Stay informed – get involved!

EcoChange Briefing Sheets regularly inform on the progress within the project activities and can be downloaded from our website. If you are interested in receiving the *EcoChange newsletter* on a six-month basis, please subscribe to ecochange@seri.at or register on our website. You will then also receive an invitation to the stakeholder workshop in summer 2011 where EcoChange results will be discussed with the public.

Find more information at www.ecochange-project.eu!

The EcoChange Project

Aim and Focus

The aim of EcoChange is to assess and forecast changes in terrestrial biodiversity and ecosystems. The project assesses the capacity of biodiversity and ecosystems to supply humans with required goods and services and to buffer against climate and land use change.

The project concentrates on the improvement of models and the generation of new data. It also integrates the findings with socio-economic analysis. Project work is organised into six activities.

Project information

EcoChange -"Challenges in assessing and forecasting biodiversity and ecosystem changes in Europe" is an Integrated Project with 22 Partners from all across Europe. It is supported by the 6th Framework Programme of the European Union. Contract number: FP6-036866

Project duration: January 2007 – December 2011

The consortium of EcoChange is led by the National Centre for Scientific Research (CNRS), Grenoble, France. Project Co-ordinator: Pierre Taberlet, pierre.taberlet@ujf-grenoble.fr

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EcoChange

Briefing Sheet Series 1
2008

Improved modelling and uncertainty assessment

Work Description of EcoChange Activity 5

Activity 5 aims at improving the main modelling approaches used to derive projections of global change impact on biodiversity. It includes: niche-based models, dynamic vegetation models and landscape models. Improvement is achieved by improving the techniques themselves, but also by incorporating new remote sensing predictors, assessing and developing multi-scale and multi-model ensemble approaches, developing and incorporating advanced dispersal modelling into current approaches, and better evaluating models' predictive power and assessing uncertainty associated with model projections.

EcoChange Briefing Sheet

Activity 5
Improved modelling and uncertainty assessment

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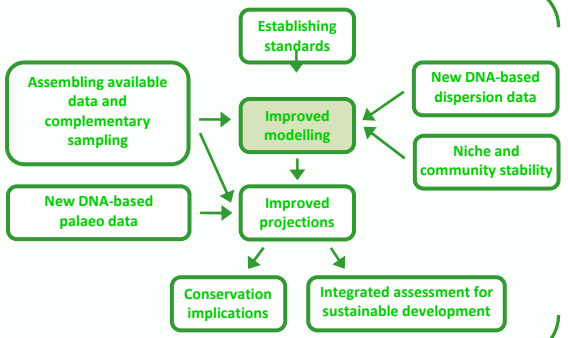

Overview

Over the last two decades, several modelling techniques were developed and used to evaluate the potential impacts of global change on biodiversity. However, despite major methodological improvements, some major limitations remained that required new data and developments to be overcome. This activity precisely builds on the previous four activities where new data of crucial importance are generated and important modelling assumptions are being tested, to further improve modelling techniques and derive global change projections and integrated assessment.

Objectives

Activity 5 aims at improving a range of modelling approaches, especially:

1. Statistical niche-based models of species and diversity distributions.
2. Dynamic models (including DVM and landscape models).

Besides improving each approach and model per se, key efforts here will be to:

3. Develop a dispersal module for species or functional groups that can be further incorporated into the different modelling approaches;
4. Evaluate all types of models and their projections; in particular, we will test the ability of models to predict the future by assessing how they predict the past from the present (hindcasting), or the present from the past (forecasting).
5. Quantify uncertainty along the whole modelling process to provide more informative projections of global change impact on biodiversity in Europe at various spatial scales.

Approaches

Two core activities take place within this activity: (i) an array of models are being developed and improved at three geographical scales over currently existing approaches; and (ii) thorough testing and uncertainty analyses of the models are carried out.

The three scales used for modelling are Europe (continental scale), regional study areas (e.g. Alps, Finnmark, Central Europe; regional scale) and local study areas (landscape scale). Three types of predictive model are being improved over currently existing approaches. First, niche-based models of species distribution, ecosystem boundaries, and biodiversity pattern are calibrated based on new spatial predictors of climate, topography and land use. Scale effects are also assessed and multi-model projections (ensemble forecasting) developed with these models. Second, a hierarchical hybrid model, combining a spatially explicit dynamic landscape model and a population viability model is being developed and tested. And third, biogeochemistry models (LPJ, CARAIB) are being improved and will be applied to scenario simulations in order to evaluate expected ranges of ecosystem processes and functioning for a range of plant functional types, biomes and bioclimatic affinity groups in Activity 6. A transversal effort is also dedicated to developing a dispersal module that can be incorporated in all these modelling approaches. The new dispersal routine will allow simulating forecasted migrations in all three types of models, by considering either species or functional groups.

Testing and assessing uncertainty in models and projections is a crucial task, yet not sufficiently considered so far in global change ecological studies. A thorough evaluation procedure is being developed to assess predictions. Here, paleoclimatic data obtained in A1 will serve at projecting models back and forth between past and present times, as a way to evaluate our ability to predict the future. Projections in the past will be checked against paleodata on past species distribution from the European pollen database and, where possible, using the novel paleo DNA identifications from A2. Uncertainty assessment is as important. It is assessed at all levels of the project, by gathering and storing error and uncertainty estimates associated to all data, modelling techniques and projection tools used or developed throughout the project.

Expected results

This activity will deliver test of scale effects and power of new remote sensing predictors in niche-based predictive models of species distribution, and optimized biodiversity scenarios from multi-model ensemble forecasting. On the dynamic side, it will deliver new plant functional type classification to be used by the landscape model, improved CARAIB and LPJ-GUESS models, and a new hierarchical dispersal modelling tool tested by simulating past migrations and compatible with all previous modelling approaches. Sources of errors and uncertainties in global change projections should have been identified and procedures developed to evaluate models' predictive power and to associate uncertainty estimates to individual or ensemble projections.

Publications

see http://www.ecochange-project.eu/publications/PublicationsActivity5.pdf/view