Forest Monitoring Services Developed in the frame of the GEOLAND2 Project – Mediterranean Area

Dorothea Aifantopoulou, Sideris Paralikidis

Development of services and dedicated processing lines in the frame of the FP7 GMES Land Core Service Project: Environment Monitoring / Management efficiency of international, regional and local institutions accounting for the Regulatory and Legal framework in force. Usage of satellite data (multi date / multi resolution), Integrated processing of satellite and other data (Digital Terrain Model , institutional entities data, etc) for forest ecosystems monitoring in Southern Europe and production of Very High Resolution Information Layers.

50 Collaborating Entities:

Geo Informatics Companies and Research Institutions: **Research and Development Activities**

Public Domain Institutions/ Services (MS and EC Level): **Formulation – Specification of Requirements and Evaluation of Results**

Design and Implementation Pillars

Users Requirements

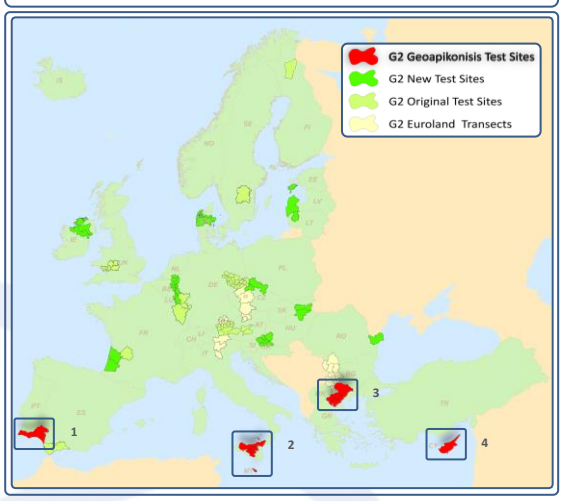
- Geo information needs, for the implementation of sectorial policies and the relative guidelines of the European Union
  - Themes: Water management, Regional Planning, Agriculture, Environment, Crops Monitoring, Sustainable Development of Africa, Carbon & Water cycle and Climate Changes in Global scale
  - Set up of the Core services Requirements: Bottom - up approach (FP6-Geoland1, GSE Forest, GSE Land, GSE SAGE, GSE Urban Services)
- Condition: Common approach (European Commission–Member States) on the basis of the FTS Sealing /CORINE Land Cover principles

Services - Products

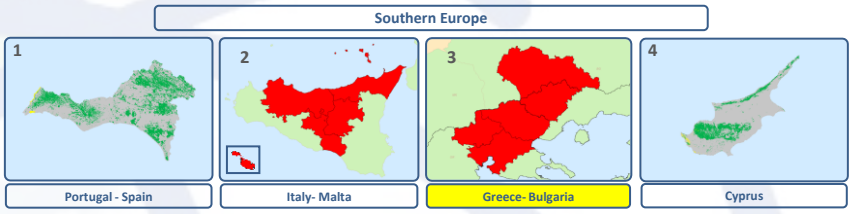
- Consolidation of (a) Core Services Specifications, (b) Methodology and processing lines for producing and validating the Land Use/ Cover monitoring information layers
- Development of capabilities for serving European Scale services' requests

Demonstration - Evaluation

Geoland 2 – Sites selection optimizing coverage within the EU Member States



Southern Europe



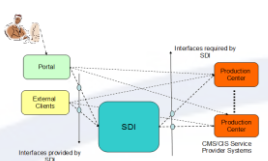
Portugal - Spain | Italy- Malta | Greece- Bulgaria | Cyprus

Dissemination

Geoland 2 SDI (http://www.geoland2.eu)

Geo-portal Services

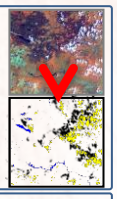
1. Products Description
2. Maps Display Interface
3. Access to Metadata



Forest Task: Services Implementation & Products

Methodological Approach

1 - EO Data Pre-processing



1a. Radiometric Enhancement
SW used : ENVIMON (VTT)

1b. Special Areas (clouds, shadows, water bodies) masking
SW used : ERDAS IMAGINE/ Expert classifier - Spatial modeler

2 – Training and Validation Data set up

SW used : ARC GIS

2a. Stratified Random Sampling: Samples Selection

2b. Computer Assisted Photo Interpretation (VHR): CCD & Trees' Type

2c. Modeling parameters Estimation (CAPI results)

3 – Modeling & Thematic Classification

SW used : PROBABILITY (VTT)

3a. Unsupervised Clustering

3b. Correlation of modeling parameters (CAPI results) with existing clusters

3c. Clusters spectral characteristics calculation (Gaussian algorithm)

3d. Land cover likelihood calculation (pixel basis)

3e. CCD & trees type percentage calculation (pixel basis)

3f. Thematic Classification

4 – Change Detection

4a. Unsupervised Changes' detection
SW used : ERDAS IMAGINE/ Change Detection & Spatial modeler

4b. Changes labeling
SW used : ERDAS IMAGINE/ Change Detection & Spatial modeler

5 – Internal Validation of the Results

- *SW used : ERDAS IMAGINE/ GIS Analysis & Spatial modeler*

5a. Systematic errors detection

5b. Products improvement/ enhancement

6 – Final Production

- *SW used : ERDAS IMAGINE/ GIS Analysis & Spatial modeler*

6a. Products Mosaics realization

6b. Noise Removal

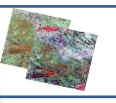
6c. Products Finalization (different versions of spatial resolution, projection system, etc)

6d. Metadata creation

GIS – RDBMS Data

Earth Observation Data

IRS-P6 LISS III, SPOT 4, 5



Spatial Resolution : 20m
Pan European coverage: 2006 & 2009

Landsat TM-ETM

Spatial Resolution : 15-30m
Pan European coverage: 1990 & 2000

Ikonos

Spatial Resolution : 1m
Sporadic coverage: 2010

IRS-P6 AWiFS

Spatial Resolution : 60m
Sporadic coverage : 2009

Orthophotos

Spatial Resolution : ≤ 1m
Sporadic coverage : Various Years

Other Geospatial Information

Administrative Limits

Digital Terrain Model

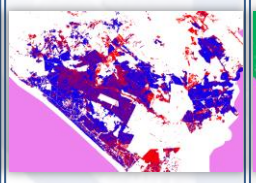
At various scales

Existing Land Cover/Use Data

(Corine Land Cover, etc κλπ)

CMS (Core Mapping Services) Products

Basic Products-Services: The outcome may be used as is and covers basic and/ or specific Forest ecosystems monitoring needs

EL-04a Forest Area	EL-04b Forest Types	EL-05 Forest Density	EL-05 Changes assessment
			
Forest Areas mapping. Forests with a crown density larger/ equal to a user specified density on the basis of the monitoring needs (eg ≥ 10%).	Two products' options: 1. Discrete Values: Conifers, Broadleaved, Mixed(2. Continuous Mixing Ratio Values: Coverage percentage per forest type (conifers/ Broadleaved)	Crown Cover Density (CCD) product Quantitative (discrete) layer: It allows mapping of the forest area on the basis of the definition (European, national, other) in force with reference to the CCD (eg CCD≥ 10%)	Changes Detection and Delimitation Discrete Values: 1. Forest without changes 2. No Forest without changes 3. No Forest to Forest 4. Forest to No Forest

Thematic Products Specifications
Spatial accuracy : RMSE < 20m
Thematic precision : 85% (+/- 10)
Minimum Mapping Unit (MMU): 0,5 ha
Linear Elements Minimum Width: 20m (1 pixel)

CIS (Core Information Services) Products

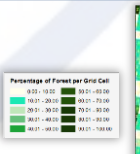
Thematic products resulting for the CMS Services and Products use, in combination with other input data. They have been developed in collaboration with the European Environmental Agency (EEA) to fulfill National or Local level Users.

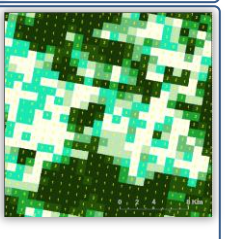
The CIS Forest focuses to creating environmental indicators for the forests, aiming to support (a) reporting activities in the context of the MCPFE, SEBI2010, UNCBD and (b) the relative to the EC Regulations and Directives obligations.

SW Used for the Developments/ Production: Spatial modeller - GIS Analysis / Erdas Imagine; EEA Fishnet Grid Tool / ArcGIS; GUIDOS SW / Joint Research Centre (JRC)

P-FO-01, Forest Area-based Indicators
CMS product: Forest Areas Mapping
- *Forest percentage within a reference unit area*
- *Number of Forest Patches within a reference unit area*

Reference Unit Area: 0,1 x 0,1km - EEA grid



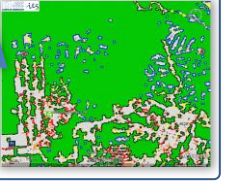


P-FO-03, Forest Type based Indicators
CMS product : Forest Types
- *Forest type percentage within a reference unit area*

Reference Unit Area: 0,1 x 0,1km - EEA grid

P-FO-04, Forest Crown Cover Density-based Indicators
CMS product : Forest Density
- *Forest Density within a reference unit area*

Reference Unit Area: 0,1 x 0,1km - EEA grid



P-FO-02, Forest Fragmentation and Connectivity Indicators
CMS product : Forest Areas Mapping and Forest Types
- *Xx Indicators calculated within a reference unit area*

Reference Unit Area: 0,1 x 0,1km - EEA grid

GEOAPIKONISIS SA
11 Maiandroupoleos str, 11524 Athens
Tel: +30 210 6980158 Fax: +30 210 6980686
E-mail: mail@geoapikonisis.gr, URL: www.geoapikonisis.gr

www.gmes-geoland.info