

Topic report

No 9/1999

Land Cover Annual topic update 1998



Topic report No 9/1999

Land Cover

Annual topic update 1998

Prepared by:
Martin Krynitz and Rolf Bergström
MDC, Sweden

June 1999

Project manager:
Chris Steenmans
European Environment Agency

European Environment Agency



Cover design: Rolf Kuchling, EEA

Legal notice

The contents of this report do not necessarily reflect the official opinion of the European Commission or other European Communities institutions. Neither the European Environment Agency nor any person or company acting on behalf of the Agency is responsible for the use that may be made of the information contained in this report.

A great deal of information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu.int>)

Cataloguing data can be found at the end of this publication.

Luxembourg: Office for Official Publications of the European Communities, 1999

ISBN 92-9167-147-9

©EEA, Copenhagen, 1999

Reproduction is authorised provided the source is acknowledged

Printed in Belgium

Printed on recycled and chlorine-free bleached paper

European Environment Agency

Kongens Nytorv 6

DK-1050 Copenhagen K

Denmark

Tel: +45 33 36 71 00

Fax: +45 33 36 71 99

E-mail: eea@eea.eu.int

Homepage: <http://www.eea.eu.int>

Contents

1. The European Topic Centre on Land Cover	4
1.1. Background.....	4
1.2. Work programme for 1998.....	6
2. Progress in 1998.....	7
2.1. Monitoring and data collection	7
2.1.1. Progress in CORINE land cover data collection	7
2.1.2. Emerging needs for updating CLC.....	8
2.1.3. Towards CLC2000, a proposed plan to update the CORINE Land Cover data.....	9
2.2. Information and assessment.....	10
2.2.1. CORINE land cover data storage and information system	10
2.2.2. Integration of nature and land cover information NATLAN	11
2.2.3. Analysis of water catchment areas	13
2.2.4. The European Environmental Information System EEIS	15
2.2.5. Collaboration with UNECE/FAO on European forest mapping	15
2.2.6. Support to European spatial planning policies.....	17
2.3. Assessment and reporting	18
2.3.1. Environment in the European Union at the turn of the century.....	18
2.3.2. EEA indicator based reporting	19
3. ETC/LC products 1998.....	20
4. Plans for 1999	23

1. The European Topic Centre on Land Cover

1.1. Background

The European Topic Centre on Land Cover (ETC/LC) continued in 1998 its support to the Agency's activities on land cover as described in the EEA Annual Work Programme 1998 project on land cover – ecological monitoring. The work of the ETC/LC and the further development of the CORINE Land Cover (CLC) database are significant developments for the integration of environmental aspects, in particular those regarding the Fifth European Community Environmental Action Programme, regional planning strategies and integrated statistical data and geographic information.

The ETC/LC is organised as a consortium of 16 partners as listed in table 1. The ETC/LC lead organisation is the Environmental Satellite Data Centre (MDC), a subsidiary of the Swedish Space Corporation. The Centro Nacional de Informação Geográfica (CNIG) and the European Commission Joint Research Centre (JRC) are co-leaders. The needs for research and development of methods identified in relation to the land cover topic are carried out and funded separately by the Joint Research Centre, Space Application Institute. Since July 1997, the PHARE Topic Link on Land Cover (PTL/LC, financed by the DGI.A PHARE Programme) has extended the activities of the ETC/LC towards Central and Eastern Europe. The work of the PTL/LC is integrated with the ETC/LC work plan. Specific information on products and progress of work of the PTL/LC can be found on the website <http://ptl.gisat.cz/ptl/>. A full overview of the ETC/LC activities and products can be found on the ETC/LC website <http://etc-lc.eionet.eu.int/>.

Table 1: The ETC/LC consortium

Organisation	Acronym	Country
Geospace	GEOSPACE	Austria
Geographic Information Management	GIM	Belgium
National Environmental Research Institute	NERI	Denmark
Finnish Environment Institute	FEI	Finland
Institut Français de l'Environnement	IFEN	France
Federal Statistical Office	StBA	Germany
Hellenic Mapping & Cadastral Organisation	HEMCO	Greece
Natural Resources Development Centre	NRDC	Ireland
EU Joint Research Centre / Space Applications Institute	JRC/ SAI	Italy
Centro Interregionale	CI	Italy
Centre de Recherche Publique – Henri Tudor	CRP-HT	Luxembourg
Centro Nacional de Informação Geográfica	CNIG	Portugal
Instituto Geográfico Nacional	IGN	Spain
Environmental Satellite Data Centre	MDC	Sweden
Winand Staring Centre for Integrated Land, Soil and Water Research	SC-DLO	The Netherlands
Institute for Terrestrial Ecology	ITE	United Kingdom

In 1998, Rolf Bergström was leader of the ETC/LC. Martin Krynitz assisted the Topic Centre leader from October 1998 onwards and took over the leadership from January 1999.

Contact address:	Environmental Satellite Data Centre - MDC P.O.Box 806 SE-981 28 Kiruna
Telephone:	+46 980 671 70
Telefax:	+46 980 671 80
E-mail	mdc@mdc.kiruna.se

Table 2. Overview of the Primary Contact Points for land cover (Dec. 1998)

AT

Mr Peter Aubrecht, Umweltbundesamt; Dept. for Environmental Planning; Spittelauer Lände 5; 1090 Wien; Austria; Tel: +43 1 31304 5438; Fax: +43 1 31304 5400; E-mail: aubrecht@ubavie.gv.at

BE

Mr Jan Voet; Intergewestelijke Cel voor Leefmilieu/ Cellule Interrégionale de l'Environnement; Kunstlaan 10-11; 1210 Brussels; Belgium; Tel: +32 2 227 5676; Fax: +32 2 227 5699; E-mail: voet@irceline.be

DE

Mr Michael Deggau; Statistisches Bundesamt; Gustav-Stresemann-Ring 11; 65189 Wiesbaden; Germany; Tel: +49 611 752730; Fax: +49 611 753971; E-mail: michael.deggau@@StBA.bund400.de

DK

Mr Ole Sortkjær; Danmarks Miljøundersøgelser; Vejlssøvej 25; 8600 Silkeborg; Denmark; Tel: +45 8 9201400; Fax: +45 8 9201414; E-mail: os@dmu.dk

ES

Mr Antonio Arozarena Villar; Instituto Geografico Nacional; Calle de General Ibáñez Ibero 3; 28003 Madrid; Spain; Tel: +34 9 1 597 9575; Fax: +34 9 1 597 9770; E-mail: teledetec@igntel.org

FI

Mr Yrjö Sucksdorff; Suomen ympäristökeskus, akt-palveluyksikkö; P.O. Box 140; 00251 Helsinki; Finland; Tel: +358 9 4030 0643; Fax: +358 9 4030 0691; E-mail: yrjo.sucksdorff@vyh.fi

FR

Mr Jean-Louis Weber; Institut Français de l'Environnement; 61 Boulevard Alexandre Martin; 45058 Orléans Cedex 1; France; Tel: +33 2 38 79 78 78; Fax: +33 2 38 79 78 70; E-mail: eionet-nfp@nfp-fr.eionet.eu.int

GR

Mrs. Katherine Romaidou; Hellenic Mapping and Cadastral Organisation; Timoleodos Vassou St. 11-13; 11521 Athens; Greece; Tel: +30 1 646 08 87; Fax: +30 1 644 70 39;

IS

Mr Thorvaldur Bragason; Geodetic Survey; Laugavegi 178; 105 Reykjavik; Iceland; Tel: +354 533 4000; Fax: +354 533 4011; E-mail: thorvald@lmi.is

IT

Mr Adriano Cumer; ANPA; Via Vitaliano Brancati 48; 00144 Rome; Italy; Tel: + 39 6 326 50587; Fax: + 39 6 326 50724; E-mail: acumer@pns.it

LI

Mrs Petra Bockmühl; Amt für Wald, Natur und Landschaft; St. Floringsgasse 3; 9490 Vaduz; Liechtenstein; Tel: +41 75 236 64 09; Fax: +41 75 236 64 11; E-mail: petra.bockmuehl@awnl.llv.li

LU

Mr Jean-Paul Feltgen; Ministère de l'Environnement; Montée de la Pétrusse, 18; 2918 Luxembourg; Luxembourg; Tel: +352 478 68 13; Fax: +352 400 410; E-mail: eionet-nfp@nfp-lu.eionet.eu.int

NL

Mr Gerard Nieuwenhuis; DLO Winand Staring Centre; Marijkeweg 11; 6700 AC Wageningen; NL; Tel: +31 317 474 200; Fax: +31 317 424 812; E-mail: G.J.A.Nieuwenhuis@sc.dlo.nl

NO

Mr Arnold Arnoldussen; Norwegian Institute of Land Inventory; Raveien 9; 1430 Ås; Norway; Tel: +47 64 94 97 00; Fax: +47 64 94 97 86; E-mail: aha@nijos.no

PT

Mr Rui Gonçalves Henriques; Centro Nacional de Informação Geográfica; Tagus Parque, Núcleo Central, 301; 2780 Oeiras; Portugal; Tel: +351 1 421 98 00; Fax: +351 1 421 98 56; E-mail: cas@cnig.pt

SE

Mr Ebbe Kvist; Naturvårdverket; Blekholmsterrassen 36; 10648 Stockholm; Sweden; Tel: +46 8 698 1547; Fax: +46 8 698 1585; E-mail: eionet-nfp@nfp-se.eionet.eu.int

IE

Mr. Malachy McVeigh; Ordnance Survey of Ireland;
Pheonix Park; 8 Dublin; Ireland;
Tel: +352 1 820 6100; Fax: +352 1 820 4156

UK

Mr. Barry Wyatt; Institute of Terrestrial Ecology;
Monks Wood, Abbots Ripton; PE17 2LS
Huntingdon, Cambridgeshire, UK; Tel: +44 1 487
77 33 81; Fax: +44 1 487 77 34 67;
E-mail: b.wyatt@nerc.ac.uk

1.2. Work programme for 1998

The European Topic Centre on Land Cover in 1998 completed the third year of its initial 3-year subvention. During the first two years, emphasis was on developing the CORINE Land Cover (CLC) database including guidelines for CLC updating. The focus of the work of the ETC/LC in 1998 was on the use of CLC in projects and tasks where CLC data is a basic input for environmental assessments. Most of the applications were developed in support to other topic centres. The main tasks in 1998 were:

- development of datasets for policy relevant European environmental applications within nature conservation, spatial planning, transport, and monitoring of coastal zones changes;
- review of national and European user needs to update the European CLC database;
- improvement of the dissemination of CLC data by further development of the ETC website and the helpdesk functions;
- development of new applications with support from JRC, with emphasis on land cover/land use change indicators.

The PTL/LC concentrated its activities in 1998 on the assessment of land use and land cover changes of the past 20 years in Central and Eastern European countries.

These tasks were co-ordinated with other projects of the EEA work programme and other ETCs, in particular with projects where land cover data is a basic requirement for GIS applications. The ETC/LC collaborated closely with the ETCs on Nature Conservation (ETC/NC), Inland Waters (ETC/IW) and Catalogue of Datasourtes (ETC/CDS). Much effort was devoted to supporting the EEA in its collaboration with other European Commission Directorates General, especially Transport (DGVII), Environment (DGXI), Research (DGXII) and Regional Planning (DGXVI).

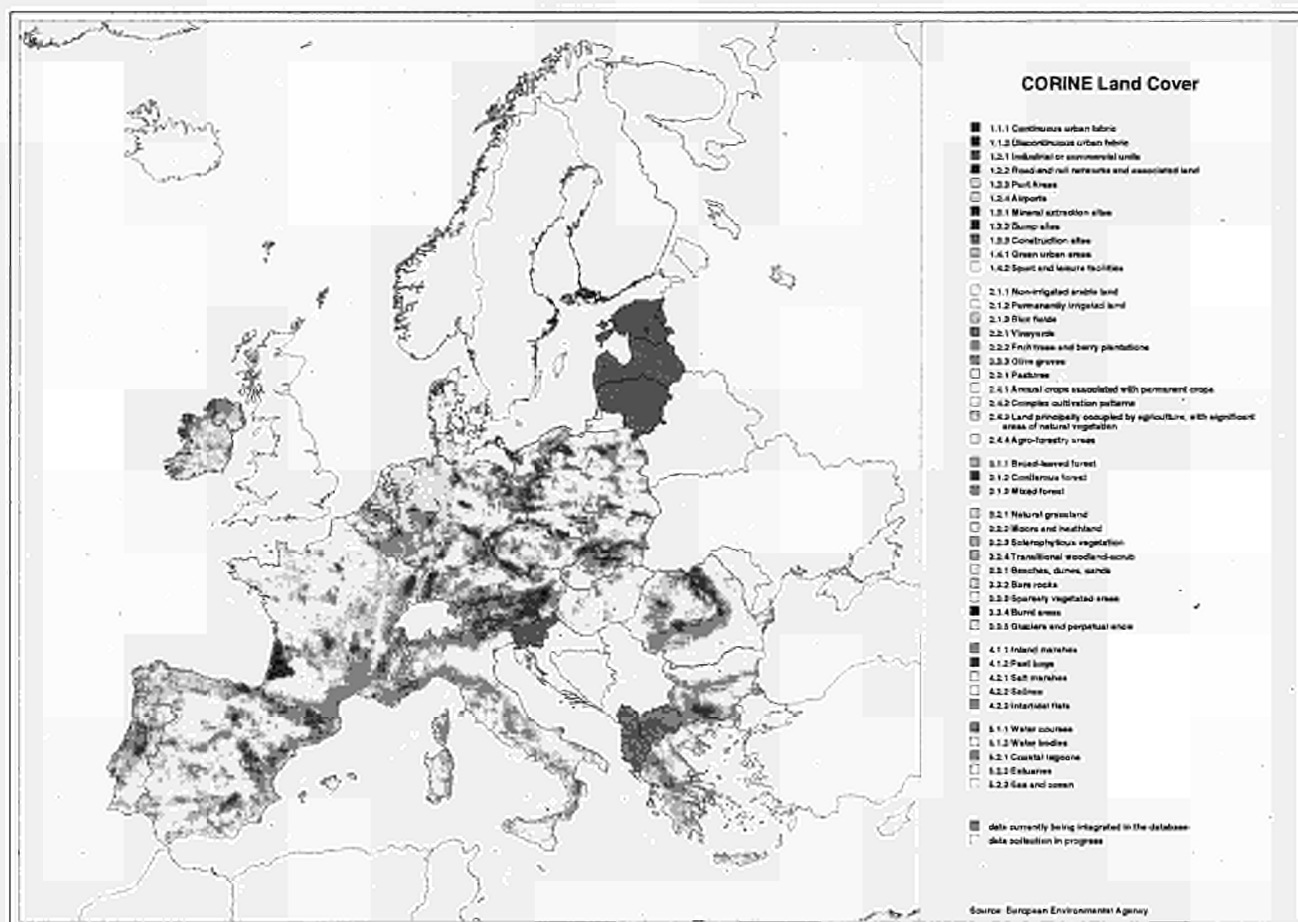
2. Progress in 1998

2.1. Monitoring and data collection

2.1.1. Progress in CORINE land cover data collection

Despite the change in emphasis of the work programme towards analysis and assessment, the development of the CLC database remains a core task of the ETC/LC and PTL/LC. At the end of 1998, CLC data are available for 12 EU Member States, 6 Central and Eastern European countries and coastal zones of 2 North African countries (see figure 1). Historical land cover data was collected by JRC for coastal and urban areas. The LACOAST project in 1998 collected CLC data for the period 1975-1990 for a 10 km coastal strip of 9 EU Member States. The MURBANDY project collected CLC data for a number of European urban agglomerations for the period 1950-1998.

Figure 1. Overview map of geographic coverage of the CORINE land cover database – end 1998



The quality of the data was assessed and documented and a proposal for an improved seamless database was prepared. This proposal to improve the quality of the existing data includes the correction of topological errors in the database, removal of map sheet boundaries, verification and correction of minimal mapping unit, correction of holes in the database and harmonisation of data across boundaries. All these recommendations will be considered during the planned update of the CLC database for the year 2000. ETC/LC provided a copy of the CLC gridded data (100 m and 250 m) to Eurostat/GISCO on a 6 monthly basis to integrate in the GISCO Reference Database.

The ongoing national CLC mapping projects in UK and Sweden were monitored during 1998 and CLC data will be integrated in the European database for UK by the end of 1999 and for Sweden by the end of 2001. The compilation of the national CLC database for Finland was completed and will be available end 1999. In Norway, three test projects were performed. No CLC data is yet available for Iceland and Liechtenstein. The CLC project is in progress in Albania, the Former Yugoslavian Republic of Macedonia and Bosnia-Herzegovina. Data will be available at the end of 1999. The Lithuanian, Latvian, Estonian and Slovenian CLC data are in the process of quality assessment and data will be integrated in the European database in Spring 1999.

2.1.2. Emerging needs for updating CLC

EEA considers that the work to date and the developing user interest and needs are a good basis to justify continuing to invest Agency's resources in the support, co-ordination and use of the CLC database. For some Member States the CLC inventory is 8-10 years old. In order to use this European inventory in environmental applications it is important to update it so as to provide indicators of changes. In 1998, CLC was the most requested database by the public through the EEA Information Centre; over 100 requests for CLC data were addressed to EEA and the ETC/LC. Aggregated CORINE land cover data was provided to 89 organisations in 18 countries for non-commercial use.

EEA and ETC/LC reviewed the user needs of EEA, European Commission and the EEA member countries for CLC data. This was achieved through several discussions with the NFP/EIONET group, EEA and Commission Services. A clear need for an updated CLC database both on European and on national level was expressed by all and was reconfirmed at the Third EIONET Workshop on Land Cover held in Brussels in January 1999. The following European applications identified CLC data as a valuable tool for integrated assessment to support various environmental policies:

- assessing impacts of agricultural policies on the environment, in support to DGVI;
- strategic environmental assessment of the trans-European transport network, in support to DGVII/DGXI (SEA of TEN);
- territorial analysis and development of landscape indicators, in support to DGXVI (Structural Funds, ESDP);
- ecological assessment, in collaboration with the ETC on Nature Conservation for DGXI (Natura2000);
- study of watersheds, in collaboration with the ETC on Inland Waters for DGXI (new Water Framework directives);
- coastal zone management, in collaboration with the ETC on Marine and Coastal Environment for DGXI (ICZM);

- analysis of areas surrounding air quality monitoring stations, in collaboration with the ETC on Air Quality for DGXI;
- modelling of soil degradation, in collaboration with the ETC on Soil;
- development of environmental pressure indices for EU, in collaboration with Eurostat (loss of biodiversity, resource depletion, urban environmental problems).

A questionnaire was sent out mid September 1998 to the NFP/EIONET Group to investigate the national user requirements to update CLC. The analysis of the answers provided by EEA member countries was made in three parts:

- the first part concerned the CLC main users at national level, the applications using CLC and priorities regarding the use and specifications of the CLC inventory;
- the second part analysed the priority given by EEA member countries for the CLC update and the compatibility with other available land cover/land use inventories;
- the third part concerned financing of the CLC update.

The questionnaires were sent out to EEA member countries and all NFPs sent back their replies. From the 18 member countries 12 have completed their CLC inventory. The questionnaires have been analysed by country and for the total (the 18 EEA members). The results were presented at the NFP/EIONET meeting in October and discussed in depth at the Third EIONET Land Cover workshop.

The challenge for updating the CLC data will be to bridge between the national and European user requirements, which stress the need for a compatible, more detailed inventory at local level. The main users of CLC data at national level are researchers/scientists, and policy makers/public administrations. France, Germany, Italy, Spain, Ireland, Austria, Portugal and Greece reported several applications at national level making use of the CLC data. A number of issues regarding the operational use of the CLC inventory, namely access to the database, compatibility with other data, update of the database, product information, distribution policy, resolution improvement and refinement of the nomenclature need to be considered during the update of the database.

The lack of time consistency in the first CLC inventory and the late availability of the land cover database for a complete EU coverage are considered by many users as the main weaknesses for use of the first CLC inventory.

2.1.3. Towards CLC2000, a proposed plan to update the CORINE Land Cover data

The Third EIONET Land Cover workshop, titled 'Towards CLC2000' took place at the European Commission DGXI premises in Brussels on 12-13 January 1999. The workshop was organised against the background of a series of meetings between EEA and key clients discussing the needs of CLC data and the funding of an update and the results of the questionnaire to the NFP/EIONET group. National delegates as well as representatives from Commission Services were invited to discuss with EEA member countries and the Commission how to link national and European user requirements for updating of the CLC data, to find agreement on a common strategy for an update of the national and European CLC data, to bridge between national and European requirements, and to demonstrate a number of applications from the Member States.

A working document with an overview of national CLC applications was compiled in December 1998, illustrating the current use and state of the art of GIS applications, based on CLC data in combination with other socio-economic and environmental data.

The workshop resulted in a general consensus on the update strategy for the CLC database and the technical plan for updating proposed by EEA and the ETC/LC. The plan is based on an inventory of land cover changes (up to 5 ha) using a satellite image snap shot of Europe for the year 2000, referred to as IMAGE2000. The National Reference Centres of participating countries would undertake the update work under technical co-ordination of the ETC/LC.

Further work is needed in 1999 to clarify the specific Commission needs and to promote the awareness of the CLC inventory and its uses in the EU, as well as co-funding of different Directorates General needs to be further investigated. Eurostat proposed to investigate how to improve co-ordination between mapping and statistical approaches, and to work in parallel with the updating.

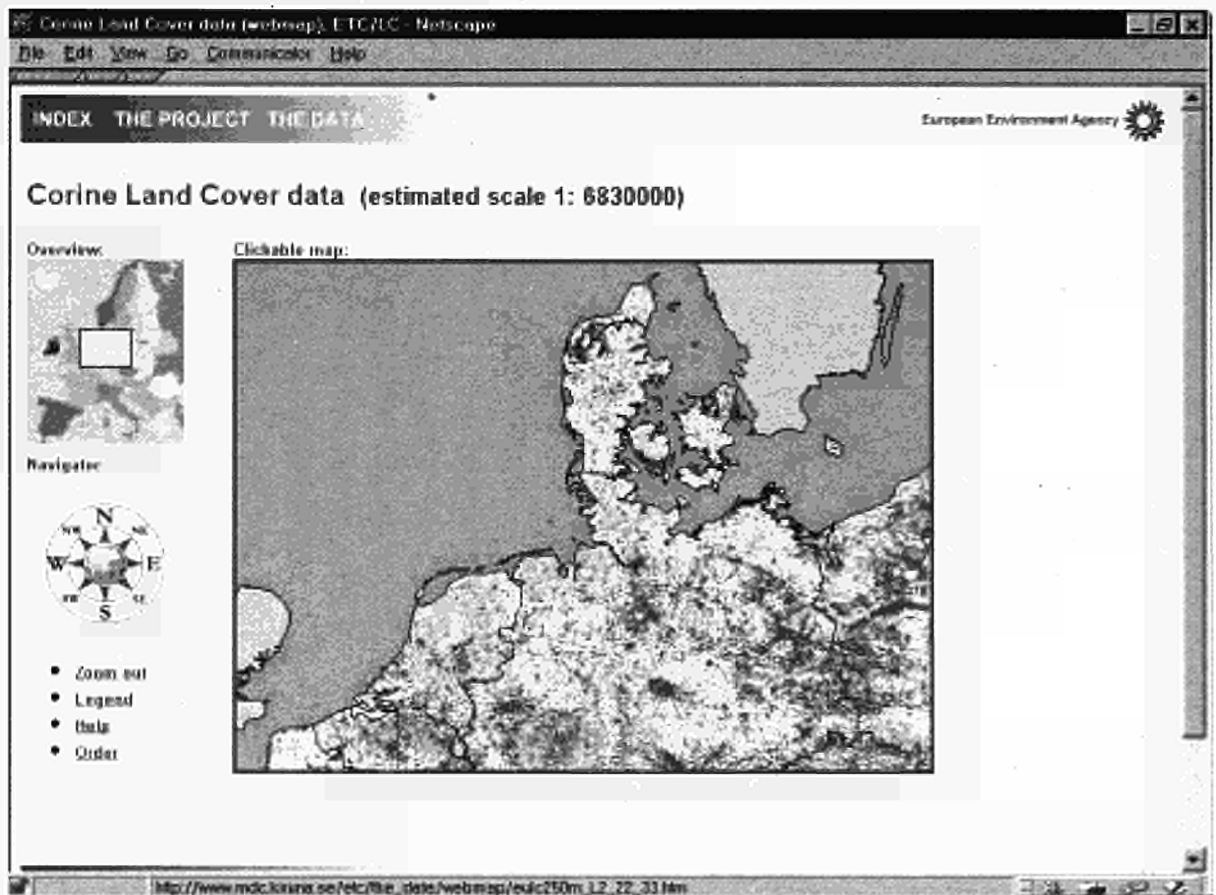
To fulfil the requirements from the user survey, it is proposed to make the high-resolution satellite images needed for CLC2000 available to countries to make it possible to derive high-resolution CORINE products from the input data. The full update should be finalised in 2003. IMAGE2000 should be available in 2001. The budget foreseen for the update in the EU Member States is estimated at approximately 10 MEuro.

2.2. Information and assessment

2.2.1. CORINE land cover data storage and information system

A prototype CDROM was produced containing the available land cover raster data at 250 meter resolution and includes a functionality to browse the European coverage of CORINE LC-data. A copy of the prototype CDROM is available from the ETC/LC on request. The information on the prototype CDROM has also been implemented on an experimental website where the user can reach the same information on-line (see figure 2). The website download functionality will be enabled once the access restriction issues have been resolved with the EEA member countries. Until then it is possible to order the aggregated 250 m CLC database online. Anyone interested in land cover has the possibility to get an impression on the resolution, coverage and quality of the CLC data. The user interface allows navigating through the CLC data at different resolutions and shows the location of the displayed data on a map of Europe. It is foreseen that the website version will be the typical way to provide CLC data in the future.

Figure 2. Example of website interface for on-line data ordering

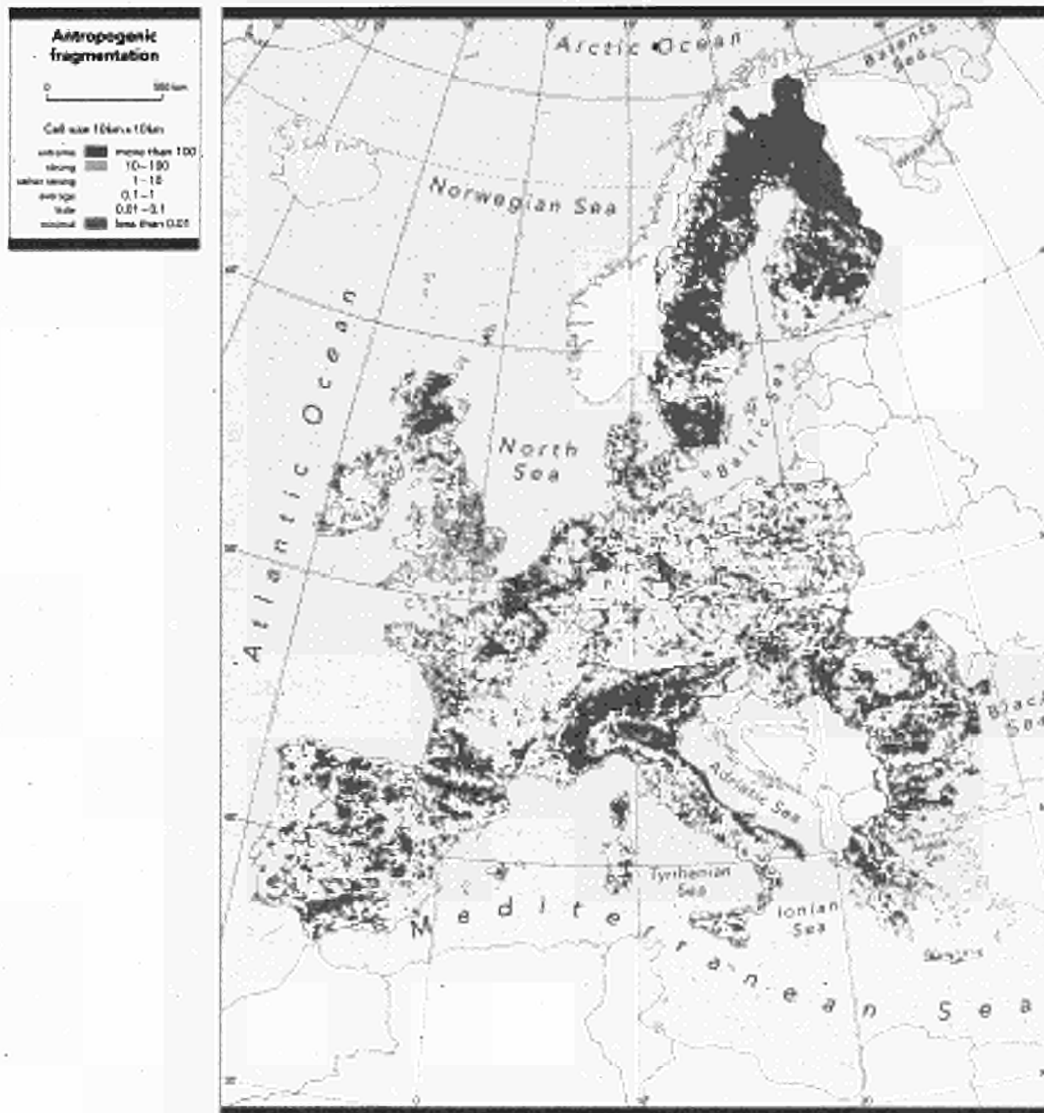


2.2.2. *Integration of nature and land cover information NATLAN*

NATLAN, a CDROM-based presentation package on spatially referenced nature and land cover information, is an EEA key product to be published in 1999 for dissemination of data and information related to both topics. Preparatory work on data compilation and data documentation were completed in 1998. The applications which will be included in NATLAN, address a number of environmental issues with the aim of illustrating the inter-relations between nature and human activities in a European geographic context.

Over 20 different geo-referenced datasets were produced and fully documented by ETC/LC for the first NATLAN CDROM, including habitat maps based on CLC data showing the spatial distribution of the major habitats in Europe according to the EUNIS (European Nature Information System) classification. This was achieved by a projection of land cover classes into habitat types, made jointly by ETC/LC and ETC/NC.

Figure 3. Antropogenic fragmentation index of potential (semi-) natural areas



By spatial overlaying of bio-geographical regions with the EUNIS habitat maps based on land cover (water-bound habitats and wetlands, woodland and shrub habitats, grassland and sparsely vegetated areas, agricultural areas) the distribution of major habitats by bio-geographic region was calculated and presented.

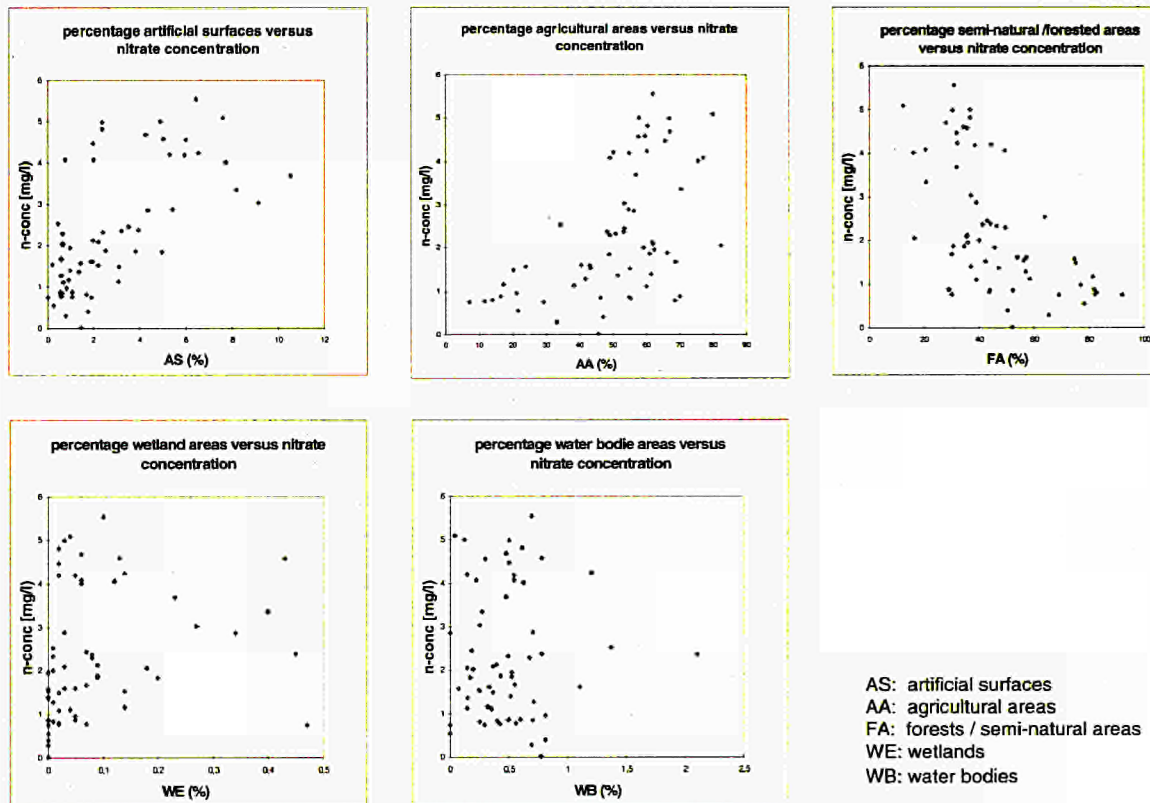
A method was developed in collaboration with ETC/NC to assess the intensity of pressure by human activities (urbanisation, transport and agriculture) in terms of a fragmentation index (see figure 3). The corresponding map illustrates the fragmented European landscape. The fragmentation index has been calculated for a 10 x 10-km grid, which was considered as the most representative for assessment on a European scale.

To assess present or potential threats arising from human activity on nature protection areas, a series of maps indicating international designated areas under pressure from urban areas, agricultural activities and the road and railway transport network were produced. The maps illustrate the pressure inside the designated areas as well as the pressures in the vicinity of the designated sites. Some of the maps will be included in the EEA report 'Environment in the European Union at the turn of the century', to be published in June 1999.

2.2.3. Analysis of water catchment areas

ETC/LC collaborated with ETC/IW on a pilot study for the use of CORINE land cover information to interpret average nitrate concentrations in rivers at the European scale. The ETC/IW is supporting the development of the new Water Resources Framework directives proposed by DGXI. Current European projects aim to establish databases on river networks and catchment areas, relating water quality to land cover characteristics. The objective of the ETC/LC support was to enable comparisons of nutrient concentrations and concentration trends in different types of catchment areas.

Figure 4. Correlation between nitrate concentration and the independent land cover variables

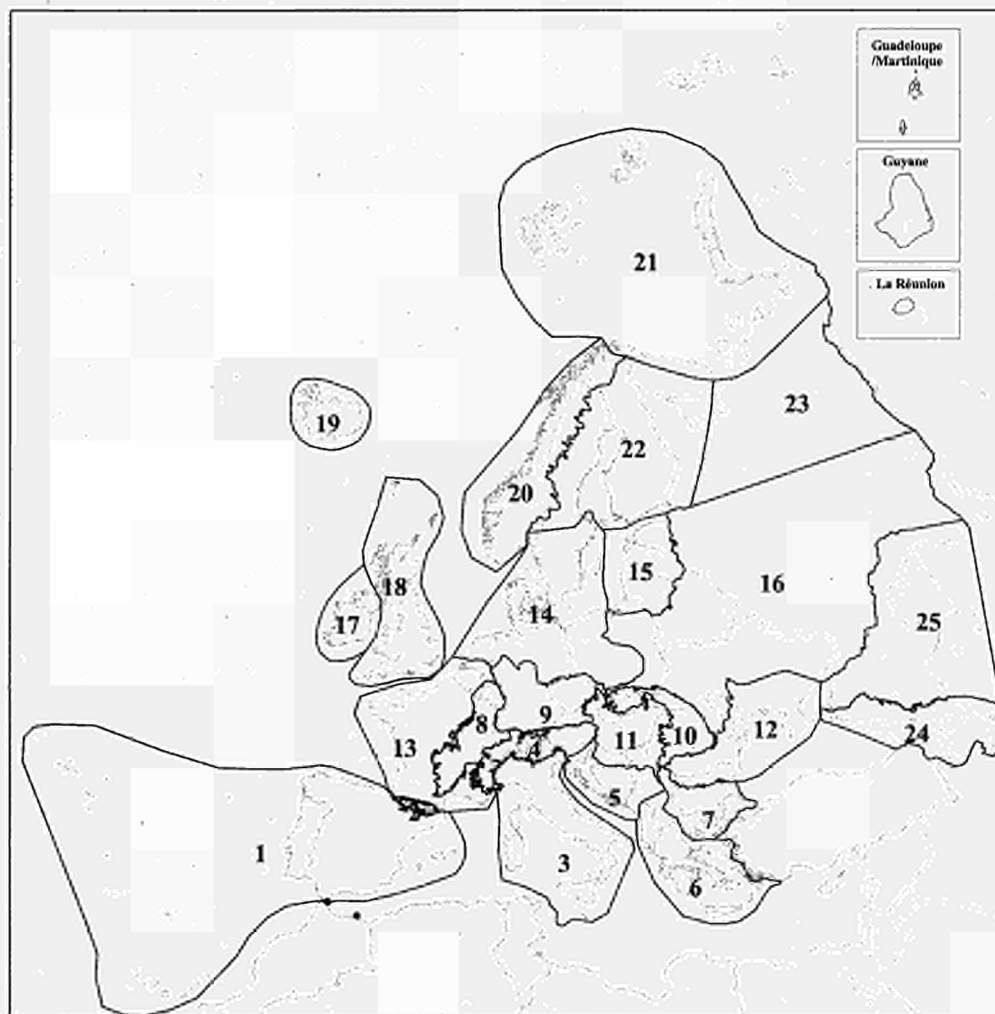


The aim of this pilot project was to evaluate the relevance of different geographical data sets for the analysis of pressures causing differences in water quality across Europe. For the studied catchment areas, the CLC data aggregated to five main land cover classes (artificial surfaces, agricultural areas, forest-semi-natural, wetlands and water-bodies) have been used as a pressure indicator and the nitrate concentration has been tested as a water quality determinant.

A set of regression analyses revealed the correlation between mean nitrate concentrations and agricultural areas and the negative correlation between nitrate concentration and forest/semi-forested areas (see figure 4). All concentrations of nitrate greater than 3 mg/l were found in rivers where the agricultural area is greater than 50 % of the total catchment area. Within the group of agriculturally dominated catchment areas there are also stations with low concentrations of nitrate.

Figure 5. Draft map of eco-regions for rivers and lakes for zoo-geographic divisions of the European freshwater fauna (zoo-geographic divisions of the European freshwater fauna map)

- | | |
|---------------------------------|----------------------------------|
| 1. Iberic - Macaronesian region | 14. Central plains |
| 2. Pyrenees | 15. Baltic province |
| 3. Italy, Corsica and Malta | 16. Eastern plains |
| 4. Alps | 17. Ireland and Northern Ireland |
| 5. Dinaric Western Balkan | 18. Great Britain |
| 6. Hellenic Western Balkan | 19. Iceland |
| 7. Eastern Balkan | 20. Borealic uplands |
| 8. Western highlands | 21. Tundra |
| 9. Central highlands | 22. Fenno-Scandian shield |
| 10. The Carpathians | 23. Talga |
| 11. Hungarian lowlands | 24. The Caucasus |
| 12. Pontic province | 25. Caspic depression |
| 13. Western plains | |



On request of ETC/IW, a map of eco-regions for rivers and lakes for zoo-geographic divisions of the European freshwater fauna was produced by the ETC/LC in collaboration with experts from ETC/IW. The scientific background of these regions and the problems of borderlines were presented and discussed by a team of specialists from 15 countries in the second edition of *Limnofauna Europaea* (Illies, 1978). This scientifically sound and practical attempt describes a comprehensive survey on fauna living in European inland waters with ecological notes and geographic distribution. The geographic information system of the ETC/LC was used for construction of a digital reference layer of this ecological region map (see figure 5).

2.2.4. *The European Environmental Information System EEIS*

During 1998 ETC/LC cooperated with ETC/CDS in the European Environmental Information System (EEIS) project. EEIS is a project between ETC/CDS and the Centre for Earth Observation (CEO) that started in 1997 and will continue until the year 2000. It is funded by DG XIII and will connect the CEO *InfEO* System with the EEA Catalogue of Data Sources (CDS). The purpose of using the 'Catalogue Interoperability Protocol' (CIP) is to make environmental and satellite data available to both user communities. CIP allows separate catalogues to be connected to one virtual catalogue. This means that users find relevant data in catalogues without having to know about the catalogues they search.

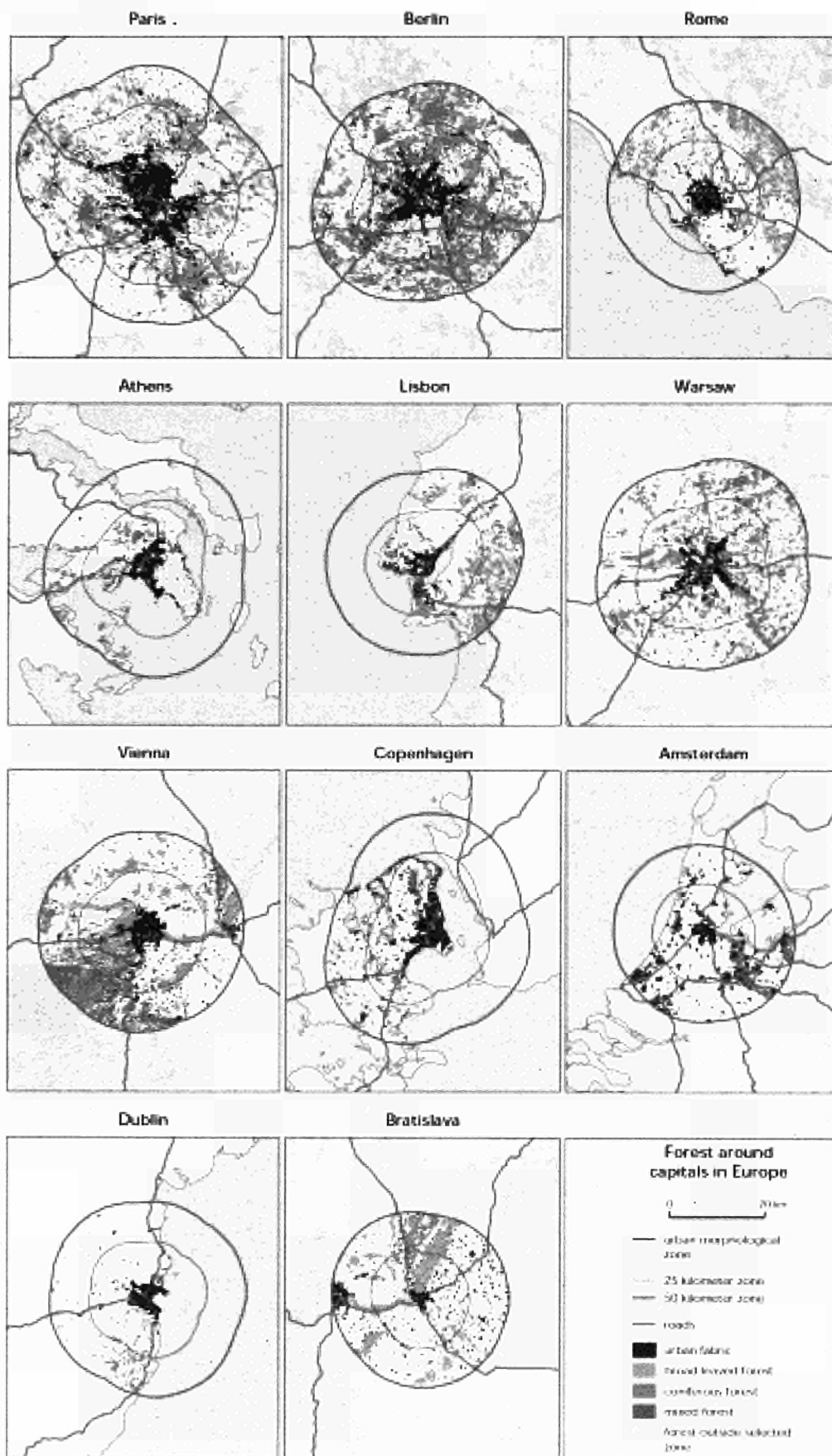
The selected catalogue provider within EEA was ETC/LC, because of its availability of data and the relevance of CLC-data for the satellite user community. A partner of ETC/LC, the Institute of Terrestrial Ecology (ITE), was selected as a national reference centre to demonstrate the access to national databases. This service will ensure access to CLC data for a larger user community and make the finding and ordering of CORINE data easier for users outside the environmental user community. More information is available at <http://eeis.ceo.sai.jrc.it/>.

2.2.5. *Collaboration with UNECE/FAO on European forest mapping*

A set of four forest application maps were produced with the main objective to integrate forest statistics from UNECE/FAO with spatially referenced land cover data. EEA and UNECE/FAO decided to co-publish the results of the UNECE/FAO analysis on forest statistics at national level based on a Forest Resources questionnaire from 1998 combined with the forest classes of the CLC database. The following forest applications were presented at the Ministerial Conference on Forest in Lisbon in June 1998:

- a map entitled 'Forest and people' depicts the distribution of forests in Europe and of forest in the vicinity of densely populated areas in Europe (see figure 6). Inserted maps and graphs show statistics on the presence of forest for all capitals in Europe where CLC data is available;
- a 'Forest and slopes' map displays the distribution of forest and other wooded land on different slope classes in Europe. Inserted graphs show the statistical distribution of forests and other wooded land per slope class within the different bio-geographical regions of Europe;

Figure 6. Extracts from the map on 'Forest and people' produced for UNECE/FAO.



- a 'Forest' map shows the distribution of forests in Europe based on the three CLC forest classes. Inserted maps illustrate the percentage of forest undisturbed by man, the annual increment per hectare of forest available for wood supply and forest per country. Forest statistics on tree logging as percentage of the net annual increment, the growing stock volume per hectare on forest available for wood supply, the net annual increment and percentage forest according to naturalness are other parameters presented in graphs based on statistics from FAO;
- a 'Forest and other wooded land' map includes CLC classes containing all types of wooded vegetation. A number of selected themes from the FAO statistics is presented by country, for instance percentage forest under management, areas of forest and other wooded land, damage by insects and diseases, changes of forest and other wooded land over the last 10 years.

During 1998, ETC/LC also produced a first dataset on fragmentation of large forests by road networks. The fragmentation of large continuous forest areas by transport networks is an increasing concern when considering sustainability of forests or impact on forest ecosystems. The smaller the forests, the more important is the issue, as they are themselves fragments of once continuously forested areas. In some parts of Europe larger forested areas only remain in regions not suitable for other purposes, for instance for agriculture or for urban development. The map 'Fragmentation of large forests by road networks' illustrates the fragmentation in terms of a fragmentation index in 6 classes, expressed as length of a road network per forested area in a grid cell of 10x10 km.

These applications and illustrations are included in the ETC/LC NATLAN technical report, initially available from ETC/LC prior to inclusion in the first NATLAN CDROM to be published by EEA in 1999.

2.2.6. Support to European spatial planning policies

The EEA is supporting DGXVI in the preparation of the first European Spatial Development Perspective (ESDP) and the study programme on ESDP which started end 1998. ETC/LC supported the map production of the first official report on ESDP prepared under the German presidency which is presented at the ministerial conference on European spatial planning in Potsdam in May 1999. ETC/LC participated in 1998 at the kick-off meeting of the study programme on European spatial planning. This one-year study programme which set up a network of national focal points on spatial planning should be considered as an experimental year of the planned establishment of a European Spatial Planning Observatory Network (ESPON).

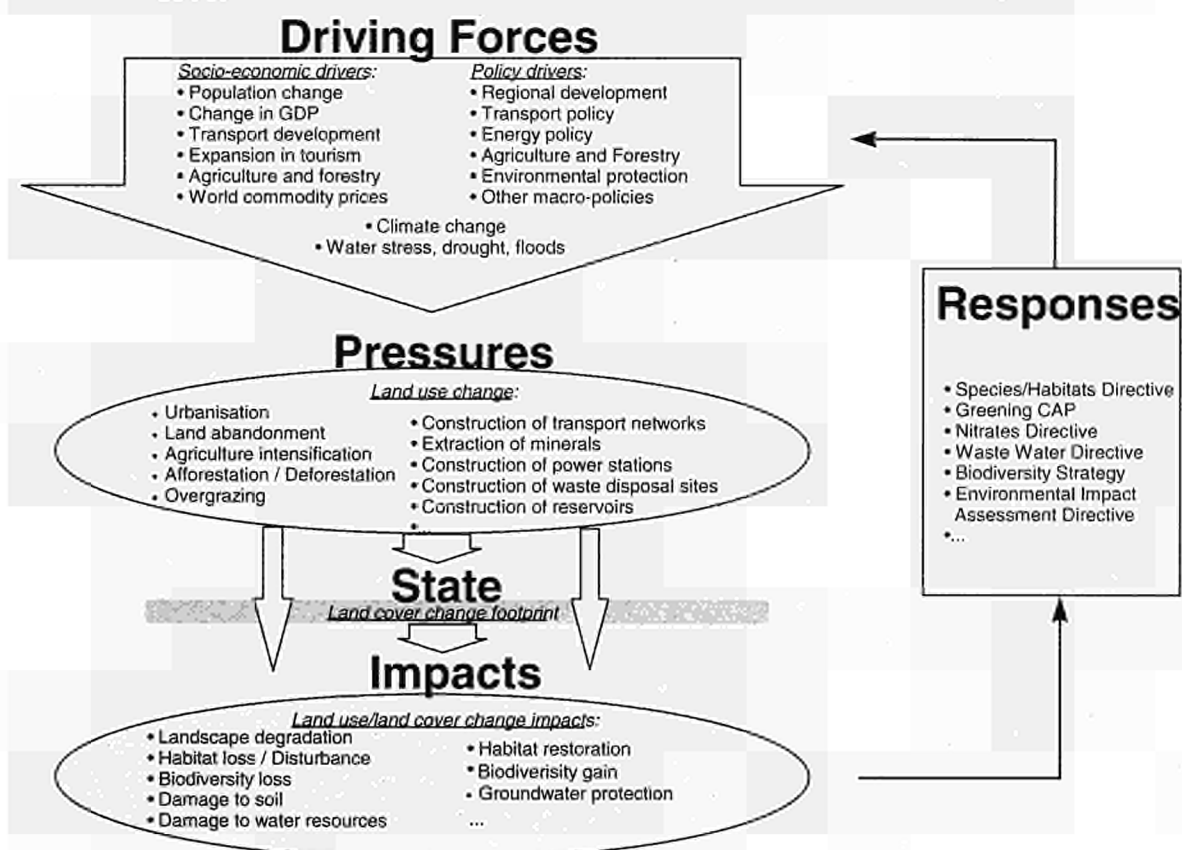
A selected number of major themes within the ESDP exemplify the integration of the various policies which have a spatial impact. A balanced and polycentric urban system, parity of access to infrastructure and knowledge and a prudent management and development of the natural and cultural heritage are just a few examples. ETC/LC drafted a working document, which highlights the proposed contributions to ESDP. This document prepared for demonstrating the potential support of EEA and ETC/LC to the ESDP process is available from ETC/LC.

2.3. Assessment and reporting

2.3.1. Environment in the European Union at the turn of the century

The 'Environment in the European Union at the turn of the century' report is a comprehensive account of the state and outlooks of environment in Europe, to be published by EEA in June 1999. It is based on integrated assessments of European environmental issues presented according to the driving forces-pressures-state-impact-response (DPSIR) assessment framework, as shown for the land use and land cover topic in figure 7.

Figure 7: DPSIR assessment framework for changes in land use and land cover



ETC/LC contributed to different parts of this report. Input was provided to the chapter on 'Land use footprints'. ETC/LC provided support to the spatial analysis of geo-data, map production and the co-ordination of the so-called 'spatial chapters' which address environmental and socio-economic issues in urban, rural, coastal and marine and mountain areas.

ETC/LC also produced prototypes of several maps which were transferred to GRID Warsaw for final map editing. In total, over 50 maps were analysed and all datasets were documented. Several maps used CLC data as input data. Table 3 gives an overview of those maps which integrated land cover data and which are included in the report.

Table 3: Maps produced by ETC/LC in support to EEA on spatial analysis

- Ratio of forest and semi-natural areas to agriculture and urban areas
- Pressures by urban areas and transport network
- Built-up land by major river catchment area
- Built-up land by sub-river catchment area
- Forest and semi-natural area per inhabitant
- Fragmentation of large forests
- Antropogenic fragmentation
- Combined area definition map for spatial chapters
- Zoom on urban and rural areas
- Zoom on mountain and coastal areas
- Population distribution according to land cover class in the selected parts of Europe
- Urban extension Oporto 1950 - 1997
- Urban extension Dublin 1950 – 1998
- Forest distribution around 12 European capitals
- Dominant land cover types in Europe
- Land use and population density in European coastal areas
- Urban centres around mountains
- Land cover map of Europe, integrating CORINE Land Cover (CLC), Pan European Land Cover Monitoring (PELCOM), and USGS Global Land Cover data
- Land cover changes for the area of Zeebrugge, Belgium 1930-1995

2.3.2. EEA indicator based reporting

Land cover data provides major input to the development of environmental and sustainable development indicators. Nevertheless the introduction of the spatial dimension in the definition of indicators is still under development and only included in EEA's indicator based reporting to a limited extent. ETC/LC has assessed specifically environmental indicators related to CORINE Land Cover, expected to provide inputs to future EEA indicator reporting. The study draws on the results from NATLAN, SEA of TEN, spatial planning projects and also considers results achieved by JRC. The results are presented in the form of applications on a number of key environmental issues and were included in the working document of the Third EIONET Land Cover workshop.

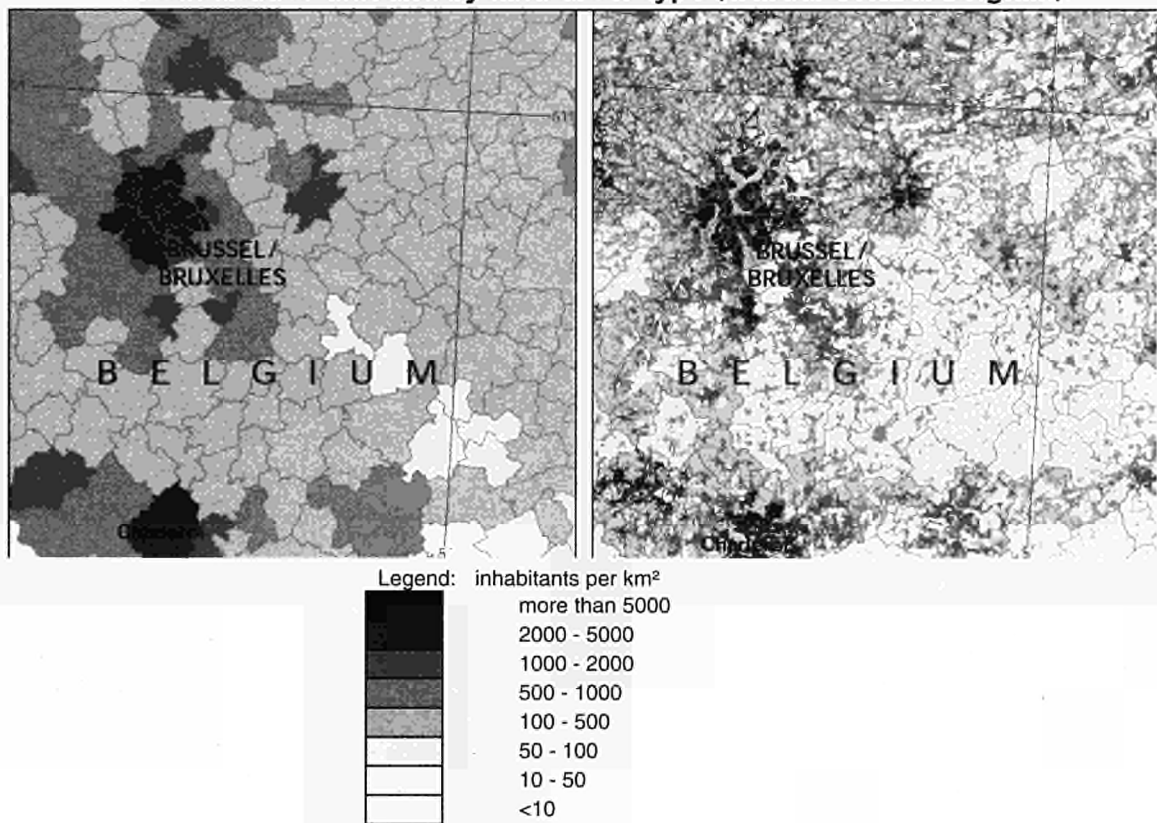
Policy relevance is assessed in reference to the DPSIR assessment framework. The spatial dimension, inherent in the CLC-data, makes the indicators more explicit by making them easier to understand for policy makers and the public. Examples of spatial indicators development are:

- assessment of protected areas: pressures by land use. A prototype dataset was developed showing the pressure of transport networks on international designated sites in 1997;
- coastal zone management: changes over time in land cover categories. The LACOAST project collected data on land cover changes between 1975 and 1990. JRC did this work as support to ETC/LC;
- assessments of changes in CAP: for instance appraisal of the areas with high probability of land abandonment by agriculture. A case study was developed in France for the region of Franche-Comté;

- urban monitoring within the MURBANDY project of JRC, which provides detailed analysis on the change within European cities for the period 1950 - 1998;
- to improve modelling of the greenhouse gas cycle, in particular the carbon sink, correct input of land cover data is essential. A first comparison between the USGS Global Land Cover Characteristics Map and CLC data reveals an underestimate of forests in the global data;
- prototype for the design of a European monitoring water quality strategy, Eurowaternet, based on catchment areas, characterised by land cover, population and agricultural data.

For the development of a number of pressure indicators, ETC/LC produced in collaboration with JRC a new European dataset on the distribution of population using CLC data. A model was applied which disaggregated population data at commune level (NUTS5, Eurostat 1991) assigning different population densities according to different land use and land cover classes. Figure 8 shows an extract of the population data for 1991 represented by administrative unit in comparison with the new population density map based on a spatial reference model using CLC data. This new population dataset will be used for calculation of pressures on protected areas and spatial analysis within coastal zones.

Figure 8. Comparison between the distribution of population represented by administrative unit and by land cover type (extract Central Belgium).



3. ETC/LC products 1998

Table 4 gives an overview of reports, databases and software produced during 1998 and available from EEA or ETC/LC. For more information, contact:

European Environment Agency - EEA
 contact person: Chris Steenmans
 Kongens Nytorv 6
 DK- 1050 Copenhagen K
 tel: +45 33 36 71 16
 fax: +45 33 36 71 99
 e-mail: information.centre@eea.eu.int
 website: <http://www.eea.eu.int/>

Environmental Satellite Data Centre - MDC
 contact person: Martin Krynitz
 P.O. Box 806
 SE-98128 Kiruna
 tel: +46 980 671 70
 fax: +46 980 671 90
 e-mail: mdc@mdc.kiruna.se
 website: <http://etc-lc.eionet.eu.int/>

Table 4. ETC/LC products in 1998

Title	Available	Content
Published Topic Reports		
Annual Topic Update 1997	EEA	Summary description of progress and results in 1997. (ISBN 92-9167-105-3)
Spatial and Ecological Assessment of the TEN: Demonstration of Indicators and GIS methods	EEA	A feasibility study of GIS supported spatial and ecological assessment environmental impacts of the trans-European transport network, based on quantitative evaluation methods. Indicators studied within five environmental themes studied. (ISBN 92-9167-112-6)
Technical Reports		
National CLC Applications	ETC/LC	Working document Third EIONET Land Cover workshop – towards CLC2000.
Potential use of CORINE land cover information to interpret mean nitrate concentrations in rivers at the European scale	ETC/LC	Pilot study in support to ETC/IW on the development of DGXI Water Resources Framework. The relevance of different geographical data set, including CLC, is evaluated for analysis of pressures causing differences in water quality across Europe. Preliminary results.
ETC/LC Contributions to ESDP	ETC/LC	Working document prepared for demonstrating the potential support of the EEA and the ETC/LC to the ESDP needs and objectives, including maps and illustrated applications.
NATLAN Technical Report on Map production and Spatial Analysis	ETC/LC	Maps and documentation produced for the NATLAN CD-ROM, a nature and land cover presentation package. 27 application sheets are presented within four areas: EUNIS and land cover, pressure on natural and semi-natural areas, pressure on designated areas and forests.

Databases		
CORINE Land Cover vector database	EEA, ETC/LC	European land cover database compiled from national CORINE land cover inventories, 44 classes, 25 m minimum mapping unit
CORINE Land Cover 100 m and 250 m grid database	EEA, ETC/LC	100 m and 250 m grid database derived from the vector database; is available from ETC/LC via the helpdesk service.
Major Land Cover Types 250 m grid database	EEA, ETC/LC	250 m grid database including national land cover inventories (not fully CORINE compatible) for UK, Sweden, Finland and Switzerland
CORINE Land Cover Directory	EEA, ETC/LC	Meta information on European CLC database. Contains general information on the national land cover project, basic and ancillary data used for data collection, applied hard- and software, data validation, persons and organisation involved in the data collection process.
Software		
Correspondence to other themes as a basis for integrated approaches	EEA, ETC/LC	Demonstrator software, inter-linking between different land cover/land use classification systems.

4. Plans for 1999

ETC/LC will continue its support to EEA in 1999. The central task will be to support the development of IMAGE2000 and CLC2000. A plan for the full production flow and all production steps will be generated. This will help to find the full necessary funding and to describe the envisaged role of ETC/LC in the implementation of CLC2000. A high quality brochure will be produced to highlight the use and value of the existing CLC data and the need for an update. The brochure explains the connection between regional, national, and European needs linked to CLC data and the extensive value added by updating the present database in a co-ordinated way. It also copes with the additional benefits of the IMAGE2000 concept and the various applications developed by ETC/LC in collaboration with its users, both on national and European level.

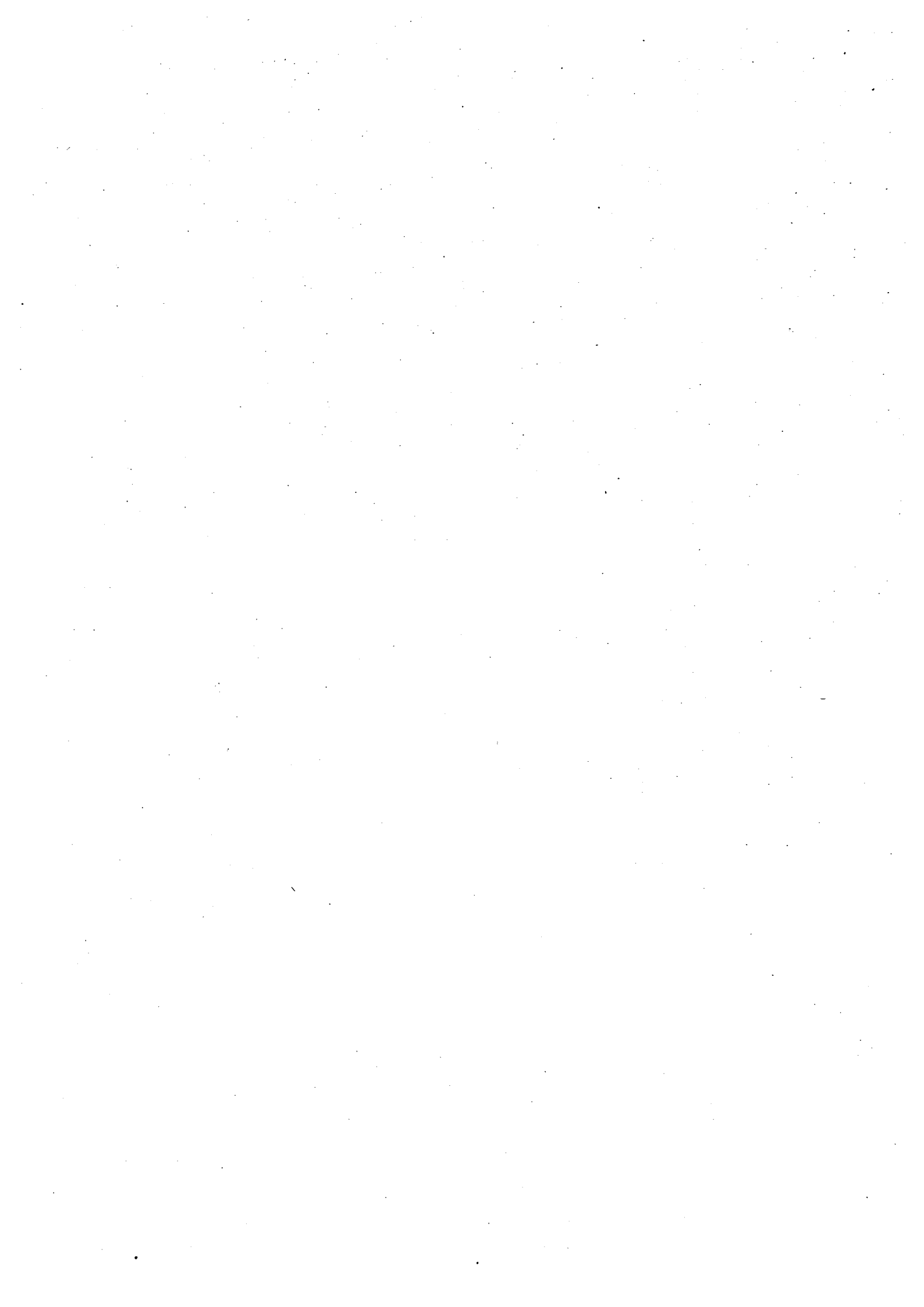
The existing CORINE database will be improved and enlarged by integrating six PHARE countries (Baltic States, Former Yugoslavian Republic of Macedonia, Slovenia, Albania) to the present CLC database and completing the EU15 CORINE Land Cover for Finland and UK. The Topic Centre will renew its website adhering to EEA style and will offer online data ordering of CLC-data. It will also participate actively in establishing in the European Environmental Reference Centre, to be launched by EEA in 1999.

ETC/LC will contribute to EEA reporting activities mainly through support to other topic centres on spatial data analysis and mapping. The links to other existing networks initiatives (Eurostat land use working group, LACOAST, PELCOM, MURBANDY) will be continued.

Table 5. Overview of main planned events 1999

Event/Activity	Event date	NFP/NR C response deadline	Expected output	EEA output date
<i>Workshop</i>				
EIONET Land Cover Workshop	Jan. 99		Minutes of the Workshop	
<i>Country visit to</i>				
UK	Mar. 99		Advisory group meeting CLC UK	
<i>Questionnaire</i>				
Data Access CLC	Sep. 99	Oct. 99	Agreement on web access to CLC data	
<i>Data Update Requests</i>				
CLC database upgrade version June 99	Jun. 99		New release CLC database, including new data PHARE countries	Jun. 99
CLC database upgrade version December 99	Dec. 99		New release CLC database, including new data PHARE and UK	Dec. 99

Reports				
Annual Topic Update report	Apr. 99		EEA publication	Aug. 99
Technical Reference Plan for CLC2000	May 99	Aug. 99	technical reference document describing proposed steps CLC2000	Oct. 99
Environmental indicators based on land cover	May 99	Jul. 99	EEA publication	Nov. 99
Other main events				
Brochure CORINE land cover applications	Apr. 99		EEA brochure on CLC applications	Jul. 99
Newsletter 10	Jun. 99			Jun. 99
Newsletter 11	Nov. 99			Nov. 99



European Environment Agency

Land Cover - Annual topic update 1998 - Topic report No 9/1999

Luxembourg : Office for Official Publications of the European Communities

1999 — 24 pp. — 21 x 29.7 cm

ISBN 92-9167-147-9



The Annual Topic Update 1998 report from the European Environment Agency's Topic Centre on Land Cover (ETC/LC) provides an overview of progress made in 1998 on monitoring, data collection, information, assessment and reporting on land cover related environmental issues.

An overview is given of products produced by ETC/LC during 1998, and plans for further development during 1999.

Not for resale



OFFICE FOR OFFICIAL PUBLICATIONS
OF THE EUROPEAN COMMUNITIES

L-2985 Luxembourg

ISBN 92-9167-147-9



9 789291 671472 >

