Foreword

The now printed thesis of Mr. Wei Hou, which originated in the period of his stay at the Leibniz Institute of Ecological and Regional Development, deals with advanced methods of landscape structure analysis and remote sensing for landscape monitoring. Background is a widespread approach in landscape ecology, according to which the landscape structure or, in other words, the "pattern" or "mosaic" of a landscape arises from the composition and arrangement of discrete patches, e.g. Individual land use units.

These spatial patterns can be quantified using "landscape metrics". The goal is to capture the structure of a landscape, to document it for the purpose of monitoring, or to provide it as input parameters for landscape ecological simulation models. Up to now, however, landscape metrics have mostly deviated from concrete landscape elements. Ecologically important transitional areas between such elements, e.g. height differences, have so far been not or hardly included. In addition, small-scale elements such as individual trees, shrubs, hedges, etc. are also important for a landscape monitoring, but these often do not show up in existing data. The work begins on these two points. The objectives of the work were:

- Development of a model and corresponding methods for the detection of small landscape elements or biotopes as well as transitional areas between different land uses (ecotones) from remote sensing data and a high-resolution digital surface model.

- Integration of the small-scale landscape elements and ecotones into the methods of landscape structure analysis by adapting or extending existing methods and indices of landscape structure analysis.

For his work, he used data from the satellite "RapidEye" and high-resolution elevation data from airborne laser scanning. He subsequently developed a multi-level approach in which small-scale landscape elements can be detected using common image processing and GIS software. Furthermore, transitional areas between different land use classes, here mainly between forest and open land, can be characterized. Afterwards, methods for analyzing the landscape structure are presented on this basis. Specially developed indices allow the analysis of landscape diversity, fragmentation, landscape contrasts and biotope networks. Both for complex methods for the detection of small-scale elements and ecotones, as well as for the methods of landscape structure analysis, own algorithms and indices were developed. The developed methods were tested in study areas in Germany and China and their behavior in different landscapes and with different data bases were examined.

Mr. Hou has made a significant contribution to the progress of this research area - even in the international context - with the doctoral thesis he has presented. The innovative approaches, which he developed and exemplarily prepared, testify to this. Beyond that, the work also shows the necessity and also possibilities for application in landscape monitoring. We are confident, that the methods developed by him will find interest and application in science and practice.

Ulrich Walz