CORINE Land Cover - Research Papers
National and European Policies - Vol 2 Articles

2005

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Project Manager: Stefan Kleeschulte

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We would like to greatly acknowledge the voluntary contribution of all authors of the individual applications who have provided the original text of the application and related illustrations and who have reviewed the text after the English editing.

EEA project manager was Adriana Gheorghe.

Executive Summary

This publication brings together information about applications from different European countries in support of the 6th Environmental Action Programme as well as several sectoral policies (e.g. agriculture, transport) based on CORINE Land Cover (CLC).

CORINE Land Cover has been and continues to be one of the most frequently downloaded database from the EEA data service. During a country survey at the end of 2003 the national authorities responsible for the dissemination of national CLC data reported significant number of usages of the database by various organisations and for various fields of application, which subsequently sparked the idea for this publication.

The list of sectors in which CLC data has been successfully used, is being led by the environment applications, followed by research, agriculture, spatial planning and education.

Within the environmental domain itself, applications for nature conservation & biodiversity in combination with water related applications account for close to 40% of all these applications.

Of increasing importance are transboundary applications, especially in the context of river basin management or spatial planning and since the completion of the CLC2000 database – the mapping and analysis of land cover changes.

This publication does not aim to provide an exhaustive overview of existing applications or even fields of applications. This would never be possible as the number of applications is increasing every day. Therefore, the authors of this publication would like to encourage those who have developed new and interesting applications to submit a summary of them to the European Environment Agency for future inclusion in this "living" document.

Introduction to EEA, ETC/TE

The objective of the European Environment Agency (EEA) is to provide policy makers with timely and relevant environmental information. Regarding land cover (LC), EEA aims to provide those responsible for and interested in European policy on the environment with qualitative and quantitative LC data that is consistent and comparable across the continent.

As part of the EEA mandate, the CORINE Land Cover (CLC) database initiated by the Commission in 1985 should be further maintained and regularly updated. Consistent geo-referenced LC information has been identified by different national and European policies as a key database for integrated environmental assessment. In order to reach this goal EEA and the Joint Research Centre (JRC) launched the IMAGE2000 and CLC2000 Project (I&CLC2000), which includes as well the updating of the CLC database. The satellite image 'snap shot' of the EU territory (IMAGE2000) is the principal material to undertake the updating of CLC database for the year 2000 (CLC2000) and to identify main LC changes occurring in Europe within the period 1990-2000.

The project is also extended to several other European countries, 10 of which are new members of the European Communities from 1st May 2004. The dissemination and use of the I&CLC2000 products is defined in an agreement between the EEA, the European Commission and the participating countries. The database, which has been finished early 2005 for 29 countries covers about 4,5 million km^2 with 25 ha spatial resolution. The CLC-changes database has 5 ha spatial resolution.

Today, CLC is recognised by decision-makers as a fundamental reference data set for spatial and territorial analyses. Within the European Commission Services, such as DG-Regional policy, DG-Environment and DG-Agriculture, as well as in EEA and its European Topic Centres (ETCs) there is a growing need of using spatial analysis for integrated environmental assessment.

The CORINE Land Cover Technical Team (George Büttner, Gabriel Jaffrain, Lazlo Mari, Jan Feranec, Tomas Soukup) – part of the ETC on Terrestrial Environment – has been responsible for the implementation of the CLC2000 database in 29 participating countries. This team has assured a harmonised approach across many national and regional teams and the creation of a quality controlled final database.

Introduction to Publication

This publication on CORINE Land Cover application is part of a joint publication by the Joint Research Centre (JRC) and the European Environment Agency. The objective of this joint publication is to provide a general reference for CORINE Land Cover, its methodology and applications.

Volume 1 of the joint publication – under JRC responsibility – addresses the process of creating the CORINE Land Cover database from the selection of suitable satellite image data, via the formation of national teams responsible for the national interpretation of CLC data to the role of the CLC technical team responsible for quality assurance across the countries and quality control of the final product.

Volume 2 – the present document developed by the EEA – aims to provide the reader with an overview of applications that have been created in the past by researches to explore the potentials of the database as well as operational agencies to support their daily work. The current publication provides examples of applications from some 14 European countries, some of them already transboundary in addition to several applications developed by the European Commission and its services.

Applications Review

This section provides a review of applications that have been employed in the research and information functions related to Corine Land Cover. The applications describe the use of CLC90, CLC2000 as well as IMAGE2000 products.

The review is constructed in support of the 6th Environmental Action Programme nomenclature in the form of domains and sub-domains, mainly:

Domain: Tackling climate change

Domain: Protecting Human Health and Quality of Life

- **Sub-Domain: Biodiversity**
- **Sub-Domain: Landscape**
- **Sub-Domain: Land Use and Land Cover Change**
- **Sub-Domain: Regional Planning**

Domain: Protecting Human Health and Quality of Life

- **Sub-Domain: Water Framework Directive (WFD)/EUROWATERNET**
- **Sub-Domain: Nutrient Pollution**
- **Sub-Domain: Health**

Domain: Sustainable Use and Management of Natural Resources and Waste

- **Sub-Domain: Transboundary Air Pollution**
- **Sub-Domain: Soil Erosion/Soil Degradation**

Domain: Applications in Support of Sustainable Development and Other Environmental Policies

- **Sub-Domain: Forestry**

Domain: Applications in Support of Other Sectoral Policies

- **Sub-Domain: Forestry**
- **Sub-Domain: Agriculture**
- **Sub-Domain: Coastal Management**
- **Sub-Domain: Environmental Risk Assessment**

Domain: Tackling climate change

1_1: Downscaling of Near Surface Wind in the Alpine Region

1_2: Evaluation of the balance of organic carbon in soil and in vegetation through the use of land cover data

Paper 1.1: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

"Research for Climate Protection: Model Run Evaluation" (reclip:more) is an Austrian research project commenced in late 2003. The three year project was initiated to encourage the national community on global and climate change (Loibl et al., 2004).

It evaluates the ability of two meteorological models, the European ALADIN (Météo-France, 2004) and the US MM5 (Dudhi a et al., 2004), to sim ulate the current climate (perio d 198 1 to 1990) and future scenarios (period 2041 to 2050). The two models are driven by global climate datasets which are available at a horizontal resolution of about 120 km to provid e information on m eteorological effects of climate change in the Alpine region at a resolution of about 15 km (mesoscale). Furthermore, grid distanc es les s than 1 km (microscale) are re ached by apply ing statistical an d diagnostic methods

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While the mesos cale models cover the entire Al pine region, the com plete set of reclip' s downscaling applications at m icroscale (concerni ng tem perature, precipitation, solar rad iation, snow cover and wind respectively) are performed wi thin three study areas; na mely Lower Austria, South-East Sty ria, and the Hohe Tauern regi on. The resulting spatial datasets will be freely accessible.

One special focus lies on downscaling of near-surface wind from the coarse (120 km) global data to a final resolution of 20 0 m . The method's results are analy sed with respect to wind speed and direction as well as d ensity of wind energ y and ai r. The CORINE land cover data is used to parameterise the characteristics of the earth's surface.

The application of CORINE data obtains inform ation about loc al wind characteristi cs, w hich is needed for various appliances in the fields of ecology, biology, agricu lture and forestry . One commercial utilisation pr ovides decision support f or the im plementation of wind energy parks; another utilis ation concerns environm ental i mpact assessments, where reliable information about local air flows is needed to estimate areas innervated by air pollution.

Methodology Used

The Wind Atlas Analy sis and Application Program (WAsP) (Mortensen et al., 1993), which was used for the preparation of the European Wind A tlas (Troen et al, 1989), deliv ers satisfying results only over hom ogenous flat terrain (Dobesch et al., 1997). T o overcom e this disadvantage, a combined application of meso- and micro-scale models is used.

The m ethod consists of two m ain steps. In order to prepare suitable initial conditions for the following step the mesoscale modelling results at 15 km horizontal grid distance are further refined applying the meteorological model MM5 at 5 km resolution.

The second step is carried out b y a modified version of the wind model CALMET (Scire et al.,

1999). Here, CALMET is used to compute a three-dimensional divergence-free wind field up to 1000 m above ground. This process is carried out in a diagnostic manner at the final grid resolution of 200 m under consideration of the most important effects of the highly resolved topography.

For this purpose certain physical quantities (external parameters) describing the interactions between the earth's surface and the atmosphere have to be related to the CORINE classes to set up CALMET's surface boundary conditions. As a first approach, the external parameters are taken from literature (Hagemann, 2002; Pineda et al., 2004) and statically linked to the CORINE dataset. An improved version will afford to derive these parameters directly from the driving mesoscale model to achieve both, more accurate results and consistent modelling at different scales.

Results Obtained and Outlook

Reclip:more has currently completed the development of the first version of the wind-downscaling method. Future work will focus on the evaluation of the method using SODAR (Sonic Detection and Ranging) and surface observations from the Mesoscale Alpine Programme (Bougeault et al., 2001) as well as on the optimisation of the process to prepare the external parameters. Finally, the downscaling method will be applied to the mentioned long-run datasets to obtain wind climatology and eventual trends due to climate change.

Fact Points

Key Words: climate, wind, alpine,
Policy Driver: Intergovernmental Panel of Climate Change (IPCC) - Alpine Global Change Issues, Convention on the Protection of the Alps (Alpine Convention)

Contact

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Paper 1.2: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Domain: Protecting Human Health and Quality of Life

Sub-Domain: Biodiversity

2_1: National Grassland Inventory Project Romania

2_2: NATURA 2000 Implementation in Bulgaria: “Conservation of species and habitats in Bulgaria – EU approximation” project

2_3: Development of Ecological Networks in Baltic Countries (example: Estonia)

2_4: Possible conflicts between animal movement and traffic in Estonia

2_5: Designating potential wildlife migration corridors between Augustow Forest, Biebrza National Park and Bialowieza Forest with application of CORINE Land Cover database

2_6: NATURA 2K Application

2_7: Andalusian biodiversity map: Creation of a model that evaluates the biodiversity using normalized variables existing in SinambA (Andalusian Environmental Information Net) that would help to obtain a cartography at an adequate scale from this source. Afterwards, development of an evaluation and continuation of this cartography.

Sub-Domain: Landscape

2_8: Identification and Characterisation of Environments and Landscapes in Europe (LANMAP)

2_9: Maltese Islands Landscape Assessment

Sub-Domain: Land Use and Land Cover Change

2_10: Land use of Belgium, the Netherlands and Luxembourg

Sub-Domain: Regional Planning

2_11: 3rd Cohesion Report Map on Territorial Diversity (Fragmentation)

2_12: OderRegio: Estimating flood risk and damage potential in transnational context

2_13: Downscaling population density with CORINE Land Cover

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Paper 2.2: NATURA 2000 Implementation in Bulgaria: "Conservation of species and habitats in Bulgaria – EU approximation" project

'Implementing the NATURA 2000 requirements – the Bulgarian experience of using CORINE Land Cover'

Introduction

The Bulgarian application employed the CORINE Land Cover database for the analysis of species and habitats, required for the project implementing NATURA 2000 in Bulgaria. The project was developed in line with Council Directive 92/43/EEC of 21 May 1992 on the Conservation of natural habitats and of wild flora and fauna, and the Council Directive 79/409/EEC of 2 April 1979 on the Conservation of wild birds.

CLC data was used for defining a methodology and general approach for the implementation of NATURA 2000 in Bulgaria. The CORINE database was also used as background information for analysis of the potential sites and for basic evaluation of the population and therefore the sufficiency or insufficiency of species and habitats. According to the EU requirements regarding Natura 2000, certain priority type of habitat (habitat type included in Annex 1 of the Habitat Directive) is considered as sufficiently presented within the protected zones, forming the Natura 2000 network, if at least 20 % of the total coverage of that habitat type in the country is included in the proposed Natura 2000 sites. The same criterion goes for the habitats of the animal species included in the list of Annex 2 of the Habitat Directive.

The CORINE Land Cover classification was used by the Natura 2000 project to develop interpretation for identifying the important Natura 2000 habitat classes – needed for completion of point 4.1 of the Standard Natura 2000 Data Form – *Site Description*.

Methodology Used

NATURA 2000 sites are described by the broad habitat classes and their area designation. In this case Corine Land Cover polygon features and NATURA 2000 potential site boundaries were overlayed in ArcGIS 8.3 and passed through a geoprocess known as clipping, to extract the relevent attribute and boundary information.

Selected number CORINE Land Cover classes and their combination were used to describe the character of a NATURA 2000 site: Settlements, Agro-forestry areas, Broad-leaved forests, Mixed forests, Coniferous forests, Pastures and meadows, Bushes, Vineyards, Orchards and Water areas.

The Indicative Map of the Pan-European Ecological Network for Central and Eastern Europe was used as reference with respect to the interpretation and application of land coverage classes.

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Results Obtained and Outlook

During the duration of above mentioned project two field seasons were organised and held. Experts of different taxonomy groups were sent to investigate sites identified as potential Natura 2000 sites – they were given maps of the site containing the CORINE Land Cover layer as well as other ones. As a result above 150 potential Natura 2000 sites were investigated, data obtained, SDF completed and therefore so far around

10 % of the Bulgaria territory identified as part of the future Natura 2000 network.

Before accession date, Bulgaria has two more field seasons left during which the rest of the identified potential sites (around 25 % of the rest of the country territory) should be investigated and data collected for them. It is planned that, as previously experienced as useful, the CORINE Land Cover classification is used for achieving these.

Fact Points

Key Words: NATURA 2000, species, habitats, biodiversity
Policy Driver: Council Directive 92/43/EEC of 21 May 1992 on the Conservation of natural habitats and wild flora and fauna and the Council Directive 79/409/EEC of 2 April 1979 on the Conservation of wild birds.

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Paper 2.3: Downscaling of Near Surface Wind in the Alpine Region

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Policy Driver: Intergovernmental Panel of Climate Change (IPCC) - alpine global change issues, Convention on the Protection of the Alps (Alpine Convention)

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Paper 2.4: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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It evaluates the ability of two meteorological models, the European ALADIN (Météo-France, 2004) and the US MM5 (Dudhi a et al., 2004), to sim ulate the current climate (perio d 198 1 to 1990) and future scenarios (period 2041 to 2050). The two models are driven by global climate datasets which are available at a horizontal resolution of about 120 km to provid e information on m eteorological effects of climate change in the Alpine region at a resolution of about 15 km (mesoscale). Furthermore, grid distanc es les s than 1 km (microscale) are re ached by apply ing statistical an d diagnostic methods

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Paper 2.5: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Paper 2.6: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Paper 2.7: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Sub-Domain: Landscape

2_8: Identification and Characterisation of Environments and Landscapes in Europe (LANMAP)

2_9: Maltese Islands Landscape Assessment

Paper 2.8: Identification and Characterisation of European Landscapes in Europe (LANMAP)

'A physiographic approach in the spatial identification of landscape units on basis of existing spatial data sets'

Introduction

Over the last five years, "landscapes" have received increasing attention from policy makers and researchers across Europe, at both national and international levels. An increasing demand for high-accuracy landscape information at the European level (Wascher, 2000; Klijn 2002) and for landscape expertise can be recognised within various political institutions.

This interest reflects a new increasing awareness regarding the functions and value of landscapes. Such concepts offer new tools for sustainable land management through the integration of sectoral activities, and through participatory processes involving a wide range of stakeholders.

The above implies the need to establish a classification system European Landscape in a consistent and hierarchical approach. The objective of the LANMAP project was to establish a European-wide, neutral and culturally unbiased typology of landscape types, based on high-quality data of European coverage. Such a European classification cannot replace national landscape approaches, however, could be used as an intermediary to link the amalgam of national approaches.

The second main objective of the project was to ensure that the proposed landscape types provided a meaningful reference base for policy application, for example Agenda 2000 (rural development), reporting according to the DPSIR framework (Driving Force - Pressure - State - Response) and ESPON (European Spatial Planning Observation Network) spatial planning activities.

Landscapes can provide a very useful spatial entity for the integration of bio-physical and socio-economic processes in a holistic approach.. Important applications of such a European landscape map are integrated assessment, monitoring and reporting, especially for indicator-based approaches, such as it is now being used in the European Integrated Project SENSOR for sustainable impact assessment of European policies.

Methodology Used

Initially, a functional hierarchy of abiotic, biotic and cultural phenomena was developed for both the development of an Environmental Map, together with a European Landscape Map. After formulating a list of user requirements and possible target groups, a critical review of the major European data sets was undertaken in order to select the most suitable core data sources for the delineation of the major landscape units. Important data sets such as a surface-geology and geomorphology are still missing for Europe. Finally, the following datasets were selected: topography (GTOPO30, grid data, 1km resolution); parent material/ Ecological stand conditions (ESDB 1:1M, vector data); and land use / land cover (CORINE land cover database, vector data, 1:100 000). These core datasets determine the matrix for a European Landscape Map. Specific In the case of wetlands as well as for urban landscapes, the identification could be directly based on CORINE land cover.

The software package eCognition was used for the segmentation of landscape units. As in input in the segmentation process the three above mentioned data layers were used as a kind a pseudo-

satellite image (using a RGB layer stack). But first, the three data layers were recoded into a limited number of relevant classes (Mücher et al. 2003).

Results Obtained and Outlook

The resulting landscape map (LANMAP-1) is an database with 2682 landscape mapping units, of which 2600 are larger than 2500 ha. Twohundredtwo landscape types are identified in the European Landscape Classification legend, each type having a unique code. The code is based on the dominant altitude, parent material class and land use.

A large advantage of this European Landscape Classification is that its selection of boundaries is consistent, crisp and transparent, based on the underlying layers: topography, parent material and land use. However, if there are any erroneous classifications in any of the three underlying layers, this is reflected in the European Landscape Classification. The European Landscape Classification still lacks information on land use history; although this is a limiting factor, it has proved to be difficult to collect this data at the European scale.

The current landscape classification is now being distributed and revised by a limited number of landscape experts. Improvements on the landscape map will be based on their comments. It is expected that the final version will be released in 2005 with a pan-European coverage. Databases like CORINE land cover are being integrated with other land cover data sources such as PELCOM and CLC2000 to obtain a pan-European coverage.

Fact Points

Key Words: topography, landscape
Policy Driver: Agenda 2000, DPSIR framework and ESPON

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Paper 2.9: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Fact Points

Key Words: climate, wind, alpine,
Policy Driver: Intergovernmental Panel of Climate Change (IPCC) - alpine global change issues, Convention on the Protection of the Alps (Alpine Convention)

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Sub-Domain: Land Use and Land Cover Change

2_10: Land use of Belgium, the Netherlands and Luxembourg

Paper 2.10: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

"Research for Climate Protection: Model Run Evaluation" (reclip:more) is an Austrian research project commenced in late 2003. The three year project was initiated to encourage the national community on global and climate change (Loibl et al., 2004).

It evaluates the ability of two meteorological models, the European ALADIN (Météo-France, 2004) and the US MM5 (Dudhi a et al., 2004), to sim ulate the current climate (perio d 198 1 to 1990) and future scenarios (period 2041 to 2050). The two models are driven by global climate datasets which are available at a horizontal resolution of about 120 km to provid e information on m eteorological effects of climate change in the Alpine region at a resolution of about 15 km (mesoscale). Furthermore, grid distanc es les s than 1 km (microscale) are re ached by apply ing statistical an d diagnostic methods

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One special focus lies on downscaling of near-surface wind from the coarse (120 km) global data to a final resolution of 20 0 m . The method's results are analy sed with respect to wind speed and direction as well as d ensity of wind energ y and ai r. The CORINE land cover data is used to parameterise the characteristics of the earth's surface.

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Methodology Used

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Sub-Domain: Regional Planning

2_11: 3rd Cohesion Report Map on Territorial Diversity (Fragmentation)

2_12: OderRegio: Estimating flood risk and damage potential in transnational context

2_13: Downscaling population density with CORINE Land Cover

Paper 2.11: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Paper 2.12: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Fact Points

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Policy Driver: Intergovernmental Panel of Climate Change (IPCC) - alpine global change issues, Convention on the Protection of the Alps (Alpine Convention)

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Paper 2.13: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Domain: Protecting Human Health and Quality of Life

Sub-Domain: Water Framework Directive (WFD)/EUROWATERNET

3_1: Harmonised land cover data for the estimation of nutrient inputs in European river systems – The example of Danube River

3_2: Land use of the Romanian rivers catchments areas

3_4: Use of CORINE LC data in EU WFD related applications in a transboundary river basin: The Lake Peipsi Region

Sub-Domain: Nutrient Pollution

3_6: Significance of land use data for risk assessment pesticide pollution in German river basins

Sub-Domain: Health

3_7: Biological and socio-political factors in the recent up-surge of tick-borne encephalitis and Lyme disease in the Baltic States

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Paper 3.1: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Paper 3.2: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Results Obtained and Outlook

Reclip:more has currently completed the development of the first version of the wind-downscaling method. Future work will focus on the evaluation of the method using SODAR (Sonic Detection and Ranging) and surface observations from the Mesoscale Alpine Programme (Bougeault et al., 2001) as well as on the optimisation of the process to prepare the external parameters. Finally, the downscaling method will be applied to the mentioned long-run datasets to obtain wind climatology and eventual trends due to climate change.

Fact Points

Key Words: climate, wind, alpine,
Policy Driver: Intergovernmental Panel of Climate Change (IPCC) - alpine global change issues, Convention on the Protection of the Alps (Alpine Convention)

Contact

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Paper 3.4: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Sub-Domain: Nutrient Pollution

3_6: Significance of land use data for risk assessment pesticide pollution in German river basins

Paper 3.6: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Sub-Domain: Health

3_7: Biological and socio-political factors in the recent up-surge of tick-borne encephalitis and Lyme disease in the Baltic States

Paper 3.7: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

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Fact Points

Key Words: climate, wind, alpine,
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Domain: Sustainable Use and Management of Natural Resources and Waste

Sub-Domain: Transboundary Air Pollution

4_1: Assessment and Mapping of Critical Loads of Sulphur, Nitrogen and Heavy Metals in Germany

Sub-Domain: Soil Erosion/Soil Degradation

4_2: Soil Erosion Assessment

4_3: Using CORINE Land-Cover and Statistical Data for the Assessment of Soil Erosion Risks in Germany

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4_1: Assessment and Mapping of C ritical Loads of Sul phur, Nitrogen and Heavy Me tals in Germany

Paper 4.1: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

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Sub-Domain: Soil Erosion/Soil Degradation

4_2: Soil Erosion Assessment

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Paper 4.3: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

"Research for Climate Protection: Model Run Evaluation" (reclip:more) is an Austrian research project commenced in late 2003. The three year project was initiated to encourage the national community on global and climate change (Loibl et al., 2004).

It evaluates the ability of two meteorological models, the European ALADIN (Météo-France, 2004) and the US MM5 (Dudhi a et al., 2004), to sim ulate the current climate (perio d 198 1 to 1990) and future scenarios (period 2041 to 2050). The two models are driven by global climate datasets which are available at a horizontal resolution of about 120 km to provid e information on m eteorological effects of climate change in the Alpine region at a resolution of about 15 km (mesoscale). Furthermore, grid distanc es les s than 1 km (microscale) are re ached by apply ing statistical an d diagnostic methods

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Reclip:more has currently completed the development of the first version of the wind-downscaling method. Future work will focus on the evaluation of the method using SODAR (Sonic Detection and Ranging) and surface observations from the Mesoscale Alpine Programme (Bougeault et al., 2001) as well as on the optimisation of the process to prepare the external parameters. Finally, the downscaling method will be applied to the mentioned long-run datasets to obtain wind climatology and eventual trends due to climate change.

Fact Points

Key Words: climate, wind, alpine,
Policy Driver: Intergovernmental Panel of Climate Change (IPCC) - alpine global change issues, Convention on the Protection of the Alps (Alpine Convention)

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Domain: Applications in Support of Other Sectoral Policies

Sub-Domain: Forestry

6_1: Definiti on of Vegetation Qualit y Index According to ME DALUS Methodol ogy an d Using Corine Land Cover

Sub-Domain: Agriculture

6_4: Landscape structure and agri-environmental programmes

6_5: Str uctural / morphological analy sis of field b oundaries and parcel structure derived fro m IMAGE 2000

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Sub-Domain: Coastal Management

6_9: Lan d Use Changes: Methodological Approach to Understand the In teractions Nature/Society in Coastal Areas (Alencoast)

Sub-Domain: Environmental Risk Assessment

6_11: Application of CORINE Landcover data to policy support for Land Use Planning related to Industrial Hazards

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Paper 6.1: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

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Paper 6.4: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

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Paper 6.5: Downscaling of Near Surface Wind in the Alpine Region

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Paper 6.6: Downscaling of Near Surface Wind in the Alpine Region

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Sub-Domain: Coastal Management

6_9: Land Use Changes: Methodological Approach to Understand the In teractions Nature/Society in Coastal Areas (Alencoast)

Paper 6.9: Downscaling of Near Surface Wind in the Alpine Region

'Mapping climate: understanding air flow in the Alpine region'

Introduction

"Research for Climate Protection: Model Run Evaluation" (reclip:more) is an Austrian research project commenced in late 2003. The three year project was initiated to encourage the national community on global and climate change (Loibl et al., 2004).

It evaluates the ability of two meteorological models, the European ALADIN (Météo-France, 2004) and the US MM5 (Dudhi a et al., 2004), to sim ulate the current climate (perio d 198 1 to 1990) and future scenarios (period 2041 to 2050). The two models are driven by global climate datasets which are available at a horizontal resolution of about 120 km to provid e information on m eteorological effects of climate change in the Alpine region at a resolution of about 15 km (mesoscale). Furthermore, grid distanc es les s than 1 km (microscale) are re ached by apply ing statistical an d diagnostic methods

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While the mesos cale models cover the entire Al pine region, the com plete set of reclip' s downscaling applications at m icroscale (concerni ng tem perature, precipitation, solar rad iation, snow cover and wind respectively) are performed wi thin three study areas; na mely Lower Austria, South-East Sty ria, and the Hohe Tauern regi on. The resulting spatial datasets will be freely accessible.

One special focus lies on downscaling of near-surface wind from the coarse (120 km) global data to a final resolution of 20 0 m . The method's results are analy sed with respect to wind speed and direction as well as d ensity of wind energ y and ai r. The CORINE land cover data is used to parameterise the characteristics of the earth's surface.

The application of CORINE data obtains inform ation about loc al wind characteristi cs, w hich is needed for various appliances in the fields of ecology, biology, agricu lture and forestry . One commercial utilisation pr ovides decision support f or the im plementation of wind energy parks; another utilis ation concerns environm ental i mpact assessments, where reliable information about local air flows is needed to estimate areas innervated by air pollution.

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Sub-Domain: Environmental Risk Assessment

6_11: Application of CORINE Landcover data to policy support for Land Use Planning related to Industrial Hazards

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Other projects using CLC applications: linkages

Domain: Protecting Human Health and Quality of Life

Sub-Domain: Water Framework Directive (WFD)/EUROWATERNET

3_3: Use of CORINE LC data in EU WFD related applications in Viru-Peipsi catchment area

3_5: EUROWATERNET Emissions

3_xx: NOPOLU

Domain: Applications in Support of Sustainable Development and Other Environmental Policies

Sub-Domain: Forestry

5_1: IRENA INDICATORS

Domain: Applications in Support of Other Sectoral Policies

Sub-Domain: Forestry

6_2: Use of Image 2000 for monitoring forest biodiversity at landscape level

6_3: Use of Image 2000 for monitoring forest dynamics at landscape level

Sub-Domain: Agriculture

6_7: Utilisation of CLC 90 & 2000 data for monitoring the impact of CAP developments on the rural landscape

Sub-Domain: Coastal Management

6_10: Investigation of South Bulgarian Coastal Zone 1990 - 2000 Land Cover Changes Based on CLC Methodology and Databases

List of Abbreviations

ARC	Austrian Research Centers
BENELUX	Belgium, the Netherlands and Luxembourg
CALMET	
CAP	Common Agricultural Policy
CEH	Centre for Ecology and Hydrology
CEO	Centre for Earth Observation
CNIG	Centro Nacional de Informação Geográfica
CORINE	
DB changes	A database of land cover changes
DDNI	Danube Delta National Institute
DG AGRI	Directorate General Agriculture
DPSIR	Driving Force - Pressure - State – Response
EC European	Commission
EEA	European Environment Agency
EEIC	Estonian Environmental Information Centre
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long Range Transmission of Air Pollution in Europe
ESA	Environmental Sensitive Areas
ESPON	European Spatial Planning Observation Network
ETC/AE	European Topic Centre on Air Emissions
ETC/AQ	European Topic Centre on Air Quality
ETC/BD	European Topic Centre on Biological Diversity
ETC/IW	European Topic Centre on Inland Waters
ETC/IW	European Topic Centre on Inland Water
ETC/LC	European Topic Centre on Land Cover
ETC/NC	European Topic Centre on Nature Conservation
ETC/W	European Topic Centre on Waste
EU European	Union
EUNIS	European Nature Information System
Eurostat	Statistical Office of the European Union (Luxembourg)
FCCC Fram	ework Convention on Climate Change (UN)
GI Geographic	Information
GIS	Spatial Information System

GISCO-EUROSTAT	
IGAM Institute	for Geophysics, Astrophysics, and Meteorology
IGAM	Institute of Geophysics, Astrophysics and Meteorology
IPCC	Intergovernmental Panel of Climate Change
IPPC	Integrated Pollution Prevention and Control (EU Directive)
JRC	Joint Research Center
MAHB	Major Accident Hazards Bureau
MCYFS	MARS Crop Yield Forecasting System
MEPA	Malta Environment and Planning Authority
NDVI	Normalised Difference Vegetation Index
NECONETs	National Ecological Networks
OECD	Organisation for Economic Cooperation and Development
PEEN	Pan-European Ecological Network
PELCOM	Pan-European Land Cover Database
Ramsar	Convention on Wetlands of International Importance especially as Waterfowl Habitat
RCM	Regional Climate Models
reclip:more	Research for Climate Protection: Model Run Evaluation
SAPARD	European Strategy for Sustainable Development
SinambA	Andalusian Environmental Information Net
SODAN	Sonic Detection and Ranging
SODAR	Sonic Detection and Ranging
SPACE	Software for the Processing of AVHRR-images for the Communities of Europe
SPIRS	Seveso Plants Information Retrieval System
TBE Tick-Borne	Encephalitis
UBA Um	weltbundesamt
VGT SPOT-VEGETATION	
WAsP W	ind Atlas Analysis and Application Program
WFD	Water Framework Directive

Glossary/ Thesaurus/Definition:

Definitions taken from http://en.wikipedia.org/

Climate - (ancient Greek: *κλίμα*) is the weather averaged over a long period of time. The Intergovernmental Panel on Climate Change (IPCC) glossary definition is:

> *Climate in a narrow sense is usually defined as the "average weather", or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.*[1]

Wind - Wind is the quasi-horizontal movement of air (as opposed to an air current) caused by a horizontal pressure gradient force. It occurs at all scales, from local breezes generated by heating of land surfaces and lasting tens of minutes to global winds resulting from solar heating of the Earth. The two major influences on the atmospheric circulation are the differential heating between the equator and the poles, and the rotation of the planet (Coriolis effect).

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Domain: Tackling climate change

1_1: Downscaling of Near Surface Wind in the Alpine Region

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Sub-Domain: Biodiversity

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Sub-Domain: Regional Planning

2_11: 3rd Cohesion Report Map on Territorial Diversity (Fragmentation)

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Sub-Domain: Transboundary Air Pollution

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Sub-Domain: Soil Erosion/Soil Degradation

4_2: Soil Erosion Assessment

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Sub-Domain: Forestry

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None listed

Sub-Domain: Environmental Risk Assessment

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None listed

Maltese Islands Landscape Assessment

Saviour Formosa

Land use data in the Maltese islands: working with high densities in small areas

1. Introduction

Malta is a small state consisting of three small islands with a total area of 316.16 square kilometres, and a built-up area of 23% of the total area; Malta has a population density of 1200 persons per square kilometre. Geographic Information (GI) data is normally created at large scales of 1:1000, 1:2500 and 1:25,000; small-scale EU-wide projects are very rarely developed.

CLC2000 provided the first test case of small-scale photo-interpretation Malta's contribution to CLC2000 was launched on the 2nd July 2003 (MEPA, 2003), with interpretation and verification carried out in August 2003. The project was developed through an agreement between the European Environment Agency, the Malta Environment and Planning Authority (MEPA) and the Umweltbundesamt (UBA)-Vienna. UBA provided interpretation and implementation expert support through the Twinning Project MT2002/IB/EN-01 "Establishing Institutional Capacity in the Environmental Sector".

MEPA's data dissemination policy has resulted in spatial environmental data being made publicly available via the MapServer: a web based on-line GIS available, on the organisation's Internet site. The Malta CLC2000 was converted for uploading to the MEPA mapserver and integrated with other environmental datasets.

There are two levels of users of the MapServer: MEPA staff and the general public. The web based application is used internally to fulfil MEPA's development and monitoring objectives; case officers use the data for analysis of development permit applications, enforcement action and policy review; environmental officers interpret the data for environmental protection projects and monitoring. The general public can access the data for general viewing purposes through an interactive map.

2. Country Background

Malta 

- Country area: 316 km2
- Population:
- National Authority: Malta Environment and Planning Authority
- Contact person: Matthew Gatt
- Contracted organisation: Malta Environment and Planning Authority
- Main CLC2000 outcome:

Milestones:

- Project started: 2003
- Final verification: 19 August 2003
- Project finished: 3 October 2003

3. Application Review

Methodology used

The project was based on a series of inte grated steps: the first s tep invo lved interpretation of the Lan dsat TM7 sa tellite image; the following phases included data digitisation, projection and format conversions and data dissemination. UBA provided the expertise on interpretation and im agery enhancement using IMAGE 2000. MEP A utilised in-h ouse resou rces through the pr ovision of necessary GI lay ers such as ecology and agriculture datasets, and detailed topographic base m aps and orthorectified imagery produced by the nati onal mapping agency that op erates within MEPA's structure.

The greatest problem encountered in th e creation of the CL C dataset was the minimum polygon size of 25Ha stipulated by the CORINE standard. Difficulties occurred when various important areas th at would have been im portant inclusions in the dataset "disappeared" in the interpretati on process, given the small surface area of Malta. The second difficulty was related to scale, as the sm allest scale of the CLC2000 is too generic for mapping the Maltese islands.

Once the d ata layer was cre ated and ver ified, data dissem ination options were explored. Since MEPA had already develope d an application to dissem inate spatial planning data through an Internet based GI S, it was decided that the Malta CLC2000 would exploit this m edium. The ma in objectiv e for the f uture is to use this m edium for all envir onmental da ta; the poss ibility of adding new options to the m apserver such as full-querying functions is anot her objective. The final CLC2000 layer was uploaded to the Environmental Data – Terrestrial section.

An alternative data dissemination medium that will be developed in the near future will include an interactive CD version of the Maltese output. CD development will be carried out in-house; the final product will be developed as either an imagemap, or as an interactive application utilising distributable GIS applications/scripts. This multimedia product will allow users to interact further with data that are not available through the current web-based technologies.

Results obtained and outlook

Though the real use of CLC2000 is limited in the Maltese context due to issues of scale and resolution, the results obtained were highly encouraging. The project offered the developers their first example of interpretation and application of the standard EU small scale. It also offered generalised quick-reference information for both specialists and the general public. The project offered the opportunity to help launch environmental datasets on MEPA's MapServer, and helped disseminate previously unavailable data including information extrapolated from development applications, protection zone coverage, strategic assessment, environmental analysis, EIAs, and a number of other queries.

4. Fact Points:

Key Words: urban planning, landscape

Policy Driver: Urban planning, Landscape and Land Cover

5. Contact

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Maps

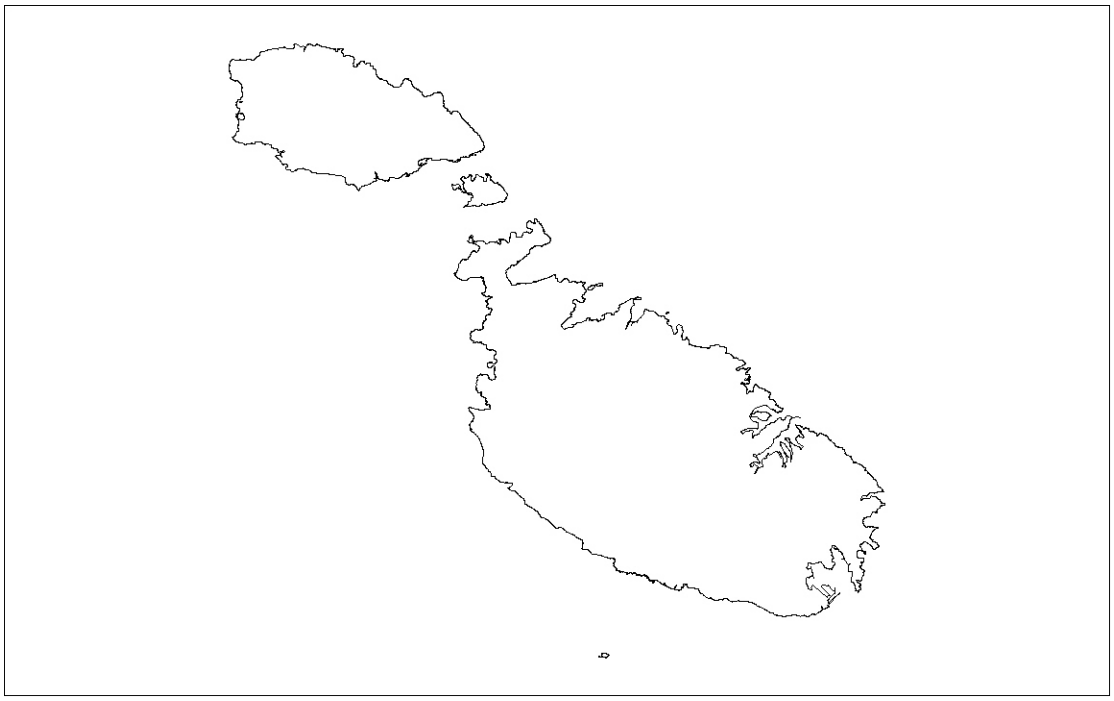

Figure 1: The Maltese Territory

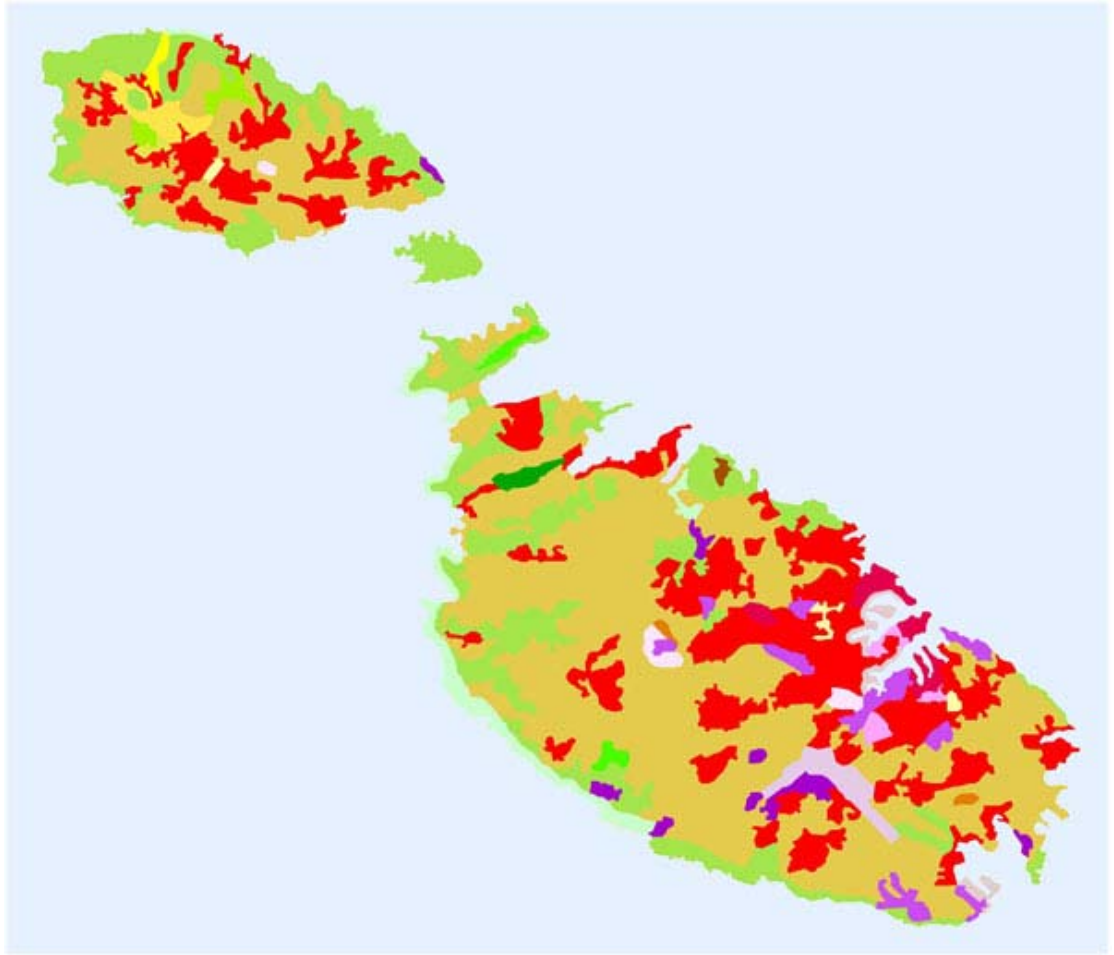

Figure 2: CLC2000