

A European Vulnerability Assessment

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Introduction

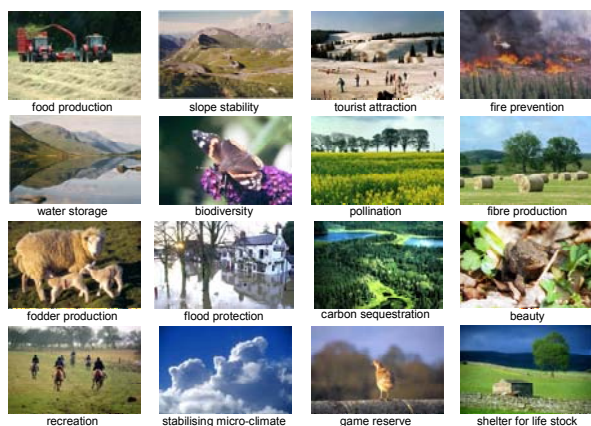
Ecosystems provide a number of vital services for European people and society. Global environmental changes, for example in climate and land use have significant effects on ecosystem services. The ATEAM project investigated the vulnerability of stakeholders to these effects.



Global change impacts the human-environment system - humans are integral parts of European ecosystems.

Objectives

- (1) to translate scenarios of global change into potential impacts (changes in ecosystem services) and changes in society's macro-scale adaptive capacity
- (2) to assess our resulting vulnerability



Ecosystem services are the conditions and processes through which ecosystems, and the organisms that make them up, sustain and fulfil human life.

Methodology

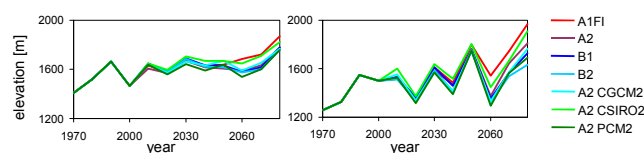
Taking up the challenges recently posed in vulnerability science (Schröter et al. 2004), vulnerability within the ATEAM project is a function of two elements: (1) changing supply of ecosystem services, and (2) changing macro-scale adaptive capacity of a region.

From the beginning of the project the approach was developed and discussed with stakeholders. Changing supply of ecosystem services was estimated by a framework of models of the human-environment system. A consistent set of multiple scenarios of changes in climate and land use was input to these models (based on 4 socio-economic storylines, SRES A1f, A2, B1, B2, and 4 general circulation models). The ability to adapt to changes in ecosystem service provision was considered based on socio-economic scenarios.

Results and Conclusions

The set of multiple plausible global change scenarios shows severe changes in European climate and land use in the next century. Though some of the expected impacts may be considered positive (e.g. increases in forest area, increased forest productivity), and others hold potential opportunities for the future (e.g. "surplus land" for extensification of agriculture or biomass energy production), most of the anticipated changes have negative impacts on ecosystem service supply, and therefore human society.

A climate driven decline in soil fertility is expected (indicated by soil organic carbon losses) in some areas. Drought and fire pose an increasing risk to Mediterranean forests, and the distribution of some Mediterranean tree species is projected to change, e.g. cork oak, holm oak, aleppo pine and maritime pine. Europe's terrestrial biosphere currently acts as a small carbon sink. Despite considerable regional differences all scenarios show a weakening of this carbon sink after 2050, because the soils of boreal forests begin to loose more carbon than the trees take up. Projections of occurrence of more than 2000 species across Europe for 2080 show great sensitivity of biodiversity under all climate change scenarios. Flexible management of nature reserve areas is necessary to maintain the conservation effect under changing environmental conditions. Mountain tourism may be impacted negatively in both winter and summer. In winter the elevation of reliable snow is expected to rise considerably. In summer the frequency of heat days is expected to increase.



Elevation above which the snow cover is reliable as projected for seven future climate scenarios over time. The left chart shows the Alptal catchment, the right chart shows the Verzacsa-Lavertezzo catchment.

The full range of environmental impact scenarios provides spatially explicit projections of ecosystem services over time, including for the first time the variation over multiple plausible scenarios. This variation may be high, however, a considerable amount of it is due to the socio-economic pathway we choose to take. The main trends in anticipated environmental impacts of global change seem clear enough to trigger both immediate action and further inquiry.

The full set of results is made available on an interactive CD-ROM with maps, charts and documentation. The project final report and a journal special issue are currently being completed.

Literature: Schröter, D. et al. 2004 in press. Assessing vulnerabilities to the effects of global change: an eight step approach. *Mitigation and Adaptation Strategies for Global Change*. Next issue.