Climate change and nature, integration of spatial policies with a land use model

Michiel van Eupen[1] Sabine van Rooji[1] Eveline Steingröver[1] and Eric Koomen[2]
[1]Alterra Wageningen UR, Wageningen, the Netherlands, [2]VU University, Amsterdam, the
Netherlands

Objective of this research is to model the impact of climate change and land use pressures on the
spatial configuration of nature areas, related to a series of climatic and policy scenarios. The
results of the study can be used to evaluate current nature conservation policies and will be
useful to future optimising and implementation of nature areas related to climate change. Future
land use is an important topic in studies related to planning and evaluation of spatial strategies.
Land-use models are a well known instrument to inform spatial planners of the possible future
land-use configurations, describing changes in the area of land use types related to such spatial
strategies. The current available land-use change models are based on the determination and
quantification of the main drivers of land use change. Results of this analysis are integrated into
mathematical allocation mechanisms which redistribute the predefined areas per land-use-class
based on location specific potentials.

This approach, in which socio-economic and biophysical factors are driving the rate and location
of land use change, is limited applicable to the current procedure of nature planning. In the
Netherlands the sometimes purely political decision for the designation of nature areas cannot be
combined with the approach used for modelling the other land use classes (e.g. change within
agriculture or urbanisation). As a consequence the current land use models are failing when
focussing on planning of nature. In the land–use scanner this is solved by predefining and
allocating a fixed area for nature, prior to the allocation of all other land use classes. However,
this is disturbing the principle of a dynamic land use model, which should be able to integrate all
social, economic and spatial drivers involved. In our new approach, nature is integrated more
stepwise and iterative into the land use model. First climatically and site conditions are used to
calculated the probable distribution of nature types. This is done with current available state of
the art models calculating effect of (the change in) site conditions (e.g. groundwater and
precipitation) on nature. These potentials for nature types are the basis for further allocation and
can be combined with strategies to keep or remove current designated areas.

Second step is the iterative integration with other land-use classes with probably competing
claims at the same locations. Based on economical or social factors of importance, reallocation
of nature areas could be considered. This decision can be made based on mathematical
thresholds (e.g. maximum applicable economical cost for nature) or just based on expert
judgement. Reallocation of nature can be based on the results from the first step. The new
approach was applied in a Dutch case study, focussing on the climatically robustness of the
Dutch Ecological main structure related to current known land-use pressures in the Netherlands
up to 2040. We conclude that the new stepwise application of nature in the land-use scanner
produces new and potentially useful information for policy makers, although the involved
models and especially their climate knowledge are still under development.