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# GMES SERVICE ELEMENT

## FINDINGS FROM THE THIRD GSE COLOCATION MEETING

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## 1 INTRODUCTION

This report summarises the findings emerging from the GMES Service Element (GSE) programme of ESA with respect to the on-going implementation of GMES. They have been drafted and endorsed by the participants to the Third GMES Services Element co-location meeting held in ESA-ESRIN, Frascati, Italy from 3-6 May 2004.

The colocation meeting was attended by members of the twelve consortia under contract to ESA within the consolidation phase of the GMES Services Element. These consortia represent over 200 organisations, based mainly in Europe. More than half of these are international, national or local user organisations. These organisations include:

- End user organisations, mostly public sector and including environment ministries, civil protection agencies, forestry agencies, national geological surveys, meteorological offices, coast guards and local authorities
- Geo-information service providers
- System integrators
- R&D organisations
- Expert consultants in environmental policy, international law, security issues and economics

A list of current GSE Consortia is contained in Annex A1.

## 2 GMES SERVICES ELEMENT COLOCATION MEETING

### 2.1 Scope of the colocation meeting and information day

Colocation meetings are held every 6 months at the ESA-ESRIN establishment in Frascati, Italy as part of the overall GMES Services Element management process. The third such colocation meeting was held from 3-6 May 2004. Participants from all consortia participated.

The scope of the colocation was to ensure an overall view and synthesis of activities supported so far and identify any appropriate re-orientation necessary. This included:

- Critical review of each service in terms of public benefits, user acceptance and scenarios for progressive implementation in terms of timescales, issues to be addressed and critical dependencies, assumptions and milestones for sustainability
- Coordination options between existing consortia and identification of needs for additional activities
- Indications and requirements for future EO operational capacity in Europe together with infrastructure requirements for in-situ data gathering and data access, modelling and data assimilation, data processing and fusion, service delivery and user exploitation
- Lessons learned and future actions to be completed relating to service validation and standardisation including compliance with user standards

The colocation concluded with an Information Day to brief ESA Earth Observation Programme Board Delegates, GMES Steering Committee Members and consortia strategy group members on progress to date within the GMES Services Programme Element.

### 2.2 Information day structure

The information day covered three main topics:



## 1 Presentation of position papers by colocation focus groups

Eight focus groups were set up as part of the colocation meeting. Their focus was agreed in advance between ESA and the consortia. Each was intended to analyse dominant issues presently faced and determine options for resolution. These were then recorded as findings within a position paper. These findings were presented to attendees at the GMES Services Information day for approval.

The focus groups were defined as follows:

- **Critical review of existing GSE Services** – is the present portfolio a sufficiently mature basis for moving to the next phase of GSE?
- **GSE Validation and Standards** – to what extent is dedicated effort required in this domain?
- **User Communities, Federation and Leadership** – are there overlaps in the user segments for the different services, are key users involved to an adequate extent and what mechanisms can be explored to expand the overall user base?
- **GSE Supply-Side Synergies and Overlaps** – what are the options for further consolidation between portfolios and what common requirements can be identified? In addition, a separate assessment was conducted of how to structure common interfaces to FP6 Integrated Projects
- **Service Benefits Impacts and Costs** – what benefits have already been identified, what further benefits are expected and what are the critical assumptions on future growth underlying sustainability?
- **Infrastructure and Data Needs** – what are the overall requirements from the different service portfolios in terms of availability of different data sets and access to key infrastructures and what issues arise from these requirements?
- **Service Partnership and Agreements** – how do these presently operate, how effective are they and to what extent do these need to be contractual elements for the next stage of GSE?
- **Service Sustainability** – what are the different routes to sustainability and what milestones need to be achieved by when in order to ensure this?

The findings are described in the section 4.

## 2 Presentation by consolidated consortia

This was an overview of the proposed service prospectus and progressive implementation approach for the next stage of GSE. Proposed service prospectuses are listed in section 3 while detailed presentations are available on the ESA GMES Services Element website (<http://earth.esa.int/gmes>)

## 3 Review and comment by partner organisations

This started with specific presentations by EEA on their priorities with respect to GSE and DG Research on their complementary activities related to GMES under FP6.

A round-table session involving additional user organisations analysed key issues arising from the focus groups and proposals for progressive service implementation. Summaries of partners presentations can be found in section 4 while the round table discussion is recorded in Annex A1.



### **3 FINDINGS OF THE GSE COLOCATION MEETING**

#### **3.1 Critical review of existing GSE Services**

##### **3.1.1 Background**

- Out of a total portfolio of 48 services (and which is planned to grow to 55 services), 39 have been delivered to 224 core users within GSE consortia to date. This represents approximately 27% of the target geographic area to be covered.
- Due to the diversity of service content, the units in which services are delivered to users varies considerably. However each consortium has defined appropriate units which can form the basis for future characterisation within service level agreements, partnership protocols and sustainability assessments. Example service units delivered to date include:
  - 200 daily ice charts
  - water quality analysis for 4 river basins
  - burned scar maps for 17 regional administrations
  - ground displacement monitoring for 7 cities
  - urban land use for 24 cities
  - forest cover analyses for 3 national GHG reports
  - algal bloom monitoring for 60 regional basins

##### **3.1.2 Issues and findings**

###### **Issue 1 – EO data supply**

Existing services depend critically on EO data availability. Some services could not be delivered in Phase1. This risks losing credibility with existing Users.

###### **Related findings**

- Improve delivery times and availability of EO data sources wherever possible
- Prioritise access to EO data from existing missions for GSE services (wherever possible)
- Take immediate steps to ensure long term continuity of the critical EO data sources (e.g. Sentinel missions under consideration)

###### **Issue 2 – Supply chain redundancy**

There are dependencies & risks associated with supply chains. Overall, GSE services lack redundancy:

- 92 GSE supply chains are in place (for 39 services available, 10 consortia) but 25 services rely on one supply chain only
- 13 services have more than 3 supply chains in place & operating: redundant service supply chains exist
- A few services have more supply chains than 1 year ago: service providers have developed partnerships to consolidate supply

###### **Related findings**

In Stage 2 GSE should avoid single sourcing for services and encourage a reasonable degree of redundancy of supply chains to assure service availability



## **3.2 GSE Validation and Standards**

### **3.2.1 Background**

Validation, standardisation and certification are three very different elements and must be addressed in a phased approach as the service expansion and scale up is progressively implemented. The focus group addressed each element (validation, standardisation, certification) in turn to fully elaborate the issues involved in its implementation.

### **3.2.2 Issues and findings**

#### **Issue 1 - Validation**

Existing GSE users demand to have more and better validation. Non-validated products can not be sustained. Today cost-effective and quality-ensuring formal standards and protocols for validation of EO services are missing. Currently access to in-situ data for validation is inadequate

#### **Related findings**

- A generalized GMES service validation framework is needed. The next GSE stage shall implement it. It has to cover Service management, Service delivery, User interaction, Processing chain
- Stage 2 of GMES shall implement third party auditing for all GSE services. The effort could be as much as 10 percent of the total resources in stage 2

#### **Issue 2 – Standards**

- Many GSE services are delivered without using standards
- The user community is not aware of existing standards
- Competing standards (local, regional, European) are stopping the acceptance of services
- Bringing in new users is a slow and expensive process
- Standards simplify reporting, ensure products and services compatibility, services up scaling

#### **Related findings**

- Adopt relevant standards where they exist
- Influence on going standardization initiatives
- GMES has to create de-facto standards for services - not bureaucracy, but practical solutions
- Standards have to be applicable to Service Level Agreements

#### **Issue 3 – Certification**

- What makes a service a GMES service?
- Today users are validating the suppliers' products
- Users are confronted with broad service offers
- They have no means to judge whether a service is fit for their purpose

#### **Related findings**

- GMES must establish a certification framework accounting for proven standards.
- GSE certification will remove a burden from the users and will broaden acceptance of services



### **3.3 User Communities, Federation and Leadership - Issues and findings**

#### **Issue 1 – the User Base**

- Do we know who the users are? Is the user community at large fully represented within GSE?

#### **Related Findings**

- A large number of users have been identified within on-going GSE activities
- The user community at large is well, but not yet fully, represented within GSE.
- Stage 2 should be based on a clear strategy and priorities for involving new users.

#### **Issue 2 – The Need for Federating Agencies**

- Federating agencies facilitate the involvement of users in GSE. Have we identified and involved a sufficient number of federating agencies?

#### **Related Findings**

- Several federating agencies are currently contributing to GSE (e.g. EEA, ETC, ENTENTE)
- In stage 2 more federating agencies must be brought in and their role strengthened. They should be used as a vehicle for growth.

#### **Issue 3 – User Leadership**

- Leadership by users is already largely realized at the service level. However, ultimately, GSE should become a fully user-led initiative. Are the users ready to take ownership of GSE right now?

#### **Related Findings**

- This is close to being the case (in some areas), but not yet as a general rule.
- Stage 2 of GSE must be structured (measurable targets) in a way to foster increased user leadership and move towards collective user governance over the process.

#### **Issue 4 – User Service Models**

- Users want two basic service models:
  1. The user procures services from external provider;
  2. User wants in-house production capability.
- This prescribes a distributed GMES service architecture.

#### **Related Findings**

- Stage 2 must from the start identify which service model each user wants.
- Stage 2 must implement both service models.



### 3.4 GSE Supply-Side Synergies and Overlaps – Issues and Findings

#### Issue 1 – Synergies and overlaps in Land information services

There is significant reliance on common elements at different levels of the service chain (eg basic land cover classification, soil sealing)

##### Related Findings

- Two major European Policy Themes addressed by several consortia:
  - Soil Thematic Strategy / Water Framework Directive
  - Kyoto protocol
- Some synergies across all above due to similar input data and delivery requirements
- Some areas distinct with little synergy e.g. Food security – crop modelling
- Improvements to European wide Corine land cover may be a service target
- Synergy may be capitalised by organising land in Stage 2 by
  - Policy Theme (i.e. 2 main groupings), and / or
  - Data and technique synergies

#### Issue 2 – Synergies and overlaps for marine and polar information services

There are many parallel activities presently on-going under both EC and ESA funding, each addressing different aspects of marine and coastal environmental information. In addition there is a requirement for common access to tools (eg ocean models) and data (eg ScanSAR near real time access for oil spill surveillance and sea ice monitoring)

##### Related Findings

- Need for ESA GSE marine services to focus on the coastal scale, which is at the heart of decision making. Such focus would enable to fully exploit the complementarity between EC MERSEA and ESA GSE Marine projects as the ocean state information provided by MERSEA *global/regional* models is needed to force *high-resolution coastal* models operated by national authorities.
- The rationale for an integrated supply chain for marine & coastal environment services has been clearly identified between ROSES & COASTWATCH (e.g. HAB & Water quality products are similar on the supply side perspective as they feed on similar data streams but differs down the value chain where locally-tuned algorithms are needed).
- Synergy with EC projects (e.g. EUROCLIM & IRIS) are currently being exploited by NV & ICEMON to extend & complement their portfolio (e.g. ice-related climate change indicators will be integrated in the portfolio).

#### Issue 3 – Synergies and overlaps for risk management information services

- Overlaps between GSE supply chains are an inefficiency that ESA cannot afford. However, merging of services where there is no clear net benefit would be counter productive.

##### Related Findings

- GSE risk services have very diverse supply chains and end-users in Stage 1. At this time, there are no obvious gains to be made by re-organising the risk service supply side in GSE Stage 2.
- A GMES Network should be implemented to provide consortia with access to other consortia's products:
  - a) Synergy in pre-processing: e.g. Landslide and flood services both use Terrafirma Level 1 products.
  - b) Service brokerage: e.g. GMFS users want Risk-EOS fire & flood monitoring services



#### **Issue 4 – Integration of new service components**

- EC and national Research, Development & Demonstration programmes have produced new services which could improve the GSE service portfolio.

#### **Related Findings**

- GSE Stage 2 should continue to integrate new services as they become available. Specifically:
  - A landslide service developed under DUE should be included in GSE Stage 2
  - ASI national risk management pilot projects on fire, flood and landslide should become operational under GSE

#### **Issue 5 – Link between ESA GSE and EC FP Activities**

- The needs of operational users should be fully catered for in R&D programmes.

#### **Related Findings**

- EC FP is primarily focused on research, development and demonstration.
- GSE is operational implementation with active user involvement in the *definition* and *assessment* of the service.
- Therefore, to ensure that new developments are driven by operational user needs, GSE projects should contribute to the definition of the EC FP research and development activities.



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### **3.5 Service Benefits and Impacts - Issues and findings**

#### **Issue 1 – Benefits realised to date**

Users already demonstrate significant benefits within consolidation phase and are confident of increasing benefits and value from services provided in the next phase of GMES Services Element. These are based on both data that cannot be effectively provided using alternative means and data that enhances information gathered using alternative sources.

#### **Related Findings**

- To date these benefits accrue primarily to public agencies. There is a need to understand how benefits will reach the broader public.
- Many of these benefits are difficult to explicitly quantify despite the level of engagement from the users affected. These benefits are important and need to be included within the overall considerations for GMES implementation. At present, this is very difficult within a standard Cost Benefit Analysis.

#### **Issue 2 – Benefits presently not being realised**

There are priority areas identified within the GMES interim report and GEO which are not presently targeted. In addition users have identified areas where the full potential benefits available are not being adequately addressed due to:

- users from one consortium not having access to services from another consortium
- no targeted action within the appropriate area

#### **Related Findings**

- A mechanism to coordinate between users within each project needs to be implemented to ensure users have access to all appropriate services.
- There is scope for additional activities to be executed through an appropriate combination of expansion of the service offerings within current portfolios and initiating new GMES Consolidation Phase activities

#### **Issue 3 – Sustainability**

Some core users are committed and have indicated willingness to pay for services within the present portfolio. CBA also indicates sustainability. However, in order to meet sustainability, major growth over present levels of annual service volume is mandatory.

#### **Related Findings**

- Sufficient users exist to sustain this growth but more users need to be attracted through promotion and communication of benefits
- Unit cost per service needs to decrease, service throughput must significantly increase

#### **Issue 4 – Overall GMES Benefits**

Benefits analysis to date within GSE has focussed on sustainability of individual services. There is no comprehensive assessment of the overall benefits resulting from GMES implementation - yet this would be required for any financing decision

#### **Related Findings**

Overall assessment of benefits from GMES implementation needs a clear definition of what will actually be implemented. Issues to be included:

- Scope of GMES concept (different scenarios to be defined and assessed)
- High impact benefits, e.g. political, human capital



### 3.6 Infrastructure and Data Needs - Issues and findings

#### Issue 1 – Space Segment Infrastructure

Continuity of key data sources is not presently guaranteed – this impacts on the credibility and acceptance of the service portfolio

#### Related Findings

Key sensors have been identified: their continuity must be assured

Marine priorities:	<ul style="list-style-type: none"> <li>• C band SAR - wideswath+apol;</li> <li>• MODIS/MERIS type – ocean colour</li> </ul>
Land priorities:	<ul style="list-style-type: none"> <li>• High resolution optical (LandSAT-7 type)</li> <li>• C band INSAR</li> </ul>
Atmosphere priority:	<ul style="list-style-type: none"> <li>• Post-ENVISAT combination of atmospheric composition sensors</li> </ul>

This does not include requirements for back-up solutions to support an operational service portfolio. This must be addressed on top of the requirements defined above

#### Issue 2 – Ground Segment Infrastructure

- Ground segment needs to provide improved support to operational services

#### Related Findings

- ESA's OXYGEN project is already addressing the following:
  - Flexible multi-sensor browse, ordering and delivery;
  - Simple user interface without need for user to be expert;
  - Minimal order lead time and NRT product distribution
  - Up-to-date archive; catalogue browsing
  - 24/7 support
- GSE consortia must communicate with OXYGEN to ensure these issues are addressed
- An extended role of ground segment would relieve the present burden on services - eg Pre-processing (ortho-rectification, radiometry)

#### Issue 3 – Service and User Infrastructure

- Users and their infrastructures are distributed broadly with diverse service needs:
- Service expansion requires some investment in infrastructure

#### Related Findings

- Distributed service infrastructures must be implemented – not highly centralized developments
- GSE must draw on infrastructure developed by other organizations, e.g. EC, EEA.
- The following are investment priorities for the next stage of GSE
  - Product improvement - New/enhanced models, increased assimilation of EO & in situ data (e.g. forecasting)
  - Create synergies between European service providers:
    - Commonly accessible data-pools (e.g. elevation models)
    - Basic, common value-adding processing
    - Communications networks (distributed networks, centralization not foreseen)
    - Backup and redundancy
  - Enhance productivity by automation of service supply chain
    - Online archive facilities, catalogues, etc.
    - Automatic feature detection algorithms (e.g. oil spills)
    - Broker systems, improving user interface to services



### **3.7 Service Partnership and Agreements - Issues and findings**

#### **Issue 1 – Role & importance of partnerships for next stage of GSE**

- There is a potential risk that partnerships and service models GSE could create cartels: e.g., service providers have exclusive geographic distribution rights.

#### **Related Findings**

- The GSE service model must be open and inclusive – not proprietary and exclusive.
- The Open Partnership is a useful instrument allowing a gradual transition to an open GMES service provision.
- The Open Partnership must contain transparent rules and avoid creating monopolies, as monopolies are against the interest of the users and the GMES process and may potentially breach competition laws .
- The nature and terms of the partnership will vary depending on the specific characteristics of the user segment addressed.
- Partnerships in the next GSE stage should contain:
  - Clear mechanism that allows new service providers to join the GMES process;
  - A requirement that information, data and results derived during this phase relating to standards, technical specifications, validation protocols and any other information that may contribute to the standardization of GMES services shall be public;
  - Mechanism to create the required infrastructures to ensure service provision after the ESA contract; and
  - Mechanisms ensuring the standardization of GMES services and the user acceptance/certification.

#### **Issue 2 – Role & Importance of Service Level Agreement (SLA) for Next Stage of GSE**

- So far, ESA contracts governing service provision and the relationship with the users and SLAs are not legally binding.

#### **Related Findings**

- SLA is the key mechanism enabling a gradual transition from “ESA funded” service provision to a market driven service provision.
- In the next GSE stage, SLAs must be legally binding agreements and contain minimum terms and conditions relating to service provision, quality and standards.
- It is difficult to devise a model SLA which would apply to all the consortia as there are significant differences in the nature of the GSE services and user segments. However, general terms should be developed for all consortia.
- The key terms and conditions of future SLAs:
  - Clear service description and delivery mechanisms.
  - Precise quality control mechanisms:
    - Detailed definitions (e.g., applicable standards);
    - Measurable quality parameters (e.g., thematic accuracy, geometric accuracy);
    - User acceptance criteria (e.g., thematic accuracy of 90%).
  - User contribution: e.g., data, validation, contribution to standards development, certification.
  - Liabilities and penalties could be applied in order to reinforce compliance by service providers.



### **3.8 Service Sustainability - Issues and findings**

#### **Issue 1 – Strategic Plans**

- Strategic Plans do not yet provide a convincing roadmap (ie. key activities, timescales, milestones and priorities) for achieving sustainability of GMES services. In particular identification of and planning to acquire external non R&D funding is currently weak.

#### **Related Findings**

- The strategic plans will need to be substantially improved during 2004 as a prerequisite prior to starting Stage 2.
- There appears to be a large variety of funding opportunities in Europe (eg EC Structural and Regional funds). The process of acquiring funding may be complex and needs to be further explored and better understood in the early part of Stage 2.

#### **Issue 2 – Performance Criteria for Services to Become Sustainable**

- Few services to date have established clear measures for service performance in terms of availability, reliability and affordability. These are needed before users will commit to the services.

#### **Related Findings**

- A priority action in stage 2 is to demonstrate compliance of services with user defined quality standards
- Service volumes need to be progressively grown during stage 2 to reach a substantial fraction (>50%) of European users
- Service costs shall progressively reduce as service volumes grow and standards become implemented.

#### **Issue 3 – Coordination**

- GSE stand today as individual projects supported entirely through ESA funding. It must become part of an integrated and co-ordinated European effort for GMES.

#### **Related Findings**

- Practical mechanisms need to be established early in Stage 2 to take deliveries and give input to existing, funded EC development and operational programmes and activities.
- These mechanisms need to be recognised and supported by respective procurement agencies (ESA, EC) at programme management level.
- The level of ESA financing shall progressively decrease as a fraction of the total European development activities being exploited in the next 3 years.



#### **Issue 4 – GMES Service Delivery & Access**

- Clear ground rules for service access and supply need to be established to maximise fulfilment of public good while encouraging commercial exploitation.

#### **Related Findings**

- European public sector organisations should be given favoured access to GMES services for their operational mandate
- Private sector companies should have access at market rates
- Favoured access will have to be structured to provide low cost initial entry, progressively moving to cover the full cost of service provision
- The Open Service Partnership should be implemented to strengthen the supply capacity and take advantage of additional capabilities existing in Europe
- ESA funding in Stage 2 should be linked to service delivery based on clear user demand and acceptance

#### **Issue 5 – User Involvement**

- Users have to be given greater role and responsibility to ensure that services bring recognised benefit in their operational processes.

#### **Related Findings**

- Many key user at national level have been involved in the consolidation phase. The priority is to serve those users that have invested and committed to date.
- More Regional & Local user engagement is required in Stage 2 to go further in understanding how services can be practically integrated in their working practices.
- User based organisations need to be identified and targeted to consolidate information requirements service procurement during Stage 2.

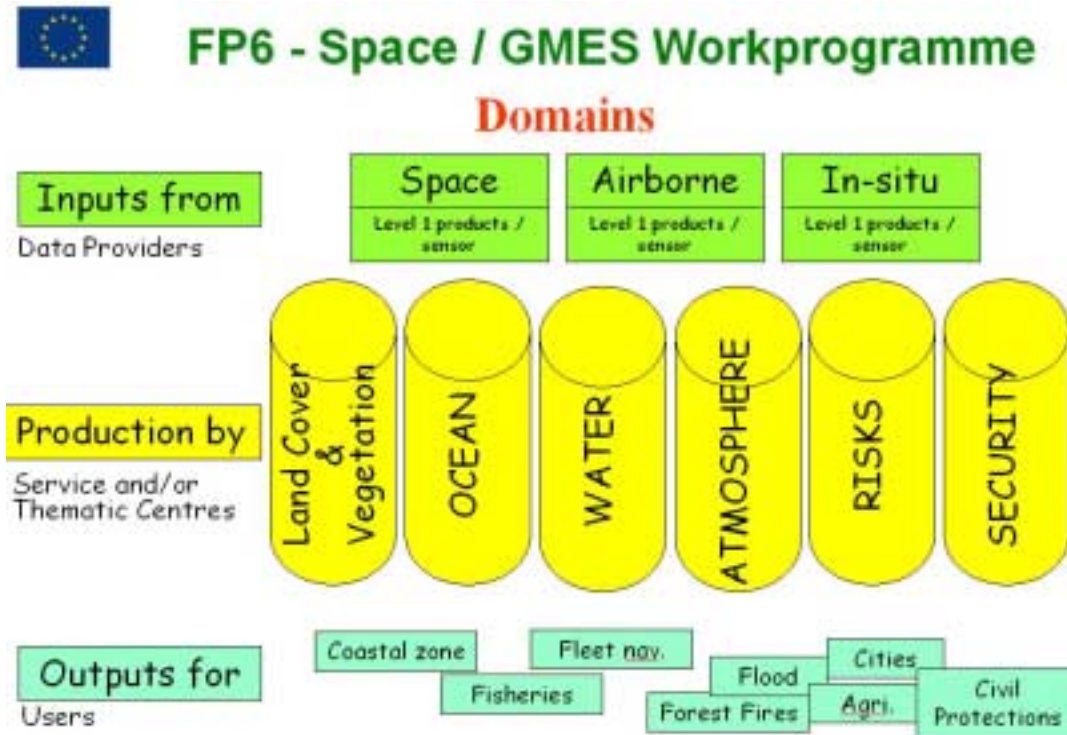
## 4 PROPOSED COORDINATED APPROACH FOR SERVICE IMPLEMENTATION

### 4.1 Introduction

This section summarises the approach proposed by the different consortia for the next stage of the GMES Services Element in terms of the target user communities, the consolidated service portfolio and the timescale for service roll-out over the next 3 years. Complementary material provided by EC DG Research is included. Priorities expressed by the European Environment Agency are also recorded here.

### 4.2 EC DG-Research partner – complementary activities within GMES

In addition to the two integrated projects, several activities under separate tools such as Networks of Excellence have started. A summary of all activities under the GMES sector of FP6 is shown in the table below:



The first call resulted in the selection of two integrated projects and a number of Networks of Excellence as summarised below.



Area	Instrument	Subject	Acronym	EC cont.(M€)
GMES	IP	Landcover	GEOLAND	10
GMES	IP	Ocean	MERSEA	14
GMES	IP	Risk	None	-
GMES	NoE	Security	GMOSS	6
GMES	STREP		INTEGRAL	1.3
GMES	STREP		EAGLE	0.8
GMES	SSA		GOSIS	0.4
GMES	SSA		NAVOBS	0.8
GMES	SSA		GMES-POLAND	0.07
GMES	SSA		HALO	1.2
Satcom	IP	Rural	TWISTER	5
Satcom	IP	Transport	None	-
Satcom	IP	Tele-edu/medicine	None	-

Proposals for the second call are presently under evaluation. A summary of the present situation is shown below:

Instrument	Area addressed	Budget (M€)	No. proposals
IP	Water resources	30 - 36	2
IP	Atmosphere		2
IP	Risk management		2
SSA	Data harmonisation	4 - 10	-9
STREP / SSA	GMES		-25

An additional proposal for an integrated project on Convergence and integration of satcom with GMES" is also under evaluation.

Like the first call which resulted in the selection of the Mersea and Geoland integrated projects, the second call will initiate projects that are complementary to activities within GSE and which need strong coordination. The content defined for this call is as follows:

- **Water resources (IP)**
  - indicators and services for water resource management, combining satellite & in-situ observations
  - support to user community and EU policies at local, regional and global levels (case of developing countries such as Africa)
- **Atmosphere (IP)**
  - services for monitoring and assessment of atmospheric components, using satellite data and in-situ measurements, from global to regional scales
  - support to user community and EU policies, especially for air quality and climate change assessment.



- **Risk Management (IP)**
  - provision & integration of satellite with in-situ data to support the decision-making chain and processes
  - hazards to be covered: industrial hazards, floods, storms, forest fires, earthquakes, landslides, volcanic eruptions, drought – starting from the more mature ones and preparing the ground for the others.
- **Data harmonisation (SSA)** - actions defined within the INSPIRE (Infrastructure for Spatial Information in Europe) initiative
  - objective: improve the level of interoperability among geospatial information systems: common standards and specifications for data documentation, collection and exchange taking into account existing standards.
  - expected outcome: Geospatial Data Implementation Specification including guidance documentation, examples and open source software tools

Content of the third call is presently under discussion within DG Research. A summary of the funding levels for GMES within FP6 and the level remaining for the third call is shown in the table below.

Area	Call 1	Call 2	Call 3	Total
<b>GMES (M€)</b>	45 (34)	40	26?	<b>100</b>
<b>Satcom (M€)</b>	15 (5)	20	10?	<b>35</b>

### 4.3 Links between GSE contracts and Integrated Projects

#### 4.3.1 Background

Two FP6 Integrated Projects have now started and more will commence in the near future. Links between these activities and the activities executed under the GSE contracts have been highlighted by the consortia involved and these can be ensured through existing level of joint participation by a number of organisations within both GSE consortia and associated Integrated Projects. However, the detailed nature of the interaction has not yet been specified and key elements remain unclear, eg:

- What models and results will each Integrated Project deliver, by when and under what conditions can these be accessed by related GSE consortia?
- How should the focus vary between GSE contracts and Integrated Projects?
- Where infrastructure is being implemented under an Integrated Project, how can additional partners exploit this?

#### 4.3.2 Identified coordination mechanisms

Participants within each of the on-going GSE contracts and EC Integrated Projects, together with representatives from DG Research defined the following approach for the detailed interface between activities funded under FP6 and the GSE contracts:

For integrated projects and GSE contracts the figure below shows the areas where project level exchange is to be set up and the associated communications flow:

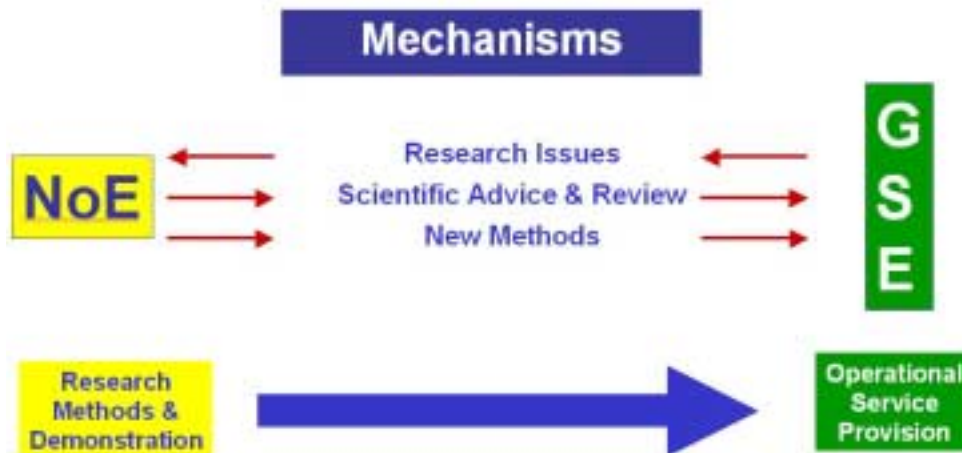


The common approach to users must include:

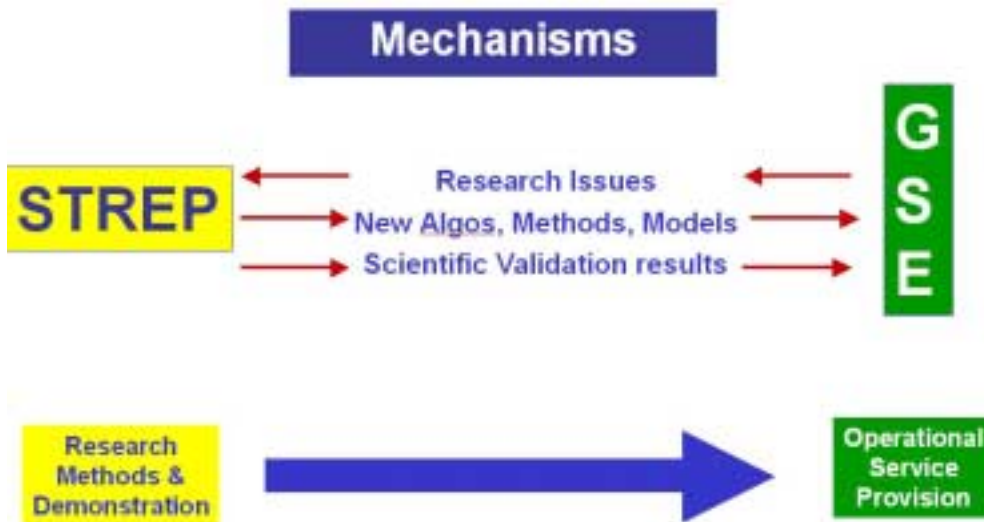
- Common Terminology
- Common roadmap for service development (Research, experiment, development, demonstration, pre-operation, validation, field test, qualification, quality assurance, certification, accreditation, reliability, operational, sustainability,,,,)
- Common Service Portfolio (Now)
- Common Service Prospectus (Future)

Similar project level exchange schemes were identified for Networks of Excellence, STREPs and RTD actions. The communications flow is illustrated in the figures below.

Network of Excellence and GSE activity



STREP and GSE activity



RTD action and GSE activity





#### 4.4 EEA partner priorities for GSE

##### General requirements

The EEA expressed the following priorities for information to be acquired:

1. Habitat diversity monitoring (LULCC, forest, fragmentation, corridors in context of halting loss of biodiversity)
2. Water management (ecological status, resource and stress, hazards in context of climate change)
3. Coastal and marine integrated management (Sustainability coastal development, ecosystems, health related issues)
4. Urban development (Quality of life, soil sealing, hotspots)
5. Basic geospatial reference data

As EEA already have comprehensive visibility of the services presently under development within GSE they have been able to complete an assessment of the relevance to their requirements of the different service portfolios from each consortium as presently structured. This is shown in the table below.

Thematic Priority	Coastwatch	SAGE	Urban	Risk EOS	Roses	Forest mapping	Northern View	IceMon	TerraFirma	Food Security
Habitat Diversity Monitoring										
Water Management										
Coastal and Marine Management										
Urban Development										

##### EEA immediate requirements for 2004

During 2004, significant internal effort will be devoted within the EEA to two main analysis activities:

- a mid-term evaluation of Europe's 6<sup>th</sup> Environmental Action Plan
- Compilation of the 2005 report on State and Outlook of Europe's Environment (SOER2005)

EEA suggest that GSE services are used within the information gathering exercise of SOER2005 for the following purposes:

1. to validate phase 1 GMES products and services
2. to contribute to assessing state-of-play in situ monitoring
3. to promote results of GSE to decision makers and public

More specifically, the SOER2005 framework would generate the following requirements for GSE product and service examples:

- Classes of information – Case studies, indicators
- Presentation methodologies – Maps, graphs, diagrams
- Coverage – 31 EEA member countries + Balkan + CH + NIS + Mediterranean

Products and services provided shall be validated by EEA Editorial Committee together with the Advisory Groups responsible for the SOER2005 subreports. The criteria shall include:

1. Timely information (past-present-future)
2. Scientifically sound (reliability)
3. Policy relevant
4. Broad coverage (availability/comparability)



5. Easy to communicate (large public)

The SOER2005 sub-reports are :

- Sustainable Household consumption – trends, outlooks and policy effectiveness
- Environmental aspects of enlargement
- Halting the loss of biodiversity
- Sustainable use and management of natural resources
- Policy integration
- Climate change, Air Quality and sustainable energy
- European Environment Outlook
- Europe’s Environment and the Global Dimension
- Environment and health

These have already been cross-referenced by EEA against current GSE services and assessed for their potential contribution. This is shown in the table below. The number of Xs show the evaluation by the EEA of the service portfolio expected impact (3 Xs are high impact, 1 X is low impact, no X means no expected impact)

<i>Subreports/Sections SOER2005</i>	Coastwatch	SAGE	Urban	Risk EOS	Roses	Forest mapping	Northern View	Icemon	Terrafirma	Food Security
Sustainable Household consumption – trends, outlooks and policy effectiveness	X		XXX							
Environmental aspects of enlargement	XX	X	X			X				
Halting the loss of biodiversity	XXX	X	XX	X	XX	XX	X			
Sustainable use and management of natural resources	X	XXX		XX	X	XXX	X			
Policy integration	X	XX	XXX			X				
Climate change, Air Quality and sustainable energy	XX	X	XX	X		XXX	XX	XX		
European Environment Outlook	X	X	XX							
Europe’s Environment and the Global Dimension							X			X
Environment and health	X	X	XX	X	X				X	

**Additional information requirements**

Finally, EEA have identified gaps in areas of service provision where additional information is necessary and could potentially be provided through incorporation of EO based information services.

It is worth mentioning that the present service portfolio within the GSE is estimated by the EEA to be capable of addressing approximately 30% of their information requirements. This should be compared with a similar analysis conducted prior to commencement of GSE where EEA estimated only 3% of their information requirements could be met. By addressing the areas where gaps in service content exist, it is estimated that approximately 60% of the EEA requirements could be met by information services incorporating EO data.

Priorities are shown in the table below:





## **4.5 The proposed approach for progressive implementation**

The overriding issue for prioritizing services in GSE stage 2 is the degree to which any of the present service-portfolios can be scaled-up to European level to become sustainable. This should be achieved by delivering significant benefits for Europe at large while, at the same time, limiting costs via economies of scale and standardization. The major technical limitation is still the timely availability of data of adequate quality (EO & in-situ), and the major non-technical issue is the maturity of the user communities concerned.

Thus in GSE stage 2, services that have already been consolidated should be allowed to evolve progressively in a manner appropriate for each user community: i.e.: some faster some slower. Stable, incremental growth in service delivery, quality and benefits should be encouraged, driven by natural evolution in user demand and engagement, so minimising the associated risks and costs.

### **4.5.1 Classification of Services**

The significant user engagement and expectations created by GMES to date, the already consolidated GSE service-portfolios, and the GMES actions initiated under the EC FP5 and FP6 programmes, have established the conditions necessary for progressive scaling-up the services in stage 2 of GSE to begin.

The candidate services for implementation in stage 2 fall naturally into two different classes, each of which has comparable potential for scaling up, geographic expansion and prospects of sustainability. These are:

- Class 1 – European Scale Services
- Class 2 – Regional Scale Services

### **4.5.2 Class 1 - European Scale Services**

These services have:

- Strong potential to deliver significant benefits and prospects for continuous large-scale growth by expansion to a wide range of user communities within Europe and Canada
- Mature & well organised user communities with the capacity to operationally exploit consolidated services from several different GSE portfolios
- High policy-relevance at national and European level, for which the EO-component of the information has significant impact
- Well-established technical feasibility and adequate European in-situ, space-based observing capabilities available today

The following enlarged service-portfolios, combining elements from several of the current GSE stage service portfolios, have been identified for implementation in stage 2:

- 1 Marine and Coastal Environment Services**
- 2 Land Information Services**
- 3 Polar Environment Services**

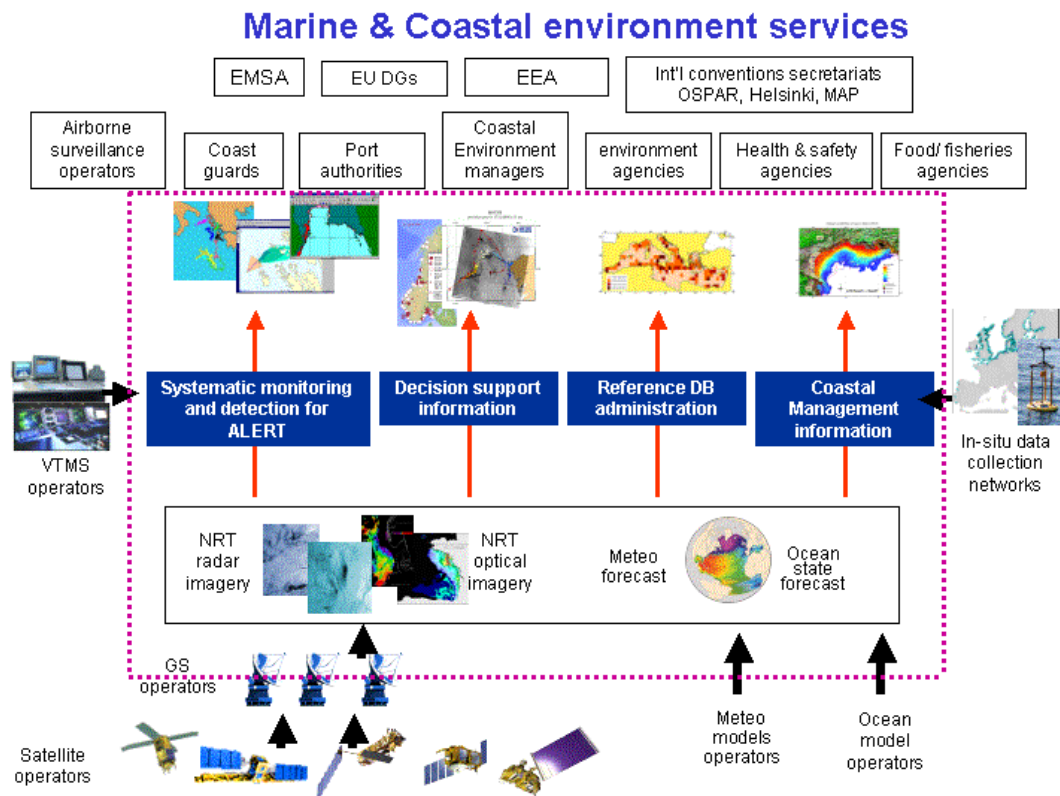
#### **4.5.2.1 Marine and Coastal Environment Services**

These should provide the following elements at European scale:

- Oil spill information services
- Water quality monitoring and harmful algal bloom monitoring

- Coastal habitat monitoring
- Coastal Vulnerability and risk assessment
- Coastal Indicators
- Basic ocean information services

The schematic overview of the proposed approach to this portfolio is illustrated below



The service portfolio addresses European, national and local users through information customised to a level appropriate to where environmental management decisions are being made. This will integrate a range of EO derived information with in-situ measurements through local, regional and global models to deliver comprehensive surveillance, evolution forecasting and impact assessment for oil slicks and algal bloom occurrences. It is foreseen that these local and regional models will be driven by global models developed within the Mersea integrated project.

In addition, statistics and analysis services such as coastal habitat monitoring, vulnerability and risk assessment and coastal indicators are generated on a systematic basis for which effective links to local and regional organisations will be enhanced to ensure appropriate access to in-situ data and effective delivery of coastal management information.

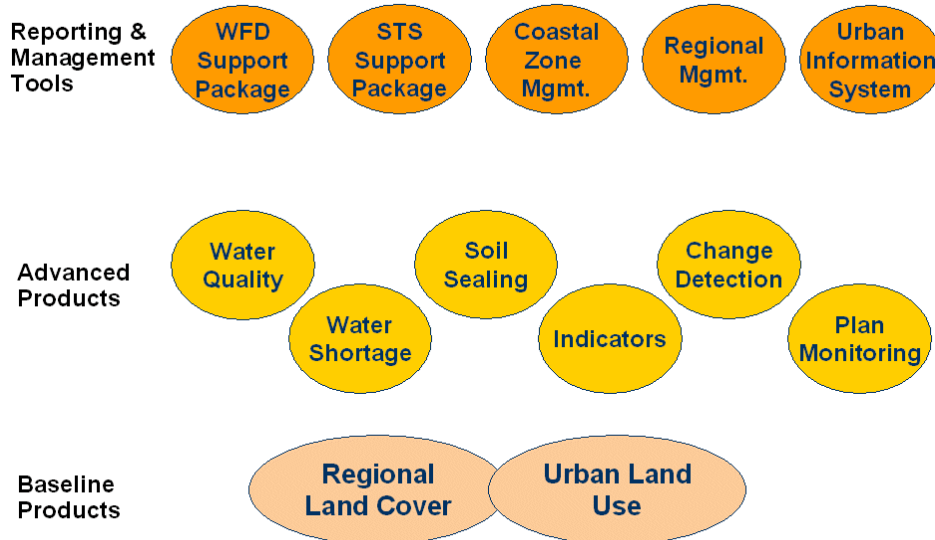
#### 4.5.2.2 Land Information Services.

These should provide the following European-scale service components:

- Regional land use
- Urban land cover
- Water quality/water shortage
- Soil sealing
- Urban management plan monitoring

- Land use and soil status indicators

The linkages between these elements and demand sectors is shown in the figure below:



The service portfolio addresses reporting requirements of national and regional government authorities to European agencies. The baseline products represent a unique capability for cost effective and homogeneous data gathering at the sub-national level which in many cases is not viable using alternative means. Coordination with research activities on-going within the Geoland Integrated Project will be important for this service network. Also integrated coastal zone management processes will require coordinated access to service components from both this GSE service portfolio and that of the marine and coastal environment GSE activity.

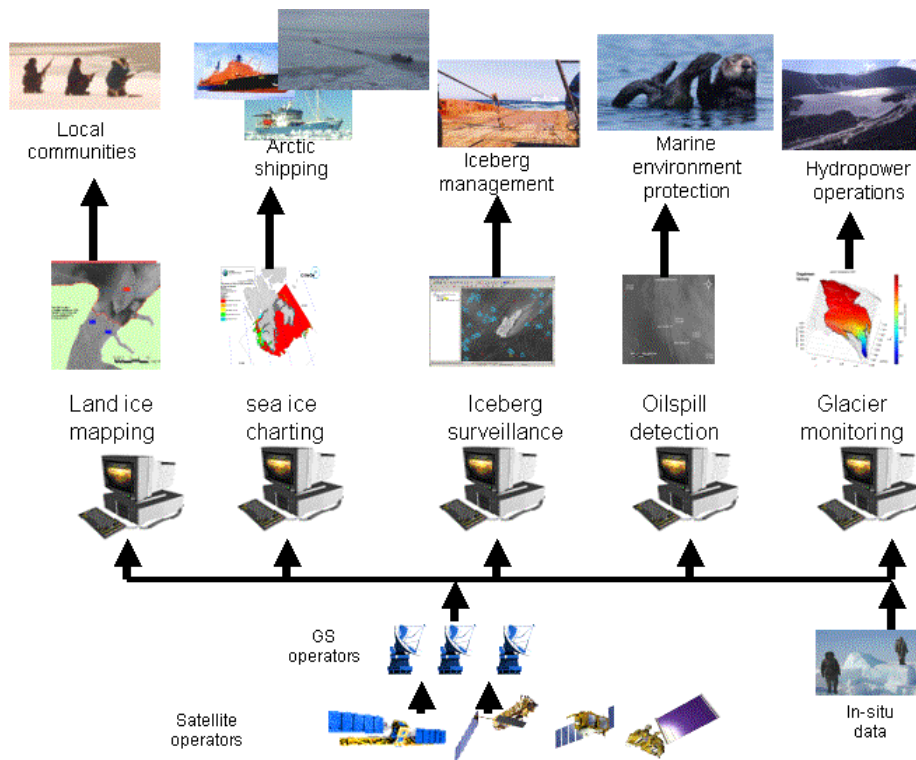
#### 4.5.2.3 *Polar Environment Services.*

These should provide the following information components for the complete polar region:

- High resolution ice charts
- Ice edge location for local communities
- Iceberg surveillance
- Water resources and glacier assessment
- Oil spill surveillance

Cooperation and information exchange between Arctic countries is already on-going within national coordination fora such as the Arctic Council and through cooperation mechanisms such as the International Ice Chart Working Group. These federated user groups have identified clear requirements to which the service portfolio responds on the basis of well understood gaps in present information gathering capacity. In addition to national government agencies, this service portfolio is also highly advanced in relation to the degree of citizen engagement, with local communities already developing significant expertise in integrating EO based ice information into their traditional practices.

A schematic diagram of the proposed service operation is shown below.



### 4.5.3 Class 2- Regional Scale Services

The second class of service portfolios also address issues that are high on the political agenda and have an established user community. The sustainable growth of these services depends critically on meeting the needs of the core-users involved today, and partnering with key downstream service partner. For many of these services cooperation needs to be developed with prospective new stakeholders and users, both inside and outside of Europe, and with key international institutions, all of whom will need to be brought gradually in and then engaged.

The demand for these services is high. They also rank as priorities in terms of the GMES Initial Period Report. Some of the target user communities are particularly demanding in terms of the reliability of information provided, and will need adequate time to realise the benefits of the services currently on offer. Time must also be allowed for some of the more innovative services to achieve full validation, demonstrate fitness for purpose, and gain full acceptance by users.

The medium-term evolution of these portfolios is likely to involve integration, coordination and standardisation of capabilities that are being developed in other programmes (eg DUE, FP5, FP6, National programmes), The geographic growth of service coverage in stage 2 should expand to full regional and national coverage for a number European countries, and to regional-scale coverage in developing countries of importance for EU policy.

These services have also reached the point where progressive implementation should be started in stage 2, but are likely to follow a more complex evolution of demand and supply than services in the first category.

Service portfolios in this second class are:



- 1 **Forest Monitoring**
- 2 **Fire and Flood Risk Management**
- 3 **Geophysical Hazard Monitoring**
- 4 **Global Monitoring for Food Security**

A brief summary of each Regional Scale service portfolio is presented here:

#### ***4.5.3.1 Forest monitoring***

This will address reporting requirements for GHG emissions and Clean Development assessment, monitoring requirements for sustainable forest management as well as forest management elements of environmental monitoring. A key benefit of the EO based information is the capacity to provide baseline 1990 data to support Kyoto reporting requirements in countries where no alternative data gathering was implemented. The proposed growth path is via incremental increases in European nations for which complete national coverage is possible. This minimises service fragmentation and ensures user readiness to adopt the service portfolio. Further growth can be foreseen with users in Africa, Central and Eastern Europe and Russia. This will require working within appropriate international cooperation mechanisms and the pursuit third party funding. In parallel, activities presently executed under preparatory programmes such as DUE will be integrated through the open service partnership agreement already defined.

#### ***4.5.3.2 Fire and Flood Risk management***

This will focus on flood response and forest fire management covering all phases of crises management from anticipation to post-crises assessment. This includes rapid mapping for flood awareness, burned scar mapping for forest fire impact assessment, flood and forest fire risk assessment products. The approach for service expansion is to expand a network of local and regional service providers that can effectively work within the civil protection framework within each country. During the next stage it is also proposed to expand the service portfolio to include near real time monitoring of fires. Evolution of this portfolio shall be closely coordinated with R&D activities and early service demonstration within the FP6 Integrated Project on Risk Management.

#### ***4.5.3.3 Geophysical hazard monitoring***

This aims to cover every European urban area with populations greater than 100000 by 2010. The focus is working with national geological surveys to reach the widely distributed local users who have the obligation to understand the exposure to subsidence risk. This will ensure that nationally available in-situ measurements and ground motion models are combined with EO derived data into a comprehensive, dynamically consistent understanding of the ground motion regime for each area. The key advantages are an existing large archive over Europe which enables a unique and significant impact of the EO based information in responding to user requirements for information – using current technologies there is no viable alternative method to obtain equivalent spatial coverage of subsidence measurements at comparable cost. In this respect, one route to sustainability will be explored by building on interest within the civil engineering industry who have expressed initial willingness to begin investigating use of these techniques on a commercial basis.

For the next stage of GSE it is proposed to increase both the number of national geological surveys engaged within the open service partnership and to expand the number of urban sites for which monitoring services are available. As all required data are already archived, this enables a scalable approach to the rate of service growth. In addition, it is proposed to expand the service portfolio to address land slide monitoring.



#### ***4.5.3.4 Global monitoring for food security***

This aims to improve the management of food aid distribution and to contribute to building long term food security in developing countries, with particular focus on regions of need in Africa. This will be achieved through delivery of accurate information on crop conditions from a range of EO sources at a range of scales combined with detailed in-situ statistics from existing sample sites within the areas of interest. Key benefits include accurate estimation of food-aid requirements by both recipients and donors (hence minimising adverse impacts on local markets or avoidable deaths due to starvation) and the potential for improved control of land-use practices that can lead to degradation in agricultural land quality. A critical issue is to allow adequate time to build cooperation with the international institutions involved on the donor side including FAO, WFP, DG-DEV, the World Bank and DG-JRC and equally importantly with the African organisations responsible for defining and issuing requests for food aid.

During the next stage, it is proposed to expand the number of African users to which services are delivered and deepen the involvement of the international donor organisations. A key element in this expansion will be coordination with the Geoland Food Security Observatory which covers Russian and Asian areas of production with a focus on R&D and demonstration of new service capabilities.



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## **ANNEX A1 RECORD OF THE ROUND TABLE DISCUSSION**

### **A1.1 Participants**

The participants to the round-table session of the GSE information day were:

- Mr T Stone, UK Maritime Coast Guard Agency and President of the Bonn Agreement
- Mr H de Groof, European Commission DG Environment
- Mr R Uhel, European Environment Agency
- Mr U Bjurman, Swedish Rescue Services Agency
- Mr J-P Malingreau, European Commissions DG JRC

The session was chaired by Mr J Achache, ESA Director of EO Programmes.

### **A1.2 Questions and discussion summary**

#### **Question 1**

*Are we using the correct mechanisms to connect beyond GMES Services Element? What else can we practically do to increase connectivity:*

- *Inspire?*
- *EEA and existing monitoring networks?*
- *Eumetsat (SAFs)*
- *Additional user owned networks?*

*Do you judge that the growth proposed for the next phase is over-ambitious, under-ambitious or correctly scaled?*

#### **Summary of Discussion**

Successful roll-out depends critically on the capacity to effectively connect the four main components of GMES, ie space and ground segment, service segment, in-situ and data integration and information management.

One of the key elements constraining this connectivity is the diverse data policies. Inspire addresses the issue of information management and puts in place an integration enabling data policy as a legal mechanism. There exists room for further initiatives from the EC to put mechanisms in place to strengthen the other three elements

EEA as a network of data gathering centres within member states is in a unique position to foster improved connectivity between the space/ground segments, the service segments and the in-situ segments. EEA is already engaged to a significant extent within specific GSE contracts. However a deeper involvement over a wider range of GSE activities will support more effective connection between the different elements.

#### **Question 2**

*Are we at a point where users can take over effective management of the service portfolios for the next phase of GSE?*

*How can this be done?*

- *How can users increase their level of leadership and ownership?*
- *What should be the role and responsibility of users within the next phase?*

#### **Summary of Discussion**

A first step to sustainability is clearly that the users take ownership of the service roll-out.



Inter-reg is a good example of users taking ownership – implementing rules include the requirement that the lead organisation is a government department or agency. However this example may not be completely applicable across all services in this context and a hybrid alternative mechanism half way between the present GSE structure during consolidation phase and users taking management responsibility for service development and roll-out is probably required.

Other large groups need to be more fully engaged. For example in marine and coastal environment monitoring, secretariats of Bonn, Helcom and Osparcom need to be brought in during the early stages as do REMPEC and DG Environment Civil Protection Unit for oil spill emergency response issues.

Clearly users will have to be responsible in years to come but at the general level they are not ready to take over this position at present. More understanding is still needed. This is not to say users do not know what they want – A sustainable service must be effective and economic. The two main sets of stakeholders involved in the dialogue to ensure that this is delivered are already active within GSE, ie the service providers and the users. Evidence from work to date and statements made by users during the colocation event strongly indicate that users can progressively take management responsibility for defining and managing service procurement through this dialogue during the next stage of GSE.

It is important to be aware that we are not starting from scratch – users already have Decision Support Systems in place but need to improve the quality and efficiency of these systems. The situation will vary from one member state to another and this needs to be recognised – a flexible but robust system is needed so that each user can access the appropriate information for each situation. Within this heterogeneity, users will be ready to take different levels of responsibility depending on the starting point, the service, the information requirements and the situation in which the information is being used.

Cooperation across different user sectors is needed given the commonalities in service provision (eg Land Use mapping) and the variation in responsibilities of different organisations within each Member State – as an example, the Swedish Rescue Services Agency is responsible for environmental protection with respect to accidental pollution whereas SMHI is responsible for monitoring activities such as illicit discharges into the marine environment. This rich variation must be catered for.

Both users and service providers have a clear interest in involving as many parties as possible but to do this requires specific, targeted and extended measures. GSE needs to be presented more proactively and the language needs to be more widely accessible. This is not the case at present. A wider understanding of GSE is needed and this means use simple vocabulary.

However, it is important to recognise that users may want access to a service without taking full ownership and this must also be catered for. Consider the analogy of travelling by train where users purchase tickets for their journeys without taking full ownership of the railway infrastructure. Like train passengers however, users are increasingly recognising that the service provision capacity needed to respond to their information requirements does not happen by itself and all the capability and support infrastructure has an associated cost. This represents important progress toward sustainability.

Another important consideration is the global aspect of GMES. One of the objectives is to increase the international standing of Europe in the fields of Environment and Security while



public organisations within Europe are becoming increasingly aware of the need to address global considerations within their everyday operations and activities. These are strategic or evolving needs that will become more and more important and contribute to greater engagement of users within the service expansion and enhancement process.

A vital part of user leadership is a clear expression of what they actually need. Once this is understood, sustainability can be fostered through construction of a solution that clearly meets these requirements and is endorsed by key users – the appropriate part of the European Commission would then be in a strong position to guarantee funding to ensure service provision.

### **Question 3**

*Is there a solid basis for going ahead to the next phase based on:*

- *Evidence from work executed so far*
- *Engagement of user communities that will form the target demand sectors*

### **Summary of Discussion**

The future is bright if the vision presented today is sustained. Each user presenting has a clear vision and we share that vision. There is no choice but to continue on this path as any drop in growth would be damaging given the commitments already made and the degree of reliance that users are now exposing themselves to.

Sustainability is a critical concern here as work cannot just be from year to year. Until now, projects have been short term with definite end dates and this limits the degree of reliance and commitment users can contribute.

Future growth takes time – there is too much eagerness for a business type approach to service roll-out. Organic growth is important. Development and cooperation between the EC, ESA and Member States is important here and is very positive for all policies. This needs to continue to be taken into account so we should continue to proceed along this sensible path as outlined within the user presentations.

We have the starting conditions but must be pragmatic. There are key lessons and lines of development for major activities to be pursued in the next stage of GSE:

- Considering supply side synergies and the integrated land, marine & coastal and polar services, this approach is absolutely necessary and builds effectively on experience to date
- There is a clear need to provide infrastructure to facilitate access to and processing of information – this is a promising concept
- Clearly we have the technical means available but have we created the conditions for service implementation just for the sake of it or are we going to implement anything. We have to implement this ambitious concept and it is not a issue of money.

### **Question 4**

*Is the forward vision for the next stage of GMES Services Element credible and do you see real benefits being realized?*



### **Summary of Discussion**

The vision is highly credible but this cannot exist only among ourselves. We must link to other efforts in GMES at EC level at Member State level and at regional level. This linkage is critical – it is acceptable to have overlap between activities during the R&D stage but not within the implementation phase otherwise the added value of GMES is zero.

Given that users are themselves investing in this vision, the credibility is without question.

This credibility exists only if lessons from past projects are adequately taken into account and we learn objective lessons. There exist significant obstacles before benefits on the scale envisaged within GMES can be realised:

- We need appropriate space systems that really meet user needs – focus on concrete solutions
- Investment is needed to transfer up present local/regional scale services within the present framework
- Do not oversell – maintaining credibility is vital

Users can clearly see benefits being realised in future but it is important to realise that each organisation will not want everything on offer –only what is effective and efficient in managing our own business. With respect to marine environment, coast guards and the Bonn Agreement signatories want pollution detection, ship identification and traffic monitoring as a fully integrated system combining EO, AIS, VTMS etc. Based on the evidence to date, this is totally achievable. Maritime security is another area to be investigated to realise additional benefits.

We have created the conditions to become credible if we go ahead and implement these ideas. However consideration is necessary of shortcomings within existing projects as these are not negligible and there are many issues to resolve. Within the currently on-going consolidation activities, many of the strategic plans are not sufficiently convincing, there is redundancy between different service portfolios and it is unclear whether we have sufficient representation of the total user community. Also GSE is just one aspect - a common approach to users between GSE and FP6 and evidence to date indicates good cooperation with the scientific community active within the Integrated Projects. This last element is critical for the EEA given its role in bridging the gap between science and operational communities for policy advice.



## **ANNEX A2 GMES SERVICES ELEMENT CONSORTIA**

At present there are twelve actions underway within the ESA GMES Services Programme Element. Ten of these have been running for approximately 14 months:

- Forest Monitoring (information for forest management and Kyoto protocol reporting)
- SAGE (information for soil and inland water management)
- Risk-EOS (information for flood and forest fire risk management)
- TerraFirma (information for urban subsidence and risk assessment)
- Urban Services (information for urban environmental management)
- GMFS (information for food security management in Africa)
- CoastWatch (information for integrated coastal zone management and water quality)
- ROSES (information for oil spill monitoring and coastal water quality assessment)
- Icemon (information for sea ice mapping)
- Northern View (information for Arctic environmental management)

Two new consolidation activities were kicked off in early 2004. These are:

- Respond (humanitarian aid)
- Promote (atmospheric environment monitoring)