

Pan-European Land Cover Monitoring



For many environmental and agricultural studies, up-to-date and reliable information on land use and land cover is urgently needed. In addition, the development of a sound environmental policy relies intensely on the outcomes of environmental models, which are significantly influenced by both spatial and temporal accuracy of land use and land cover data. Therefore, the Pan-European Land Cover Monitoring (PELCOM) project has been formulated to provide a land cover databases covering the entire European-continent having a high spatial accuracy and which can periodically be updated.

The **PELCOM project** is aimed at establishing a 1-km Pan-European Land Cover Database that can periodically be updated based on the integrative use of multi-spectral and multi-temporal NOAA-AVHRR satellite imagery and ancillary data. PELCOM is a

three-year project of a shared cost action under the Environment & Climate section of the European Union 4th Framework RTD Programme. The project started in September 1996 and will finish in November 1999.

Goals

- Establishment of a land cover classification scheme for the European continent
- Development of a consistent classification methodology, based on NOAA-AVHRR satellite data and ancillary data
- Creation of the Central Project Information Server (CPIES) and a metadata information system
- Development of a methodology for monitoring land cover changes at a European scale
- Establishment of a 1-km Pan-European Land Cover Database
- Application of the established land cover database in various environmental and climate studies

End Users

The PELCOM project focuses on land cover mapping and monitoring activities for establishing a consistent Pan-European Land Cover Database, which is useful for national, European, and international environmental agencies. In this project, end users are actively involved in the development of the methodology as well as the applications. The Pan-European Land Cover Database is being applied in various environmental and climate models by end users coming from a variety of organisations, such as RIVM, ARCS and CNRM. The European Environmental Agency (EEA) is also envisioning the

Project Partners

- Wageningen University and Research Centre (formerly SC-DLO)
- Swedish Space Corporation (SSC)
- Austrian Research Centre (ARCS)
- Meteo France (CNRM)
- Istituto Universitario di Architettura (IUAV)
- Space Applications Institute (SAI-JRC)
- Dutch National Institute for Public Health and the Environment (RIVM)
- Geodan BV

strategic use of this database for the protection and improvement of the European environment. Likewise, IGBP-DIS is a potential end user of this database. In addition, contacts have been established with IGBP's Land Use and Land Cover Change (LUCC) core project. The LUCC

Scientific Steering Committee agreed that the PELCOM project addresses questions that are strongly related to the LUCC science plan.

Data Sources

One of the data sources for the PELCOM Project was the MARS (Monitoring Agriculture by Remote Sensing) archive provided by the Space Applications Institute (SAI) of the Joint Research Institute (JRC). This archive contains pre-processed daily multi-spectral mosaics of AVHRR (Advanced Very High Resolution Radiometer) images covering the European continent. Normalised Difference Vegetation Index (NDVI) composites are also available in these archives, but they were considered inadequate for the PELCOM project due to the low geometric accuracy of the single AVHRR images. As a result, the NDVI monthly maximum value composites for the year of 1997 available from DLR (Deutsches Zentrum für Luft und Raumfahrt) were used as the main data source for the classification process. Various ancillary data sources have also been used as reference data sets in the PELCOM Project. Some examples are the Digital Chart of the World (DCW) and the CORINE (Coordination of Information on the Environment) land cover database.

Methodology for Land Cover Mapping at the European Scale

The methodology developed in the PELCOM project is based on combining both unsupervised and supervised classification approaches. The training samples are derived from selected homogeneous areas of the CORINE land cover database. The spectral characteristics of each training sample are used to determine class boundaries and pixel assignments in the supervised classification. In the PELCOM project, the developed algorithm calculates the first and second minimum distances for each AVHRR image pixel based on the training samples, and as a result, it derives the first best class and the second best class for each pixel. The ratio between the distances is also calculated and can be used as a measure for the “purity” (homogeneity) of a single pixel and it is a valuable information to the end user. Using the first minimum distances, the regional classification experiments were compiled into a single database. Inconsistencies between various regional classification experiments were eliminated based on visual interpretation. After this classification, specific improvements are expected to be obtained by combining thematic ancillary data in a post-classification procedure.

Case studies

- Application of the PELCOM land cover database in biodiversity research – by **RIVM**
- Large-scale inventories of biogenic emissions (VOC's) from forests – by **ARCS**
- Improvement of boundary conditions for meteorological models – by **Meteo France**

User comments on the results (preliminary)

Satisfaction: First time, consistent and detailed land cover database for entire pan-Europe

Criticism: Classification accuracy is low for small and fragmented classes such as natural grasslands, permanent crops.

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