content: Ice thickness distribution map. Typical service performance requirements: measurement posting on 500m X 500m grid;
- **Lake ice maps.** Lake ice maps for lakes freezing to the bottom. Information content: ice thickness distribution map, lake bathymetry, ice formation date distribution map, ice melting date distribution map. In-situ data lake depth profile are required to generate lake ice thickness and bathymetry. Typical requirements: scale/grid size 30 meters; Freeze/thaw date precision  $\pm 24$  hours; Ice thickness and bathymetry accuracy 0.5-0.75 meters.
- **Snow cover maps.** Information content: Fraction of snow covered area (5 km res.); Melting snow (1 km resolution). Typical requirements: Resolution with an RMS error of 15%; Map updates every second day.
- **Climate change monitoring.** The following indicators shall be generated: Cumulative specific net balance (glaciers); Snow cover extent; Arctic sea ice extent; Permafrost variation; Lake and river ice thickness variation; Ice flux. Indicator accuracy levels to be specified in consultation with climate change research community. Upgrades to these as well as generation of additional indicators shall be defined in close cooperation with the climate change research community.

#### 4) **Forest monitoring information Services:**

Requirements relating to environmental monitoring, Kyoto protocol reporting: Forest information update, detection and monitoring of forest disturbances, support to CDM forest projects.

These services are relevant to the following international environmental policy sectors:

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- *The United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol (KP)* <http://www.unfccc.int>
- *The UN Forum on Forests (UNFF)* <http://www.un.org/esa/forests/cpf.html>
- *UN Convention on Biological Diversity* <http://www.biodiv.org/>
- *Criteria and Indicators for Sustainable Forest Management* <http://ods-dds-ny.un.org/doc/UNDOC/GEN/N96/032/02/PDF/N9603202.pdf?OpenElement>
- *Illegal Logging* [http://www.g8.gc.ca/paris\\_communique-en.asp](http://www.g8.gc.ca/paris_communique-en.asp)

Potential types of users:

- Organisations interested in forest monitoring and management, biodiversity, sustainable development, at international/national/regional level.
- Public bodies (Ministry of Natural Resources/Environment/Agriculture ...)
- Private bodies (World Bank, Forest project developers)

Relevant elements of the complete GSE services portfolio are:

- **Support to environmental monitoring (international scale).** Monitoring of: Biodiversity; Forest fragmentation (avoiding dissociation of forest from other ecosystems); Impact of climate change on forest; Forest age class mapping.
- **Support to national UNFCCC and Kyoto Protocol reporting on LULUCF activities (national scale).** Forest cover and forest cover change maps; Land-use and land-use change maps; Summary statistics on totals and changes regarding the stem volume, biomass and carbon stock; Error budgets to define the minimum reliable carbon stock estimate. The service will use in-situ information from a sample-based forest survey. Typically: Min. mapping unit 0.1 to 1 ha; Mapping frequency: every 3 to 5 years.
- **Forest information update (national and sub-national scale).** The service will provide a basic forest inventory data or an update of parts of existing inventory data at the national or sub-national (e.g. Regions, provinces) level. The service will use in-situ information from a sample-based forest survey.
- **Support to environmental monitoring (national and sub-national scale).** The service will provide monitoring of biodiversity and forest fragmentation and other forest and land-use indicators.
- **Detection and post-monitoring of natural and human-induced forest disturbances (national and sub-national scale).** The service provides mapping of fires and clear cuts as well as monitoring of old and new cuttings and assessment of regeneration.
- **Support to CDM forest projects (local scale).** The service will cover the project area and possibly the potentially affected surrounding area. It will provide baseline land-use and forest maps, baseline carbon stock scenario, change maps and monitoring, and statistical data.

#### 5) **Atmospheric Pollution Monitoring Services:**

Requirements relating to the UN Framework Convention on Climate Change : monitoring of Greenhouse-gasses and Aerosol Records.

These services are relevant to the following international environmental policy sectors:

- **Montreal Protocol on Substances that Deplete the Ozone Layer.** Production and consumption of eight groups of Ozone Depleting Substances (ODS) are regulated. Only overall production and consumption are controlled.

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- **Convention on Long-Range Trans-boundary Air Pollution**
- **UN Framework Convention on Climate Change (UNFCCC)**

Potential types of users:

- Organisations interested in weather forecast, public health, environment, at international/national/regional/local level (Ministry of Environment or Public Health, Weather forecast agencies, Medical associations, local municipalities)

Relevant elements of the complete GSE services portfolio are:

- **Air Quality Records:** Global/regional analyzed/assimilated model records using ground & satellite data of tropospheric NO<sub>2</sub>, O<sub>3</sub>, AOD/speciation, SO<sub>2</sub>, HCHO, CO and PM. Provision of global and regional assimilated maps (daily, monthly, yearly maps of O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, HCHO, Aerosol) of tropospheric species covering the time period 1995 to now. Accuracy levels for all species mentioned shall be in the range 30% - 50%.
- **Greenhouse-gasses and Aerosol Records:** Global maps of greenhouse-gasses (CH<sub>4</sub>, CO, CO<sub>2</sub>) and time series of Aerosol information for climate change monitoring. This service should demonstrate the feasibility to map (monthly maps) by using satellite measurements globally sources and sinks of greenhouse-gasses from the year 2002 onwards and should be used as the baseline for future service definition in this domain. Furthermore global time series of aerosol information should be derived by the combination of ground-based and satellite measurements covering the period from 1995 until now