

## **Where have the flowers gone? From natural vegetation to land use and land cover types: past changes and future forecasts**

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The objectives of this work were two-fold: (1) to quantify past changes that have affected the natural vegetation of Europe, and (2) to analyse what rates the model of land use change (MOLUSC, developed in ALARM by Rounsevell et al.) resulted for the alpine zone. Past changes included (a) the quantification of the degree of conversion by human activities of natural vegetation in Europe, and (b) an analysis of the distribution of land use – land cover types in the major zonal (bioclimatic) and azonal vegetation types. Rates of forecast land use change were made by comparing the values produced by MOLUSC; the downscaled results for each of six scenarios and three time scales were compared against the baseline of the aggregated CORINE classes of the year 2000. As climate change and land use are perceived as drivers of equal importance for alpine and arctic environments, we sought an answer to the question if modelling climate change and land use, using climate and land use scenarios developed by the ALARM project indicated similar degrees of change.

The assessment of the extent of modification by land use of each of the main natural vegetation types was made by comparing the model map of natural vegetation of Europe (Bohn et al. 2004) with the GLC 2000 Global Land Cover map (<http://www-gem.jrc.it/glc2000/>). The analysis has shown that over 40% of the total land area is under cultivation. Some of the main natural vegetation types (mostly lowland and lower montane) have undergone large rates of conversion, while others such as those in the upper montane and alpine zones have been affected little.

A modest rate of change was predicted by MOLUSC in the alpine zone: a slight increase in forest cover (2-5%) and a corresponding decrease in 'grassland' cover. Predictions of climate change alone, based on forecast temperatures using identical scenarios to those employed in MOLUSC suggested a dramatic decrease in the alpine climate zone. A dynamic vegetation model alone (developed in ALARM by Lund University) also indicated a potential high reduction in today's alpine zone. The MOLUSC output suggests a high degree of control on vegetation change by land use in the alpine zone, a zone where land use - land cover maps suggest a low degree of human impact.

Bohn U, Gollub G, Hettwer C, Neuhäuslova Z, Raus T, Schlüter H, Weber H. 2004. Map of the natural vegetation of Europe. Scale 1 : 2 500 000. Part I. Explanatory text with CD-ROM Bonn: Bundesamt für Naturschutz.