Contribution of GMES for Monitoring Land Cover and Atmosphere to support the implementation of the World submit on sustainable development

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United Nations/Austria/ESA Symposium on Space Applications for Sustainable Development to support the Plan of Implementation of the World Summit on Sustainable Development, 9-12 Sept. 2008, Graz, Austria
Overall purpose

**GMES:** Autonomous capacity to generate & deliver *Earth observation-derived information* on environment & security: strategic for EU

- **Need for information in support of:**
  - **European policies:** environment & climate change, CAP, Maritime Policy, CFSP/ESDP...
  - **EU international commitments:** protocols and conventions (eg Kyoto, Montreal, CLRTAP..)
  - **National or regional «adaptations»** of these policies or commitments
GMES is a joint initiative of the European Commission and ESA. Its objective is to provide relevant information to policy-makers and other users, particularly in relation to environment and security.
Current challenges

• Global Environmental Change reinforces this need for Information
• Technological Progress is an asset to respond to the need
• Availability of relevant data
  – Lack of access
  – Lack of funding for technical infrastructure, lack of continuity
  – Spatial and temporal data gaps
  – Lack of data interoperability
  – Inadequate user involvement
  – …
GMES is a user driven initiative

Various categories of users
- European institutions and agencies
- National and regional authorities
- Policy makers and support organisations
- International bodies in support of conventions
- European citizens and NGOs
- Downstream industry, especially SMEs
Integrated system approach

- Relevance of EU level taking into account subsidiarities
- Overall “information chain”: from observation to information required by the users
- “System of systems“: mutualisation & long term sustainability of capacities & resources
- Build on existing capacities in Member States
- International cooperation through other initiatives (GEO/GEOSS, GCOS, UN conventions etc.)
GMES… “the main European contribution to GEOSS”
Space Infrastructure

In Situ Infrastructure

OBSERVATION INFRASTRUCTURE

CORE SERVICES

DOWNSTREAM SERVICES

Added Value Chain

GMES Architecture

Users

9-12 Sept. 2008, Graz, Austria

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Observation Infrastructure

- **In-situ** observation infrastructure: co-ordinated at National level
  - air-, sea- and ground-based systems and instruments (e.g. airborne, balloons, floats, ship-borne, measuring stations, seismographs, etc)

- **Space** infrastructure component for GMES: different missions co-ordinated at European level
  - Dedicated GMES missions: the ESA Sentinels
  - Contributing missions: EU National, EUMETSAT and third parties
Three Service areas based on Earth systems:

- **Land Monitoring**: initially European land cover & urban spots, extension to Global Land and thematic services
- **Marine Monitoring**: sea state & ecosystem characteristics over global ocean & European regional seas
- **Atmospheric Monitoring**: atmospheric composition for air quality (European) and climate forcing (global), ozone monitoring (global) and solar energies

Further, horizontal components:

- **Emergency Response**: initially rapid mapping (reference maps within 6 hours over crisis area, damage assessment maps available within 24 hours & daily updated, further evolution to other components of the Emergency cycle
- **Security**: “Interior” security, Land border security, maritime surveillance, external security (expected)
- **Climate Change**
• **Core services**
  – Pan-European, multi-purpose information service capacity
  – Linked to EU information needs (EU policies and international commitments) or to decisions to share capacities at EU level
  – Sustained public funding (EU & Member States)

• **Downstream services**
  – Tailored for specific applications at local, regional, national, European levels (public good or private use)
  – Use core services as one of the inputs
  – EU not directly driving the service and not responsible for service requirements
  – EU should encourage / support the implementation of this service layer, e.g. through R&D funding
  – EU not involved in Downstream Service governance & operational funding
Land Monitoring Core Service
Land Monitoring Service

• LMCS addresses a wide range of resources and policies at EU and international level (e.g. soils, water, agriculture, forestry, biodiversity, transport etc.)
• Very diverse user communities with various requirements
• Common key requirements: improve data access and reference data
• Will offer a portfolio of data and products with different levels of elaboration (from pre-processed images to elaborated information)
Portfolio of LMCS

• **Multipurpose products**
  – pre-processed space data (e.g. orthorectified images, image mosaic, cloud mask, daily/weekly image composites…)
  – basic reference data access improvement and European products
  – Bio-geophysical parameters to support GCOS-GTOS/ECVs
  – A set of Land Use/Land Cover and Land Cover Change products
    • at various scales (Global land cover, EU continental land cover, national or covering areas of interest)
    • and various time resolution: dynamic products (daily, weekly, monthly, or seasonally), periodic products (every 1-5 years)
    • various layers: generic land cover or thematic LU/LC&LCC (forest, agriculture…)

• **Thematic products** at European or Global level dedicated to specific usage e.g.: crop forecasts, early warning on food security, water models, environmental indicators, carbon fluxes, soil degradation and desertification models... **Still to be addressed**
Starting with…

Main information over Europe

- 3-5 yearly updates of core land cover / land use data with minimum mapping units of 1-5 ha, improved on Corine basis
- Land cover / land use data of 500 functional urban areas (≥100,000 inh.), minimum mapping units 0.1 ha
- Annual low resolution updates

Then extension

- Addition of a global component
- Thematic services: agriculture, forest, soils, water resources
Land Monitoring Service architecture
Core Atmosphere Service
Atmosphere Service

Main information within & outside Europe

- Air quality
- Climate forcing
- Stratospheric Ozone & UV
- Renewable energy support

Pilot service starting later, but maturing quickly

- User workshop in December 2006
- Implementation group set up in June 2007
- Strategic Implementation Plan due for mid-2008 (on track)

- **Service preparation:**
  - FP6 - GEMS about 10 M€
  - ESA GMES Service Element - PROMOTE about 5 M€
  - FP7 – MACC about 11 M€
• Will produce in real-time, operational, generic, multi-purpose data to monitor the composition of atmosphere at Global and European scale:
  – provision of GCOS ECVs;
  – gridded information on atmospheric composition;
  – long-term databases in order to clearly establish trends;
  – ensuring effective and easy access to in-situ and satellite data, including in near real time (NRT);
  – forecasting and assessment capabilities for policy development, health and other applications;
  – reanalysis at regular intervals;
  – interface with other GMES CS, in particular for Climate Change
Architecture of the Core Atmosphere Service

OBSERVATION SUPPLY and CALIBRATION
Space Agencies / Ground networks / Aircraft programmes

OBS ACQUISITION and PRE-PROC
QC, Validation, Multi-sensor processing

GLOBAL
Monitoring, Assim & Forecasting

EUROPEAN ENSEMBLE
Monit, Assim & Forecasting

Downstream Services
Other GMES Core Services

DATA SERVICES

END USERS

FP RESEARCH
CORE R&D

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Air Quality Ensemble

NO₂ Forecast, Surface Level

Feb 09, 2008
Daily Maximum

72 hour forecast (D+2)
issued on Feb 07, 2008
www.gse-promote.org
Climate Change and GMES

Address the topic horizontally in the Earth System components of Core Services (Marine, Land, Atmosphere)

• **Scope**
  
  – Generation of long time series of consistent observation datasets and reanalyses of past observational data → provide added value on essential climate variables identified by GCOS and drive the development of climate change (earth system) modelling to be performed by existing capacities outside of GMES
  
  – GMES supports interfacing geo-information into socio-economic models

• **FP7 Space call for 2009** includes specific topic on CC: extending Core Services for climate change monitoring

• Further funding in FP7 for CC research
Implementation Process

Approach based on identifying user needs, rather than technology push

- User Workshops
- Implementation Groups: analysis of service scope & architecture, analysis of data needs, initial elements of governance
- Pre-operational validation from 2008 through R&D projects (FP7 until 2013)

- Transition from R&D to operational programme -> Architecture & governance of services to be established
  - Governance plans
    - GMES architecture components: space & *in situ* observation infrastructure, Core Services
    - Overall governance: resourcing and linkages between components
  - Funding
    - Consolidation of Member State contribution: *in situ* & space observation infrastructure, core service
    - EC contribution: transition from R&D to operational funding
GMES in FP7 funding

Draft Budget
Annual Commitment Profile 2007-2013 (subject to annual adoption)

- FP7 Space theme is €1.4 billion altogether
- 85% for GMES ~ €1.2 billion including
  - dedicated space infrastructure ~€650m
  - information services ~€400m
  - data procurement ~€150m
GMES services - precursor projects

Current EC and ESA projects (FP6 and GSE’s) aiming at service delivery (will be over by 2008 or early 2009):

- FP6: Preview, Mersea, Geoland, GEMS, Limes
- GSE: Polarview, MarCoast, Forest Monitoring, Food Security, TerraFirma, Mariss, PROMOTE, Risk-EOS, Land service and Respond

Upcoming projects (still not officially approved)

- FP7: SAFER, My Ocean, Geoland2, MACC, G-Mosaic
- (likely) extended GES’s: PolarView, MarCoast, Forest Monitoring, Food Security, TerraFirma and Mariss
  - (activities carried out in Risk-EOS, Respond, Land service and PROMOTE will be integrated into above-mentioned FP7 projects)
Thanks for attention!