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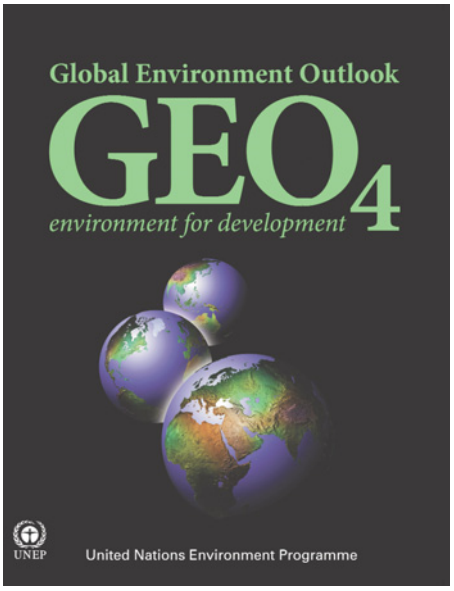
GEO-4 Report launched world-wide on 25 October 2007

by Ron Witt & Jaap van Woerden

The Global Environment Outlook (GEO) is UNEP's "flagship" integrated environment assessment (IEA) process, involving hundreds of participants and stakeholders from all sectors of society. The *fourth Global Environment Outlook: environment for development (GEO-4)* assessment is a comprehensive and authoritative UN report on environment, development and human well-being, providing incisive analysis and information for decision making. The report links findings on the state of the environment with policy analyses, and highlights emerging environmental issues that require policy attention, 20 years after the report of the Brundtland Commission, *Our Common Future*, was issued.

On 25 October 2007, UNEP officially launched the GEO-4 report - the result of five years of intensive consultation and preparation with stakeholders from all regions of the world. Three global launches took place in London, Nairobi and New York, while 41 other local launches were also planned across the world. At UNEP in Geneva, a roundtable on "Europe's environment: Belgrade and beyond", was organized with the Geneva Environment Network (GEN), to mark the launch of GEO-4 and to review the outcomes of the Belgrade Ministerial Conference on the Environment of October 2007. Other European launches took place in Berlin, Brussels, London, Moscow, Paris and Prague.

GEO-4 warns that we are living far beyond our means. The human population is now so large that "the amount of resources needed to sustain it exceeds what is available". The well-being of billions of people in the developing world is at risk, because of a failure to remedy the relatively simple problems which have been successfully tackled elsewhere. GEO-4 recalls the Brundtland Commission's statement that the world faces multiple crises, not just climate change, extinction rates and hunger, but other problems driven by growing human numbers, the rising consumption of the rich and the desperation of the poor. The report states that climate change is a "global priority", demanding political will and leadership. Yet it finds "a remarkable lack of urgency", and a "woefully inadequate" global response. "Fundamental changes in social and economic structures, including lifestyle changes, are crucial if rapid progress is to be achieved." ■



The GEO-4 report, a summary for decision-makers, various fact sheets, media briefs and many other information products are available from www.unep.org/geo/geo4

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KEO Report Launch at the Belgrade Ministerial Conference

by Ron Witt

The sixth Ministerial Conference on "Environment for Europe (EfE)" was held in Belgrade, Serbia, from 10-12 October 2007. Environment and Education Ministers and Heads of delegation from 51 countries in the UNECE region, the Representative of the European Commission, intergovernmental organizations (such as UNEP and UNDP), and regional, national or local NGOs participated in this, the largest event on the environmental calendar for the pan-European region since the last Ministerial Conference held in Kyiv, Ukraine, in May 2003. UNEP along with its close partner the European Environment Agency (EEA) had a major presence at the Belgrade Conference, and was represented by the Executive Director Mr. Achim Steiner, European Regional Director Mr. Christophe Bouvier, and several staff from the Regional Office for Europe (ROE), DEWA/GRID-Europe and GRID-Arendal, and other UNEP divisions.

Many of the side events and much of the less formal interaction took place outside of the main conference room, where UNEP along with the EEA and UNDP had mounted a large and versatile stand for a series of "side events", presentations and distribution of documents. The agenda for "side events" was quite intensive, and no morning, afternoon or evening passed without at least one presentation from UNEP, EEA or UNDP staff who were participating in the Ministerial Conference.

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KEO Report Launch at the Belgrade Ministerial Conference

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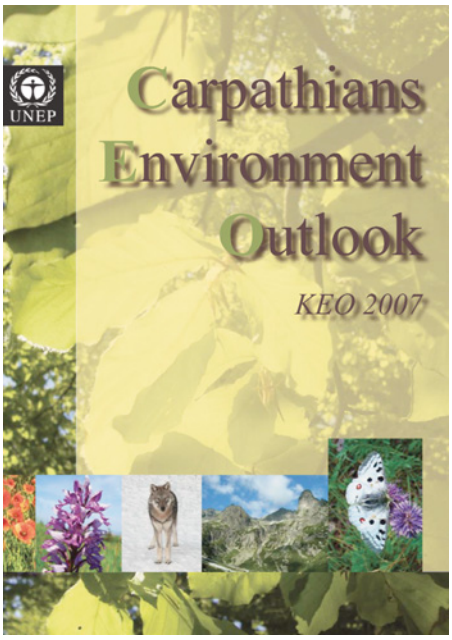
One such side event organized by UNEP's Vienna-based office (which serves as interim secretariat for the Carpathians Framework Convention) was entitled "Strengthening mountain partnerships through legal agreements: challenges and opportunities in UNEP".

UNEP, UNDP & EEA side-vent stand at the Belgrade Conference

This lunchtime event was organized as a panel discussion, including UNEP's Executive Director Achim Steiner and other distinguished panelists, along with a series of brief presentations on relevant activities and products. This provided the appropriate occasion for launching the Carpathians Environment Outlook (KEO) assessment report, which was prepared by regional experts from the seven Carpathian countries during 2005-07, in a participatory process coordinated and overseen by DEWA's European office.

Applying the integrated environmental assessment (IEA) methodology and DPSIR framework, the KEO report covers the major environmental issues (state of environment) and future trends over a 30-year perspective in an integrated manner for the Carpathian portions of the seven countries involved (the Czech Republic, Hungary, Poland, Romania, Serbia, Slovakia and Ukraine). Along with an extensive database covering the environmental and socio-economic themes analysed (driving forces; biodiversity; forest, land, mineral and water resources; atmosphere; wastes; environment and security; and urban development), the KEO report offers the scientific underpinnings for eventual implementation of various protocols prepared under the Carpathians Framework Convention, and provides a knowledge base for future studies of a similar nature. ■



The KEO report can be downloaded from and/or viewed on-line at: www.grid.unep.ch/activities/assessment/geo/KEO

Networking the Environment in Albania

by RonWitt

Following on the successful capacity building efforts of UNEP in the Central and Eastern European Region, GRID-Europe organised and led a "National Earth Observation (EO) and Environmental Data Sharing and Information Networking" workshop in Tirana, Albania, from 4-6 November 2007. The main objective was to bring together many of the leading institutions in the country who are working with environmental data and conducting related activities and analyses for national reporting and other purposes. Another aim was to learn the status quo of "who is doing what" with such data in the country, in particular in light of the "One UN" approach and approved project there.

The Workshop was organized locally by the Albanian Ministry of Environment, Forestry and Water Management, and within the Ministry itself, high-level personnel from the newly-created (in 2007) Agency for Environment and Forestry. The Agency has been given the mandate to coordinate the data collection activities of Albania's thematic institutions working in the environmental field, and thus has a major responsibility of receiving and harmonizing disparate types of data and making them available to other institutes, the research community and publicly.

National Earth Observation (EO) and Environmental Data Sharing and Information Networking" workshop in Tirana, Albania, from 4-6 November 2007

A first part of the workshop was used to provide background and orientation of UNEP's activities in assessment and early warning, along with envrionmental data collection and analysis, as well as UNEP's ENVSEC activities in the region. However, most of the time was used to present a broad series of activities and projects conducted by the Ministry of Environment and Agency for Environment, and the institutes allied with them, described by more than 15 presenters among the 40+ participants. The workshop was useful and came at a fortuitous moment, as highlighted by many participants, with institutional changes taking place now.

In the final analysis, the exchange of information on environmental data, EO/GIS and related project activities served the intended purpose of opening new channels of communication among Albanian institutions charged with overseeing and monitoring the environment, and an excellent first entry point for UNEP to such entities and individuals.■

Mapping of Transboundary Watersheds in Europe for UNECE

by Ron Witt & Dominique del Pietro

Early in 2007, DEWA/GRID-Europe was called upon by the UNECE Secretariat of the Convention on the Protection and Use of Transboundary Watercourses to prepare a series of watershed basin maps to illustrate their planned publication "Our waters: joining hands across borders ~ a first assessment of transboundary rivers, lakes and groundwaters".

For this purpose, a memorandum of understanding was signed between UNECE and UNEP (DEWA/GRID-Europe) towards the production of a total of 35 transboundary maps of lakes and river basins, principally covering the 12 countries of Eastern Europe, the Caucasus and Central Asia (EECCA), and the rest of Europe as well.

A typical map produced for this series by DEW/GRID-Europe's expert cartographer shows the extent of an entire watershed basin along with its principal river and main tributaries, and/or lakes. In some cases, several small watersheds are combined.

Among the watershed basin maps provided were 12 from DEWA-Europe's 2004 publication "Freshwater in Europe: facts, figures and maps". These maps were modified to match the requirements of the UNECE publication and conform with the rest of the series (see sample watershed basin map).

The source information for production of this map series was diverse, including atlases, large-scale maps, gazetteers and internet sites (often in national languages), since there was a need to include correct local names of the lakes and rivers, which often change from one side of a national boundary to another.

The final publication "Our Waters: joining hands across borders" covers altogether 140 transboundary rivers, 30 such lakes and 70 transboundary aquifers. This represents the first time that Europe's transboundary watershed basins have all been mapped in such detail, and is also the first comprehensive analysis of these rivers, lakes and groundwaters of the region to appear in a single publication. The final document produced by UNECE including all the maps was successfully launched by UNECE at the sixth Ministerial Conference on "Environment for Europe" in Belgrade on 10 October 2007.■

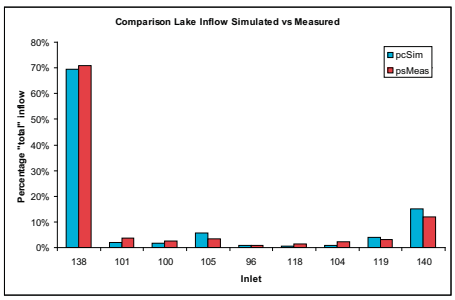
Copies of the publication are available from UNECE (water.convention@unece.org) or through DEWA/GRID-Europe upon request.

Calibration and scenarios application of Lake Balaton hydrological model

by Bruno Chatenoux & Anthony Lehmann

The "Lake Balaton Integrated Vulnerability Assessment, Early Warning and Adaptation Strategies" project began in 2005 and continued through 2007. This project contributes to a better understanding of Lake Balaton's ecological and socio-economic system vulnerability and resilience arising from multiple forces of global and local change, and build capacity for more effective policy-making and adaptation measures in response. GRID-Europe completed the calibration of a local SWAT (Soil and Water Assessment Tool) hydrological model.

Currently GRID-Europe is in the process of applying scenarios based on the



model. Two types of scenarios have been developed: land use and climate.

The land use scenarios are based on CORINE Land Cover 2000 and expand or shrink randomly land cover categories within a defined range until 2030 and 2100. A separate land use scenario has been prepared that is the strict application of the "Lake Balaton Act 2000", the official land use plan.

Climate scenarios are issued from PRUDENCE-DMI models and adapted to the appropriate period (2030, 2100) using the monthly ten-percentiles delta method. A2 (pessimistic) and B2 (optimistic) scenarios have been used.

The aim of running the scenarios is to predict how water quality and quantity will evolve as a function of the scenario used and compared to the actual period used as reference.

Ultimately the output of the scenarios will be integrated to an existing lake model and related to indicators that are not linked to water. ■

MetaLook: a 3D visualisation software for marine ecological genomics

by Gregory Giuliani, Andrea de Bono & Nans Addor

The METAFUNCTIONS project, coordinated by the Max Planck Institute for Marine Microbiology, Bremen (Germany) is pooling expertise in bioinformatics, computer science, geographical information systems and marine sciences to develop a data-mining system that correlates genetic patterns in genomes and metagenomes with contextual environmental data. GRID-Europe has been contributing to the METAFUNCTIONS project through its work on this novel data-mining system.

The GRID-Europe Metafunction Project team contributed to the article "*MetaLook: a 3D visualisation software for marine ecological genomics*", published in BMC Bioinformatics, an open access journal publishing original peer-reviewed research articles in all aspects of computational methods used in the analysis and annotation of sequences and structures, as well as all other areas of computational biology, in October 2007.

BMC Bioinformatics

Software Open Access

MetaLook: a 3D visualisation software for marine ecological genomics

Thierry Lombardot*[1], Renzo Kottmann[1,3], Gregory Giuliani[2], Andrea de Bono[2], Nans Addor[2] and Frank Oliver Glöckner[1,3]

Abstract

Background: Marine ecological genomics can be defined as the application of genomic sciences to understand the structure and function of marine ecosystems. In this field of research, the analysis of genomes and metagenomes of environmental relevance must take into account the corresponding habitat (contextual) data, e.g. water depth, physical and chemical parameters. The creation of specialised software tools and databases is requisite to allow this new kind of integrated analysis.

Results: We implemented the MetaLook software for visualisation and analysis of marine ecological genomic and metagenomic data with respect to habitat parameters. MetaLook offers a three-dimensional user interface to interactively visualise DNA sequences on a world map, based on a centralised georeferenced database. The user can define environmental containers to organise the sequences according to different habitat criteria. To find similar sequences, the containers can be queried with either genes from the georeferenced database or user-imported sequences, using the BLAST algorithm. This allows an interactive assessment of the distribution of gene functions in the environment.

Conclusion: MetaLook allows scientists to investigate sequence data in their environmental context and to explore correlations between genes and habitat parameters. This software is a step towards the creation of specialised tools to study constrained distributions and habitat specificity of genes correlated with specific processes.

MetaLook is available at: http://www.megx.net/metalook

Background

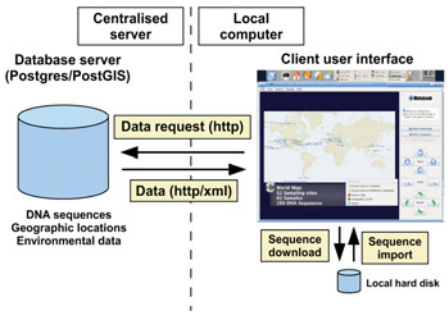
MetaLook: a 3D visualisation software for marine ecological genomics - © 2007 Lombardot et al; licensee BioMed Central Ltd.

Marine ecological genomics can be defined as the application of genomic sciences to understand the structure and function of marine ecosystems. In this field of research, the analysis of genomes and metagenomes of environmental relevance must take into account the corresponding habitat (contextual) data, e.g. water depth, physical and chemical parameters. The creation of specialised software tools and databases is required to allow this new kind of integrated analysis.

The Max Plank Institute project team implemented the MetaLook software for visualisation and analysis of marine ecological genomic and metagenomic data with respect to habitat parameters. The MetaLook interface is a locally running client based on the Java 3D API, started using the Java Web Start technology from the megx.net data portal. GRID-Europe staff performed World Oceans Atlas data set integration and interpolations.

MetaLook offers a three-dimensional user interface to interactively visualise DNA sequences on a world map, based on a centralised georeferenced database. The 3D approach allows displaying larger amounts of data and interconnections than a classical 2D visualisation.

The user can define environmental "containers" to organise the sequences according to different habitat criteria. To find similar sequences, the "containers" can be queried with either genes from the georeferenced database or user-imported sequences, using the appropriate algorithm. This allows an interactive assessment of the distribution of gene functions in the environment.



Client/Server architecture of MetaLook. The Java3D client runs on a local machine and gets data from the PostgreSQL server through HTTP request in XML format. DNA sequences of interest can be up- and downloaded for further analysis.

MetaLook allows scientists to investigate sequence data in their environmental context and to explore correlations between genes and habitat parameters. This software is a step towards the creation of specialised tools to study constrained distributions and habitat specificity of genes correlated with specific processes.

According to the article, some interesting DNA sequence tools making use of 3D are currently available. These examples show the benefits of advanced visualisation tools for DNA research and the management of large data sets. However, within this context, MetaLook is unique in its orientation toward environmental genomics, geographic and contextual data integration.

The availability of worldwide physical and chemical parameters linked to DNA sequences opens the way to multivariate analysis. This approach will be crucial as more georeferenced genomic and metagenomic samples become available. The integration of low-quality sequences (e.g. single reads from metagenomics) and biodiversity markers (e.g. ribosomal RNA genes) in the project team geographic- centric system is also a follow-up perspective.

Marine ecological genomics is an emerging field of research but available high quality and accurately georeferenced sequence data are still sparse compared to the natural habitat and organism diversity. Therefore, the observed absence of genes in particular habitats may reflect a mere gap in the database coverage. However, with the use of appropriate software tools, common knowledge can be easily confirmed and unexpected findings can be obtained for further investigation, as shown here with the example of a light-dependant gene present in the deep-sea. As more sequences with rich contextual (meta-) data from marine genome and metagenome projects are released, the accuracy and reliability of correlations between gene occurrence and habitat parameters will continuously improve. Targeted studies of gene distribution in the environment are greatly facilitated by our specialised databases and software tools presented here, offering an advanced software workbench for biologists.

More results on the METAFUNCTION project will be available from October 2008, when this European project will end. ■

BMC Bioinformatics:
www.biomedcentral.com/bmcbioinformatics

Metalook::
http://www.megx.net/metalook

MetaFunction
www.metafunctions.org

Swiss Environmental Domains (SwissED)

by Karin Allenbach & Anthony Lehmann

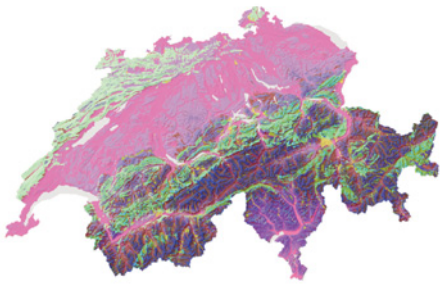
Swiss Environmental Domains (SwissED) is an original environmental classification of Switzerland based on a set of 9 essential climatic, geologic and topographic variables. Combinations of these different factors will define a landscape classification that group together sites with similar environmental character. Such a classification will help to locate similar "pseudo-ecosystems" across Switzerland. Environmental domains within one group may not be completely identical, but they will display similar potential groups of species and similar biological interactions and process.

Although Environmental Domains were initially developed as a tool for biodiversity management, it has a much wider application. Actually, environmental factors that control the distributions of many land-based plants and animals (temperature, water supply, etc.) are also factors that provide major constraints on human land uses such as agriculture, horticulture and forestry.

Compared to a traditional ecosystem classification, generally depending on subjective synthesis of multiple information sources, this multivariate classification approach presents several advantages because it is adjustable, categorical, repeatable and scalable.

The method was originally developed in New Zealand by John Leathwick at Landcare Research organisation (www.landcareresearch.co.nz/services/informatics/lenz/) (Leathwick et al, 2003).

This GRID-Europe project, mandated by the Swiss Federal Office for the Environment (FOEN), started in February 2007 and should be finished by the end of June 2008.



Map of level IV Swiss Environmental Domains classification using color scheme bases on PCA of 100 groups

Environmental space

The choice of environmental variables input is crucial in the development of environmental domains.

Nine 25m-resolution grids were finally selected to develop a general purpose classification adapted to Switzerland.

- Climatic (Mean Annual Temperature, Minimum Annual Temperature, Mean Growing season Moisture Index)
- Geologic (CaCO3 gradient, Permeability gradient, Age)
- Topographic (Topographic Position Index at small scale (500m), Topographic Position Index at large scale (2000m), Slope)

Climate estimates are derived from mathematical surfaces fitted to long-run average climatic data (Zimmermann: http://www.wsl.ch/staff/niklaus.zimmermann/progs.html).

Lithology has been extracted from the geotechnical map of Switzerland provided by the "Schweizerische Geotechnische Kommission (SGTK)" and then reclassified into principal geological gradients (CaCO3, permeability, age).

Slopes and Topographic Position Index are estimated from the Digital Elevation Model at 25m resolution provided by Swisstopo, using the Topographic Position Index (TPI) tool (www.jennessent.com).

Methodology (clustering)

The nine layers are combined to form the environmental space on which a random sampling of points (500'000) has been extracted.

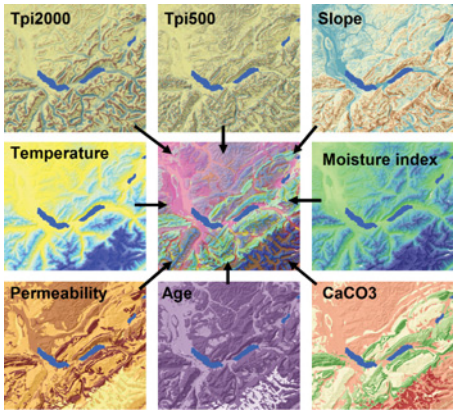
Then the points are grouped into different "domains" (100 groups) calculating their similarity "distance" in the environmental space (non-hierarchical classification).

These groups are then hierarchically organized (dendrogram) merging successively each group together (agglomerative hierarchical fusion).

The project team retained four levels of classification to work at various scales and at different levels of details (10, 25, 50, 100 groups).

Finally, classification results were applied to all pixels covering Switzerland (64 million) using a C++ code and then transfered back into a GIS.

An ingenious way to map the domains (non-continuous geographic distribution) is to create a color scheme using a Principal Components Analysis on environmental variables where the first three axes will correspond to Red, Green and Blue bands in the resulting image. By this mean, Red-Cyan axis corresponds to a temperature-moisture gradient; Green-Magenta axis corresponds to a geological gradient and Blue-Yellow axis to a topographic gradient.



Contribution of the different variables on the classification result

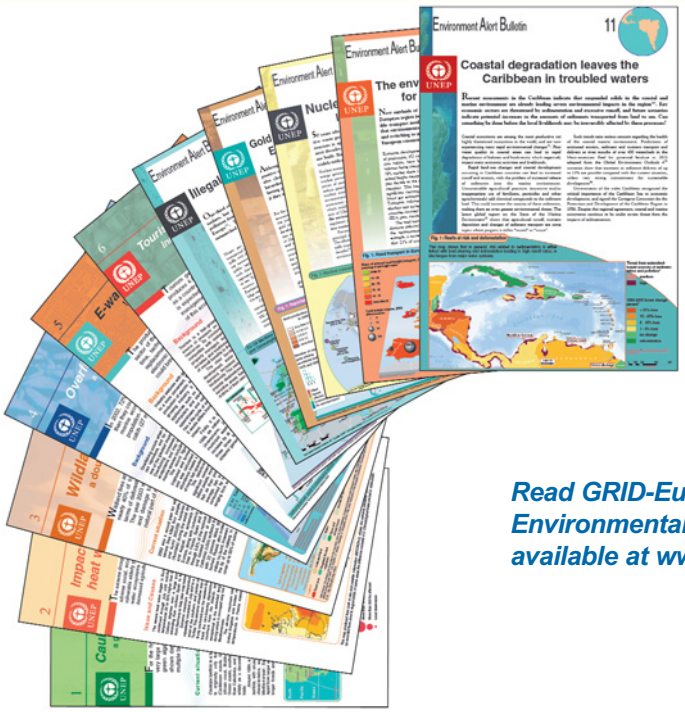
Applications

The project team believes that SwissED will bring a new and necessary spatial framework to underpin environmental research and management in Switzerland at a range of scales.

Future applications could be:

- identifying the most efficient use of limited financial resources for biodiversity management, including management of protected natural areas and other areas of land with high biodiversity values;
- identifying sites where similar problems are likely to arise in response to human activities, or where similar management activities are likely to have a particular effect;
- identifying the geographic extent over which results from site-specific studies can be reliably extended;
- providing a framework for regulatory activities and reporting on the state of the environment; and
- designing stratified sampling strategies.■

Ref: Leathwick J.R. et al. 2003, Conservation Biology, 17: 1612-1623.



Read GRID-Europe Environmental Alert Bulletins, available at www.grid.unep.ch

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GRID-Europe's latest outputs & major contributions

The fourth Global Environment Outlook (GEO-4) - UNEP - Publication
Carpathians Environment Outlook 2007 UNEP/DEWA - Publication
The environmental price to pay for heavy goods traffic - Environment Alert Bulletin 10 - UNEP/GRID-Europe - Six pages
L'impact écologique des transports de marchandises -Bulletin d'Alerte Environnementale 10 - PNUE/GRID-Europe - Edition 6 pages
State of Environment of the Donetsk oblast, Ukraine (russian) - UNEP/GRID-Arendal - Publication
GEO YEREVAN: Assessment of The Local Environmental Conditions, 2004-2006 Summary report - UNEP/GRID-Arendal - Publication
MetaLook: a 3D visualisation software for marine ecological genomics - BMC Bioinformatics - © 2007 Lombardot et al; licensee BioMed Central Ltd. - Research article
Overview map of main transboundary surface waters in Western, Central and Eastern Europe - Created for "OUR WATERS: JOINING HANDS ACROSS BORDERS", UNECE
Daugava river basin - Created for "OUR WATERS: JOINING HANDS ACROSS BORDERS", UNECE - Map
Don river basin - Created for "OUR WATERS: JOINING HANDS ACROSS BORDERS", UNECE - Map
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