MS.MONINA - an integrated multi-scale EO-based monitoring service as European contribution to sustaining global biodiversity

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Global Monitoring for Environment and Security

Supporting monitoring tasks in Europe and globally

Integrated workflows for providing geo-intelligence

- Scientific visualisation for effective information delivery
- Indicators, change analysis and structural assessments for information conditioning
- Data integration and advanced image analysis for information provision

GMES

Environmental integrity

Human security

INSPIRE
SEIS, SISE
NATURA 2000 monitoring – data dependency

(10 years ago)

In future: Sentinel family should support a continuing and standardized solutions
GMES: paradigm shift from demand-based data access to data warehouse strategy
Overall aim

- foster the use of GMES infrastructure and **EO-based analysis and modelling systems** for supporting NATURA 2000 monitoring requirements in **pre-operational** mode, tailored to user requirements in terms of level-of-detail, steadiness and reliability
- towards **an integrated, multi-scale EO-based monitoring service** as European contribution to **sustaining global biodiversity**
- <FP7-SPACE SPA.2010.1.1.04 (Stimulating the development of GMES services in specific areas)>

The MS.MONINA service portfolio

- follows a three scale approach, building upon specific SP/user networks on European, regional (sub-national), and local level (see figure next slide)
- delivers geospatial products, as value-added to the LMCS, especially the Euroland CMS, or directly derived from GMES EO space and in-situ data,
- in line with the European premise of data harmonization in terms of using common infrastructure (SDI) and standards (INSPIRE), and by this supports the effort of setting up a Shared Environmental Information Space (SEIS).
MS.MONINA – main innovations

- Offers a multi-purpose service (‘multi-scale’) with users on EC, state and site level
- Foresees user validation on each level, and integral user assessments
- Is based on GMES principles utilizing latest EO data generation and integration of in-situ data
- Utilizes advanced methods for image processing and information extraction (OBIA etc.)
- Combines image analysis (ex-post) with modelling (ex-ante) techniques for analysing and detecting sites
- Provides value-added products advancing Euroland HR products
- Establishes a knowledge basis on methods and tools for integrated EO-based site monitoring
- Sets up a MS.MONINA SDI for hosting and sharing products and services.
**Overall Service concept**

**EU level**
EC reporting on CBD related environmental policies by added value products on biodiversity status within biogeographical region

Validation of aggregated state information

**Biodiversity indicators / CBD**
User group:
EEA, TC Biodiv, DG Env

**state / province level**
(Federal) state complete reporting on sensitive sites and habitats supported by GMES space capacity (HR, Sentinels, RapidEye, SPOT), the Euroland CMS and modelling

Validation of aggregated site information

**FFH Reporting**
User group:
National or federal authorities and/or agencies responsible for FFH reporting

... demonstrators

**(sensitive) site / habitat level**
Local site monitoring supported by GMES space capacity (VHR, Pleiades, Kompasat, Quickbird etc.)

**FFH site monitoring**
User group:
Site managers

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MS.MONINA service pilots

- Detailed specification of pilot sites
  - General conditions
  - Potential threats and human impacts
  - User needs
  - Data requirements (satellite and in-situ)
  - State pilots and site pilots
An integrated service ...

- **Two integration strategies**
  - MS.MONINA state integrator
  - Member states with main responsibilities
  - Hierarchical service chain

- **Hierarchical service chain**
  - Among the many possible hierarchical relations between the EU (on top) and **individual protected sites** (on the bottom), there are **member states** (MS) in between, located in different biogeographical regions (overlapping)
  - Vertical view within a specific biogeographical region, in other ways to pierce through this network at a specific location, to reflect on the **hierarchical** (i.e. up-, downscaling) **relationships** among each of the levels. Selected vertical components (e.g. EU ↔ MS E ↔ sites b, c) are building a **service chain**. **Service chains** are formed by ‘trans-level’ applications within BR, and including the EU level.
High level WP structure

<table>
<thead>
<tr>
<th>WP 1 – Project Management</th>
<th>Z_GIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP 2 – Emerging SP/user networks and user validation</td>
<td>UAB</td>
</tr>
<tr>
<td>WP 3 – MS.MONINA.EU</td>
<td>CEMAGREF</td>
</tr>
<tr>
<td>WP 4 – MS.MONINA.State</td>
<td>EFTAS</td>
</tr>
<tr>
<td>WP 5 – MS.MONINA.Site</td>
<td>INBO</td>
</tr>
<tr>
<td>WP 6 – Common toolkit and data access</td>
<td>NOA</td>
</tr>
<tr>
<td>WP 7 – MS MONINA SDI and interoperability</td>
<td>VITO</td>
</tr>
<tr>
<td>WP 8 – Dissemination, exploitation and others</td>
<td>Z_GIS</td>
</tr>
</tbody>
</table>
Service evolution

WP 1 – Project management

WP 2 – Emerging SP/user networks and user validation

WP 3 – MS.MONINA EU

WP 4 – MS.MONINA State

WP 5 – MS.MONINA Site

WP 6 – Common toolbox and EO data access

WP 7 – MONINA.SDI

WP 8 – Dissemination and branding
## Related activities

**EBONE (FP 7 – ENV)**
- Biodiversity data collection
- Harmonization of approaches
- Sound scientific basis and institutional ground

**MS.MONINA (FP 7 – SPACE)**
Service(s) will build on these harmonization efforts and move towards market maturity for biodiversity related information products

**NatureSDIplus (eContentPlus)**
- Harmonization of databases and metadata profiles
- Towards standards
- To support INSPIRE and SEIS and also SISE
- Best practice network for geodata handling in nature conservation
## MS.MONINA State (example)

- Federal state of Brandenburg (DE) \([\text{LUP}^\circ]\)
  - Monitoring of urbanization;
  - land abandonment;
  - vegetation cover monitoring, biodiversity, connectivity of protected habitats, wood cover, wetland and peatland development etc.

<table>
<thead>
<tr>
<th>Data requirements</th>
<th>Source</th>
<th>Relevant costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog aerial photo (1992)</td>
<td>A</td>
<td>in kind</td>
</tr>
<tr>
<td>Digital aerial photo (2009)</td>
<td>A</td>
<td>in kind</td>
</tr>
<tr>
<td>IRS-LISS (1999 and 2005)</td>
<td>A</td>
<td>in kind</td>
</tr>
<tr>
<td>HR1(IRS 2010, RapidEye or similar)</td>
<td>B</td>
<td>0 (ESA/EC)</td>
</tr>
<tr>
<td>[Sentinel II type]</td>
<td></td>
<td></td>
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</tbody>
</table>

### Relationship

- \(\circ\) = SP-U relationship (link through service provider partner)
- \(*\) = U-U relationship (link through user partner)

### Source

- A = available at user’s organisation
- B = accessible through ESA GSCDA (DAP V 1.0 Sept/2009) and subsequently GMES Data Warehouse
- C = accessible to EEA or other in-situ data host
- D = purchasable via commercial providers
EC level (sub)Service

- **Addresses**
  - agencies on EU level, i.e. ETC-BD, ETC-LUSI, the EEA and DG Environment,
  - as well as on biogeographic level e.g. the MedWet (the Regional Mediterranean Initiative of the Ramsar Convention)
  - in their reporting requirements in CBD related environmental policies by providing added value information products on biodiversity status within biogeographical regions.

- **Design**
  - (1) an EU level synthesis of what are the user requirements for biodiversity inventory and monitoring and the current practices in using EO-based products and services to address these needs, and
  - (2) technical synthesis at European level on the possibilities and limits of RS methods for each broad habitat category (forests, grasslands, wetlands), and recommendations for their more efficient use at EC, biogeographical and MS levels.
Site level (sub)Service

- **Addresses**
  - local site management to monitor the effectiveness of their management and support future management decisions.
  - local and regional authorities need site-related information to report on the site’s status (e.g. EU Standard Data Forms) and to evaluate the potential impact of plans/projects on the site (‘appropriate assessment’)

- **Design**
  - offers the mapping and monitoring sensitive and/or protected sites (e.g. SCIs/SACs and their surroundings) and individual habitat patches at high resolution
  - will help updating on (1) existing habitat geometries reflecting on relevant changes using data integration techniques and spatially explicit change assessments, and (2) on reported statuses of NATURA 2000 and other sensitive sites by using advanced and automated classification algorithms
  - to derive, based on appropriate indicators, hints on deterioration or improvement of conservation status
State level (sub)Service

- **Addresses**
  - national and federal agencies in reporting on sensitive sites and habitats within biogeographical regions on the entire territory and on the network of SCIs/SACs, as outlined in Art. 17(1) of the Habitats Directive.

- **Design**
  - composed of three sub-services, the image analyzer, the modeller and the integrator.
  - Modeller comprises a modelling system for the potential presence of non-reported habitats.
  - Image analyzer sets up a reference data base and utilizes image analysis tools for users on MS level, which allows for links between the monitoring and the modelling system.
  - Integrator synthesises update information delivered at site (i.e. patch/habitat) level and at European level into a MS (member states) monitoring system.
Level-specific user requirements

- Users on different levels
  - EC (DG ENV), EEA
  - National and federal agencies
  - Site managers

- Service delivery and validation
  - Service level agreements
  - User validation
  - Validation exercises

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<tr>
<th>Level</th>
<th>Report</th>
<th>User</th>
</tr>
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<tr>
<td>EU-biogeographical region</td>
<td>Art. 17 (2): EU Composite Report (6-yearly)</td>
<td>EEA, ETC/BD,…</td>
</tr>
<tr>
<td>MS-biogeographical region, entire territory</td>
<td>Art. 17 (1): National Report (6-yearly)</td>
<td>national &amp; regional agencies</td>
</tr>
<tr>
<td>MS-biogeographical region, network of SCI’s/SAC’s</td>
<td>Art. 17 (1): National Report (6-yearly)</td>
<td>national &amp; regional agencies</td>
</tr>
<tr>
<td>Individual SCI/SAC</td>
<td>Standard Data Forms (6-yearly update)</td>
<td>national &amp; regional agencies</td>
</tr>
<tr>
<td>Individual habitat patches within SCI/SAC</td>
<td>no specific reporting</td>
<td>site managers, national &amp; regional agencies</td>
</tr>
</tbody>
</table>
Validation Concept

Figure 1.1c Service/product delivery process – user domain (red), service provider domain (blue)
MS.MONINA is offered by ...

- **Three complementary GMES actor groups**
  - User organisations (with technical contribution)
  - Academia & Research
  - Industry / SME

- **Geobalance**
  - Atlantic ...
  - Mediterranean ...
  - Continental ... biogeographical region
Thank you for your attention!

>> Let’s look beyond 2010...

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