Overview
Using Definiens’ technology, GeoVille has developed a highly-automated land use mapping application that further increases the reliability and efficacy of traditional processing approaches. The result provides European agencies, government bodies, and commercial customers with harmonized, cross-border land use data that enables customers to make better decisions.

Introduction
With increasing pressure on organizations and agencies to assess the environmental impact of regional policies and activities, there is an ever-growing demand for reliable land use information.

In Germany alone, every day some 100 hectares of land – the equivalent of 200 football pitches – is lost to urban development and transport infrastructure. With 75 per cent of Europeans living in urban areas, it is a similar story across the continent.

RegioCover, using Definiens’ technology, reveals a detailed picture of built-up areas, enabling regional governments to engage in effective urban planning.

In developing countries around the world, increasing urbanization leads to mega cities which face severe health and safety challenges from uncontrolled land consumption and growing slums.

The Challenge
Strategies for soil protection and monitoring systems are urgently needed all over the world. Initiatives such as the Global Monitoring for Environment and Security (GMES) were established to address those issues by building a space- and ground-based infrastructure to provide reliable and timely Earth Observation information services.

As a key player in GMES, GeoVille aims to develop reliable, standardized and affordable mapping and downstream services that support the implementation of European directives and their national realization.

GeoVille developed RegioCover, a specific mapping application. By integrating the Definiens Enterprise...
Image Intelligence™ platform with commercial off-the-shelf software (COTS), GeoVille created a highly-automated, accurate and reliable cross-border application for operational urban and regional land use mapping.

GeoVille’s concern was to map land cover and land use in a cost-efficient way while maximizing data throughput and optimizing information quality across different environments. In particular:

> The results need to be ready for direct integration into any GIS environment.
> Customers have to be provided with harmonized, high-quality spatial information across all environments enabling them to compare different regions and cities of interest.
> Geospatial data must contain well-defined and standardized levels of precision and confidence levels to be a reliable basis for decisions.
> For many of GeoVille’s clients, their decision-making processes require not just land cover, but much more the analysis of land use.

The service must be highly scalable supporting all types of modern spaceborne and airborne sensors, including SAR, Lidar, panchromatic, infrared, single channel, multispectral and hyperspectral imagery.

The Solution

GeoVille’s RegioCover is a processing chain which generates standardized geospatial information on land cover and land use from remote sensing imagery in a clearly defined and highly-automated way. It consists of customized software components developed and integrated by GeoVille. The core of the processing chain – segmentation and classification applications – is based on Definiens Enterprise Image Intelligence™ Suite, which offers several major advantages over other technologies:

> Definiens’ multi-resolution segmentation is essential to create meaningful objects for advanced feature extraction and GIS-ready results.

CASE STUDY

DEEPER INSIGHTS • FASTER RESULTS • BETTER DECISIONS
With traditional pixel-based approaches, image classification is limited to land cover. With its object-oriented approach, Definiens’ technology derives image context and neighborhood relations, making it possible to identify not only land cover but also land use.

Definiens’ technology fully supports a multi-source environment which greatly increases the flexibility of RegioCover and the comparability of results.

Fuzzy classification and advanced accuracy analysis make the performance analysis not only fully compliant with standard measurements, but gives additional information on confidence levels to enable better decisions.

Definiens supports GeoVille to develop simple applications quickly and easily with a ‘click and classify’ tool.

Definiens is capable of integrating expert knowledge easily where more in-depth analysis is required.

Regional Governments

GeoVille uses Definiens’ technology to automate the mapping of land use and forest extent based on terabytes of aerial photographs. Thousands of square kilometers of high resolution aerial photographs have been mapped with high precision. GeoVille guarantees accuracy of up to 95% in identifying different types of land use and land cover.

“The automated workflow increases throughput dramatically which means we can properly assess the impact of policies, the sustainability of land consumption, or the rate of land cover change in the light of accurate, up-to-date and reliable data.”

Johannes Kanonier, Head of GIS Department, State Government of Vorarlberg

Radio communication planning operators

GeoVille uses Definiens’ technology to derive large area clutter maps for radio communication planning operators. These maps are used for wave propagation modeling and the subsequent planning of radio communication networks. Clutter maps have already been produced for countries in Europe, Africa and Asia.

“WIMAX Telecom requires very high quality clutter maps for its network planning. GeoVille’s clutter maps produced with RegioCover have convinced us through an excellent quality-price ratio, their rapid availability and flexibility of coverage.”

Matthias Hatz, Head of Radio Network Deployment, WIMAX Telecom

The Results

RegioCover supports GeoVille in its mission to offer innovative and affordable geo-information products with high levels of precision for its customers.

In most cases, RegioCover achieves more than 90% accuracy in identifying land cover and land use. This is an average 20% improvement over pixel-based analysis systems. At the same time, GeoVille estimates that the cost of manual analysis would be around 30% higher.

“Definiens is an essential part of RegioCover. It means we can deliver results that much quicker. The bottom line is this: GeoVille customers get to make better and more timely business decisions. The importance of this cannot be underestimated.”

Jürgen Weichselbaum, Head of Technical Department, GeoVille

The European Environment Agency has recently recognized the important role that GeoVille plays in land cover and land use mapping.

“EEA acknowledges with great interest the Definiens GMES Innovation Award won by its European Topic Centre on Land Use and Spatial Information partner GeoVille. Technology like the one developed and applied by GeoVille will in future certainly help to address bridging the gap between regional, national and European land cover and land use mapping.”

Chris Steenmans, European Environment Agency (EEA)
The Future

GeoVille sees many opportunities of further deploying Definiens’ technology in the future.

GeoVille aims to offer object-based change detection enabling customers to update maps and detect changes to the environment automatically. For example, it would be possible to examine land use changes in a specific location or over a large area by comparing images, even if those images were taken under different conditions or by different imaging systems.

Feature extraction is an intrinsic capability of Definiens’ object-based technology. In the future, GeoVille wants RegioCover to extract any defined feature. For example, it is already possible to create a map in which all the buildings are represented by a standardized shape, which makes the map easier to read.

Currently, RegioCover involves a number of discrete software components. In the future, GeoVille aims to integrate these components so that the results produced by one component are automatically imported to the next component. The entire process chain would be controlled by a single interface, making the system even easier to use and giving people without specialized training or experience access to RegioCover’s full capabilities.

This integration would, in turn, enable RegioCover to perform fully-automated and enhanced batch processing, capable of producing complete land use maps without any manual intervention.

Conclusion

Definiens’ technology provides the vital tools of segmentation and classification in the RegioCover processing chain. It brings five key benefits to RegioCover:

- Cost reduction – automation greatly reduces the need for manual analysis while any ruleware developed can be reused on other projects.
- Quality – high thematic accuracy and precision provides information on which good decisions can be based.
- Standardization – going beyond land cover mapping to identify land use across Europe.
- Coverage – RegioCover can handle large data volumes ensuring harmonized mapping of large areas.
- Integration – allowing optimized workflows with existing proprietary components of RegioCover for Land, Cadastre, Forest and Validation.