

Scenarios of sylvan development in Hesse under the influence of climatic change – the results of a preliminary study

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With a forest proportion of 42 %, forest management plays an important part in the Hessian Integrated Climate Protection Programme 2012 (INKLIM 2012). The effects of climatic change – which can already be observed – must be identified and, on the basis of a forecast up to the years 2050 and 2100, it must be deduced what measures should be taken.

Within the INKLIM Programme, forestry research began within the framework of a preliminary study with the assessment of data on the distribution of tree species on the basis of sylvan surveys on a 4x4 km sampling network and of climate scenarios calculated in 10-year periods up to 2050. This was then evaluated on the basis of definitions given in the Hessian Instructions for Forest Management Planning (HAFEA, HMULF 2002). The following questions arose:

- What changes do the site elements growth zone (dependent on temperature) and climatic moisture (dependent on temperature and precipitation) as defined by HAFEA undergo? Both are important for the growth and vitality of trees.
- What alterations occur in the assessment of the main tree species with regard to the site types and objectives of silvicultural management as laid down by HAFEA? The site types and silvicultural management objectives combine empirical knowledge about which sites are suitable for the economic exploitation of certain tree species.

The results show that the expected climatic changes may have considerable impact on Hessian forests. **Growth zones** defined according to the chief climate type show a clear shift in the frequency distribution of mixed beech forest zones towards dry-warm mixed oak forest zones, which by the decade 2041-2050 would have spread to cover about 95 % of the Hessian forest area. Changes in **climatic moisture** up to 2050 are less clear, though a slight shift towards a subcontinental climate may be expected.

The evaluation of climate scenarios up to 2050 shows a gradual increase of as yet undescribed site types and silvicultural management objectives of **beech** (242 points). The majority of these points lies in areas of mixed oak forest, in particular in moderately subatlantic regions where it can be assumed that factors which limit the growth of beech are absent.

Oak (102 points) shows a marked decrease in those growth areas up to 2050 which do not answer to silvicultural management objectives for this main tree species. Most of the Hessian afforested areas should by then be suited to the growth of oak.

For **spruce** (246 points) the evaluation of climate scenarios up to 2050 shows an increase of as yet undescribed site types and silvicultural management objectives and of sites that do not conform to these objectives up to the decade from 2041 to 2050. The majority of sites will then be found in the areas of mixed oak forest, particularly in temperate and moderately subatlantic areas of climatic moisture on sites that today are fresh or slightly so and which would be considered not particularly suited to the growth of spruce.

The most conspicuous result for **pine** (131 points) is the strong decrease of areas that do not conform to silvicultural management objectives by the decade 2041-2050. Around two thirds of site combinations are to be regarded as conforming to silvicultural management objectives during that period.

Literature

HMULF (Hessian Ministry for the Environment, Agriculture and Forests) (2002): Hessian Instructions for Forest Management Planning (HAFEA), Wiesbaden, 72 pp.