GMES Land User Newsletter

Issue 10
December 2009

Dear Member of the Land Data User Community,

I wish all GMES project stakeholders a Happy and Peaceful New Year 2010.

We have made some advancement in various activities since our last newsletter in the summer and intend to inform you in our geoland2 Land User Newsletter about the most recent and most important results.

Several meetings have taken place in which the national approaches to land cover monitoring were demonstrated, and a more focused discussion has commenced on what and how GMES Core Services can contribute to European and national data needs.

An important driver in this discussion is the newly established EIONET Working Group on Object Oriented Data Models (WG OODM). This group will also support the TWG of Inspire for Annex 2 and 3, and will develop recommendations for the GMES activities till 2014.

Their first OODM working group meeting took place in September, and participants identified some information gaps, including insufficient communication between stakeholders and fuzzy targets. They also identified the need for a change of paradigm regarding "core activities" from mapping services to attributing data services, bringing added value to existing national and European monitoring programs. As consequence geoland2 invited the working group participants to a meeting in November, to discuss the service specifications for their high resolution layers.

In December the group met again in Madrid to start work on harmonising and developing a single data model taking into account the INSPIRE framework, existing examples at the national level (Spain, Austria), the European CORINE classification, and the global LCC System.

In addition to these meetings the EARSeL special interest group on land use and land cover met in November in Bonn, where in addition to many very interesting presentations, 150 striking posters were shown.

And so let's have a look to the future. The year 2010 will provide us again opportunities to discuss new GMES developments, products and services. For example, in March the annual geoland2 Forum will take place, the next EARSel meeting will be held in June, including a workshop on change detection, and there will be further meetings of the OODM WG.

We will inform you about the main outcomes of all these meetings and more in the forthcoming 2010 newsletters, but in the meantime let's have joyful and relaxing season's holiday

Yours
Andreas Littkopf

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Content:

Object Oriented Data Modelling Working Group 21.-22. September 2009

The first Object Oriented Data Modelling (OODM) Working Group meeting took place in Copenhagen, Denmark, on the 21st - 22nd September 2009. 13 experts representing their Member States (MS) and representatives of several European Institutions (EC, EEA, GMES Bureau and ETC LUSI) met for 2 days in order to discuss how to satisfy the EEA information requirements (not data requirements) on land use/ land cover changes (LULCC) for the reporting obligations until 2013, as well as long term visions, forming the EIONET contribution to the definition of a future European-wide GMES Land Monitoring Core Service.

The starting point of the discussion is the aim of EEA to move towards more regularly updated web-based information on the environment, thus requiring more continuous data flows. It is therefore vital at EU level to develop or derive comparable information products (backwards and across MS).

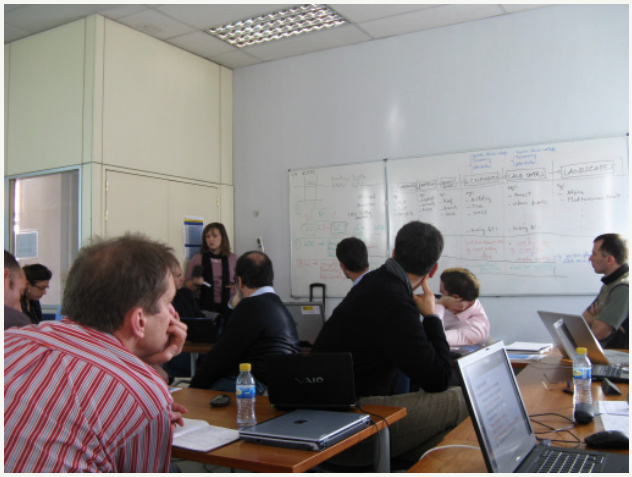
At the same time at MS level, the most important issues include:

- The regularity of requests for updated information in order to plan in advance and to set up a regular national data collection and reporting mechanisms (to implement a sustainable funding mechanism, and to synchronise national inventories with major European information requirements); and
- The aggregation of European level information from national data.

Most European countries are in favour of deriving EU land cover from MS information where such information exists at the national level, but implementation will take some time, and a dual track approach will be pursued in the transition phase focused on the development of products to improve the creation of LULCC information by:

- Developing a proposal for the transfer of CLC into an object oriented data model as a demonstrator;
- Studying the non-standard national CLC production approaches;
- Assessing the composition of 25ha CLC objects based on higher resolution data (e.g. national information, high resolution layers, …);

- Studying the gaps in CLC (linear objects, mixed classes, habitat information in CLC, implications of using a 1ha European grid (technical, semantics, …) and high resolution data layers.



At the same time, and until the object oriented approach can be implemented and is able to provide operational results in all countries, there is a need for optimised ways of providing traditional LULCC information. The option chosen, in parallel to traditional CORINE information, focuses on the development of high resolution layers to optimise the decentralised mapping of LULCC in the MS.

Finally, cooperation of the OODM Working Group with parallel on-going activities and projects was discussed:

Regarding the geoland2 project:

- Better information flow between MS and the project;
- Provide MS with the specifications developed in the project to derive the high resolution layers; and re-focus the objective of geoland2 towards the provision of guidelines and methods rather than "mapping oriented" approaches;
- MS will provide geoland2 with existing basic data layers to be updated instead of mapping each theme from scratch. This action will improve the national acceptance and usefulness of high resolution layers as MS will also receive information back based on their own inputs.

Regarding the INSPIRE process:

- The Thematic Working Groups (TWG) for the INSPIRE specifications for the land cover (annex 2) and land use (annex 3) themes are about to be established. To that end, a call for expression of interest has been launched (closing towards the end of 2009). TWG membership may be recruited from a relevant representative body, such as EIONET, or from individual experts

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Status of the Continental Land Monitoring Core Service

The EUROLAND task of the FP7 project geoland2 addresses the establishment of operational methodologies for the Continental and Local components of the Land Monitoring Core Service (LMCS). In 2007 the starting point for the geoland2 project was the definition of both the Continental and Local components in the LMCS Strategic Implementation Plan[1]. The aim at that time was to serve as first priority EEA and the EC user Directorate Generals (DG ENV, DG AGRI, DG REGIO), and also to provide valuable information to the Member States (MS) and regions.

While the local LMCS component - the Urban Atlas - is already defined by DG Regional Policy and its commercial production commenced in 2009 based on a public tender from DG Entreprise on behalf of DG Regional Policy, the political discussion on the Continental LMCS service specification has been ongoing. Here, important milestones have been the GAC paper (13-02) of January 2009, talks between the BOSS4GMES consortium and the FP6 GNU[2] project in December 2008 and January 2009, intensified discussions with MS since October 2008, recent feedback from EIONET members at meetings in Copenhagen (April 2009) and Madrid (June/July 2009) and the recent exchanges with MS experts in Bonn (November 2009).

Figure 1: Harmonised Scandinavian Land Cover dataset from aggregated national data from Norway, Sweden and Finland (1 ha minimum mapping unit; 21 thematic classes). © ETCLUSI - UAB

In all of these meetings MS experts have made it very clear that "mapping" in high resolution must be based on the subsidiarity principle, and should at least consider a shared approach between the EC and MS. The feasibility of such a "bottom-up" approach has been already demonstrated in EUROLAND by Norway, Sweden and Finland in the aggregation of national data bases towards a harmonised high resolution land cover / land use product. The approach was based on the "old" continental LMCS specifications from previous GMES projects (i.e. geoland and GSE Land) (Figure 1).

In the meantime an EIONET Technical Working Group (TWG) was set up aiming to investigate possibilities for a new object oriented database model (OODM), following INSPIRE and ISO standards, and also to examine the future of CORINE. This activity will eventually also support the INSPIRE WGs to be established in early 2010, addressing the thematic content of land cover (Annex II) and land use (Annex III), respectively. It may also shape the way forward for geoland2 to support this discussion by technical studies and possible demonstrators.

A first informal meeting between MS experts and Euroland took place in Bonn in November 2009. From the feedback gained so far the most likely way forward is for CORINE change mapping to be continued to ensure a European-wide harmonised time series on LC/LU changes. In addition, a set of currently 5 quantitative high resolution thematic land cover layers (HR layers) will be produced offering wall-to-wall coverage of Europe. These layers will at least comprise information on sealed areas, forests, and agriculture, with an emphasis on extensively managed grassland, wetlands, and water. All of this represents a fundamental paradigm change for the Continental LMCS by moving away from "traditional" land cover/use mapping (ie previously 21+ thematic classes) towards basic land cover information derived as quantitative thematic pixel-based layers of more or less complex nature.

This new concept was presented to a wider audience at the EARSeL Special Interest Group Land Cover / Use meeting in Bonn, November 25th - 27th. The feedback from the participants on the new concept was quite positive and the discussion showed general support for the approach. In the following, the current state of discussion for each of the 5 layers is presented together with a few examples from EUROLANDS´s first demonstration activities.

1. Sealing Layer

Based on the good experience of the usability of the FTS Sealing Layer, in July 2009 the EEA approached EUROLAND to produce a Sealing Layer Update by mid July 2010. The reason for this update is the rapid increase of European urban areas, which appears to be proceeding much faster than expected. These trends cannot be detected and analysed with the current CORINE time series. However, EEA needs to report by the end of 2010 on the progression of this trend, and the need for in political action. This urgent demand for a rapid sealing layer update, which was originally planned in geoland2 for 2011, requires a change in the workplan and new projects planning.

Technically feasible change detection methods have already been benchmarked, and after consolidating the service specification with EEA, the most efficient methods are now being implemented to be ready for wall-to-wall change mapping as soon as the necessary Image2009 data is available.

2. Forest Layer

The HR Forest Layer service specifications are based on a long-term consultation process between the GSE Forest Monitoring and geoland2 forest teams with EEA and a broad user base of national forest and environmental users. Thematic gaps in the service specification, identified from this collaboration are assisting in defining the service specifications. The HR Forest layer aims to provide users with a multi-purpose core forest product, enabling a variety of cost-effective value-adding and downstream applications. Synergistic accounting for existing national databases and approaches, as well as user involvement from beginning to end, are essential parts of the development concept.

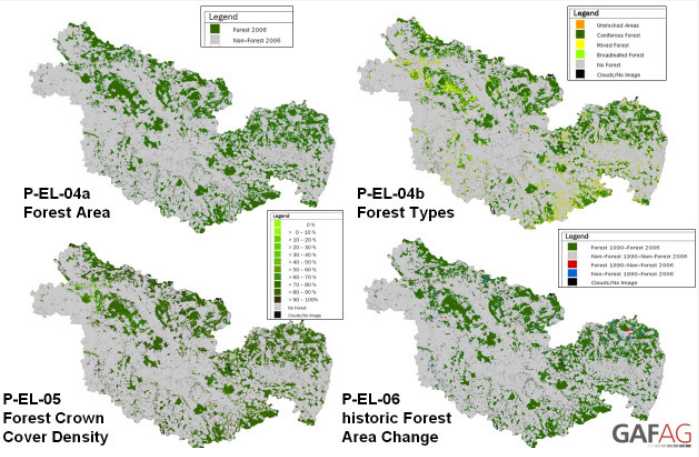

Figure 2: Example of first EUROLAND forest products in the temperate region: demonstration site EU-06 in Germany (covering major parts of Saxony, Saxony-Anhalt, Brandenburg). © GAF

The layer design as addressed and explored by geoland2 since 2007 is based on a complex integrated HR Forest Layer with geometrically consistent and synergistic pixel-based Forest Area, Forest Type, Forest Crown Cover Density (continuous %) and historic Forest Area Change information (e.g. 1990-2009) at high thematic accuracy (see Figure 2). The continuous crown cover density information will bring specific benefits by enabling MS to make customised use of pan-European Forest products for national needs and vice versa. It will for, example, permit flexible conversion of national forest information to be in line with international reporting requirements, which often differ in the definition of the applicable thresholds for forest crown closure (e.g. CLC, FAO).

3. Agriculture Layer

Although Europe annually acquires a huge amount of agriculture information from MS (i.e. from the Integrated Administration and Control System (IACS) and the national Land Parcel Information Systems (LPIS)) there are still significant gaps in knowledge on grasslands, as stated by EEA "grassland is the biggest looser". Hence, the research question for EUROLAND is: "Can we find an Earth Observation (EO) based method to meet this demand?"

By using EO data only, this demand cannot be fulfilled because today no high resolution satellite platform can ensure 3-5 European-wide coverages throughout the growing season. This demand will also not be fulfilled by a single SENTINEL-2 satellite. However, following the recommendations from MS experts and EEA in a shared approach, EUROLAND will investigate how the integration of European LPIS/IACS agriculture data can support the differentiation between natural and managed grasslands. Here, the selected demonstration sites can be used if access to national IACS data is assured. However, details need to be investigated and possible changes in the location of the test sites might be expected.

EUROLAND will analyse the technical feasibility of this approach and will demonstrate this technical feasibility in close cooperation with national users, after the completion of the sealing layer.

4. Wetland Layer

For highly dynamic wetlands the EO data situation is similar to the agriculture layer, especially in Southern Europe. Here, a similar approach by integrating existing international and national wetland data bases need to be investigated.

Possible candidate databases recommended by MS experts include:

- RAMSAR,
- NATURA2000 and Habitats Directive (Art. 17 - Monitoring),
- MEDWED Data base,
- National Data base.

As with grasslands, EUROLAND will analyse the technical feasibility of this wetland layer approach and will demonstrate its technical feasibility in close cooperation with national users after the completion of the sealing layer.

5. Water Layer

According to the EEA there is a need to identify and monitor small water bodies, including the monitoring of coastal water areas, throughout Europe, As the spectral response of water bodies in most cases permits highly automated detection such an approach can be applied to any available seasonal coverage (Figure 3). It is then up to the member states to decide if such an information is of value and how to integrate it into national databases.

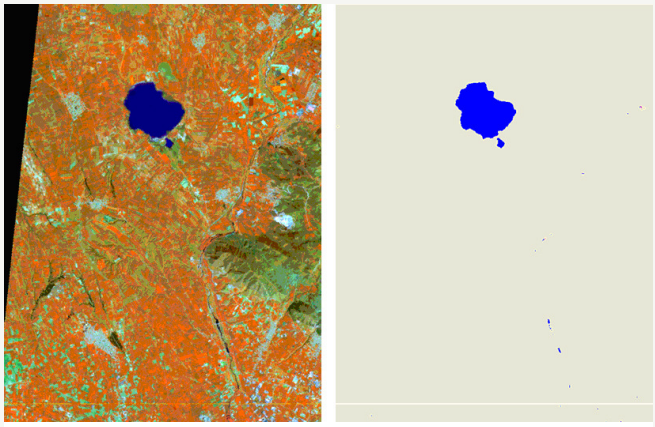

Figure 3: Example for a binary water layer (20 m pixel resolution). Such layers can be produced highly automated from any data take. © EUROLAND Consortium

6. Other Layers

There is still an on-going discussion among MS and the EEA whether or not additional layers should be made available. Of great interest, especially in the Mediterranean, are natural and semi-natural areas outside forested areas. EUROLAND will investigate how such layers can be derived based on the existence of the previously described layers and the integration of IACS data.

However, in order to proceed towards a common agreement among the stakeholders involved in the future continental LMCS service specification, the process can be technically supported by EUROLAND, but cannot be steered by the project. Here, support from the EEA/EIONET and the GMES Bureau is needed to bring forward this important issue.

EUROLAND's mapping and monitoring demonstrations (digital data from the areas mapped) of the first project year are available at: *http://www.geoland2.eu/portal/*

[1] GMES Fast Track Land Monitoring Core Service - Strategic Implementation Plan. Final Version, 24/04/2007. Author: Prof. Dr. Dietmar Grünreich, Chairman LMCS Group
[2] GNU - GMES Network of Users

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Integrated cost assessment across GMES services: BOSS4GMES

The need for a common forum is strongly felt in the world of GMES. GMES projects operate largely in service-specific thematic streams, with little interaction between them. Cross-cutting projects are the exception rather than the rule. Even within such projects, genuine inter-service integration efforts are rare (notable exceptions include the ESA-funded HALO support action, led by ECMWF between 2004 and 2007). This state of affairs is a legacy of the project-based character of GMES during its Initial Period (2001-2003), a by-product of the heterogeneity of R and D funders and funding streams. This contrasts, for example, with GALILEO with its singular focus on geo-spatial positioning.

Over time, the services converged under the five major service domains: Land, Ocean, Emergency, Security and Atmosphere (with Climate Change being an emerging sixth service). BOSS4GMES - an FP6 GMES project - provides a platform for transverse interactions, bringing partners from different services together to explore synergies, identify commonalities, and develop cross-cutting initiatives. The project was designed to build support for GMES on three main pillars: technical, organisational and communications.

BOSS4GMES's second pillar examines organisation structures and business models for GMES. Three key goals form the basis of this investigation: the identification of key stakeholders, the analysis of financial issues and the selection of appropriate governance and organisation structures. These components form the basis of a blueprint, or "business model"[1], for the implementation of operational GMES services, in making the transition from R and D to operations.

Of key importance in facilitating this transition to operational funding is a clear assessment of the costs of the services. This is especially important in light of the Commission's intention to make GMES services available initially as public goods, as laid out in the 2008 Communication: "we care for a safer planet"[2]. During the extension phase of BOSS4GMES, and in response to a specific request by the GMES Bureau, a transverse cost assessment was carried out. This was based on the need to supply the GMES Advisory Council with preliminary figures in order to assess a potential European contribution to GMES service costs. Land, Marine and Emergency Response services costs were supplied in a relatively short timeframe, being based on existing BOSS4GMES work in this area. Atmosphere and Security costs form part of a longer-term programme of work.

Service costs in the assessment were analysed with respect to two time periods, corresponding to the pre-operational (2011-2013) and operational (2013+) phases of GMES implementation. In addition, a common set of seven categories were used to classify costs across the services[3]. Labour and non-labour costs were separated, and for each cost element, the level of uncertainty contained in the estimation was provided. These common principles allow the costs to be compared across services, and facilitate the identification of the main cost drivers.

Turning to the Land Service, the cost assessment was conducted according to the three service components: European, Local, and Global. Under the European element, a number of sub-components were considered:

- The provision of reference data (such as digital elevation models);
- Pan-European land cover extending the EEA's CORINE[4] project;
- The production of five high-resolution thematic layers[5];
- Supporting the harmonisation across Member State national land cover databases and enabling their aggregation at a European level;
- Contribution to the EEA's LUCAS[6] survey;
- Intra- and inter-seasonal dynamic vegetation monitoring using near-real-time products and area frame sampling.

The Local component includes the Urban Atlas (change monitoring of land use in urban areas, using high-resolution optical satellite imagery) and regular monitoring of "hot spots" (areas of environmental or conservational interest). Finally, the Global component comprises the provision of Essential Climate Variables (ECVs) and subcomponents providing crop production forecasting and food security monitoring.

One of the key challenges of developing a comparable transverse cost assessment was the different modes of service production, service delivery and quality control across the GMES services. The continental land cover component, for example, is updated according to a periodic multi-annual timeframe (3 to 5 years). Production costs are incurred according to this cyclical schedule, as opposed to being continuous, as is the case for the ocean state variables of the Marine Service - or indeed, the biogeophysical parameters of the land global component. As well as being incurred according to differing chronological periods, costs are often categorised differently across the GMES services. Quality control costs, for example, are, in some cases, subsumed within production or operating costs.

Overcoming these differences was a key challenge in developing the transverse cost analysis. This relied on a clear and comprehensive set of underlying assumptions, which defined the scope of the analysis and played a role in explaining the uncertainty attached to particular cost elements. A number of service-specific assumptions were also made, relating to the particulars of each service domain.

Space costs were excluded from this analysis, which covered only the service, Earth Observation (EO) data and in-situ data costs. The service and EO data costs were based on figures derived from the FP7 projects for each service domain. Inflation was calculated at the aggregate level for all services. For Land, average figures from geoland2 were used to derive the current estimates. Infrastructure costs associated with new data centres, such as the EEA Land Data Centre and centres dedicated to the production of dynamic bio-physical parameters were not included in the current analysis. Research and development costs for ongoing incremental improvements were estimated, but large-scale innovation was not accounted for, as this is likely to fall within future Framework Programme funding.

A key issue across all the GMES services is the availability of EO data from satellite missions and in-situ data sources. The current arrangement for space data provision to the FP7 projects is through ESA's GMES Space Component Data Access (GSCDA) project and the Data Access Portfolio (DAP). Beyond FP7, the assumption is free availability of data from public satellite missions and their continuity. The procurement cost of data from third-party missions (GMES Contributing Missions) has been evaluated and is included in the assessment. For Land, in-situ data is generally excluded from the analysis, apart from contributions to the LUCAS survey. It is assumed that in-situ data required for orthorectification of satellite data - such as topographic maps or digital elevation models - will be included in the EO data access costs. A parallel exercise in collaboration with the EEA is underway, which aims to undertake a more detailed investigation of in-situ data costs.

The work done through BOSS4GMES has resulted in a set of preliminary cost data across the GMES services. This work is by no means complete. The refinement of these costs is a work in progress as GMES services continue to evolve. Several key items are still missing from the Land analysis, such as the cost of the data centres, including archiving and dissemination activities. A bottom-up assessment of effort and costs is currently underway for Land, in the frame of geoland2, in order to address these, as well as accounting for synergies in service production across components.

By bringing the various streams of analysis into convergence, BOSS4GMES has helped to shape a global perspective on GMES. Such a perspective enables the identification of synergies, commonalities and overlap across services. In a programme of such complexity, exploiting synergies and developing shared resources is crucial for its long-term sustainability, as GMES moves closer towards its operational phase. BOSS4GMES recommendations are being transferred to the FP7 projects in order to enable this work to continue.

[1] In the case of GMES, which will be a public good for most services, the "business model" concept refers to the processes of decision-making and operations and the structure of the stakeholder network rather than profit generation.
[2] COM(2008) 748 final.
[3] They are: Management, Operating Costs, Quality Control, Infrastructure, R&D, EO Data and In-situ Data.
[4] "COoRdination of INformation on the Environment".
[5] Their thematic content is still under discussion, but priority candidates are: Wetlands, Pastures/Arable, Forest, Sealing and Water.
[6] "Land Use/Cover Area frame Statistical Survey".

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Upcoming Events:

4th February 2010: GNU Extended Meeting Consortium in Rome, Italy

More information: *http://www.gmes-network-of-users.eu/*

25th - 26th March 2010: geoland2 Forum in Toulouse, France

The next geoland2 Forum will be held in Toulouse, France, March 25th-26th. As in previous fora it is planned to carry out dedicated training workshops where users can obtain hands-on experience on LMCS examples and Core Information demonstrators.

31th May - 4th June 2010: Change Detection Workshop in Paris, France

The 30th EARSeL Symposium will be hosted by UNESCO Headquarters, from 31th May - 4th June 2010, France. It is planned to attach a joint geoland2/EARSeL workshop on change detection issues to the Symposium. This workshop follows on from the first expert group meeting held in Madrid on December 9th, 2009 and will continue the discussion among remote sensing experts on this important topic. Details will be provided by separate mails and in the next issue of the GMES User Newsletter.

Past Events:

29th June - 1st July 2009: Inspire-GMES Workshop for Land Cover, Madrid, Spain

View the final report of the workshop here:
http://www.fomento.es/MFOM/LANG_CASTELLANO/DIRECCIONES_GENERALES/INSTITUTO_GEOGRAFICO/Teledeteccion/cnr/Workshop_Minutes.htm

25th - 27th November 2009: EARSeL in Bonn, Germany:

Minutes will be provided in the next Newsletter.

10th - 11th December 2009: 2nd Object Oriented Data Model (OODM) Meeting

Minutes will be provided in the next Newsletter.

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