Landscape Structure Analysis

Tool for Sustainability Impact Assessment on the Regional Level?

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Impact Assessment of Land Use Changes

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Contents

- Why landscape structure analysis?
- Experiences in Austria (SINUS)
- Calculating landscape structure indices for Europe – transferring the concept for SENSOR
- Differences of indices between regions and land cover classes – first results and discussion
- Indices as indicators?
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Landscape structure captures “frozen” energy cascades and matterflows ("landscape ecology")

The excessive use of fossil energy creates simple geometry in agricultural landscapes ("fractal geometry")

Landscape elements, landscape types, regions, etc. are part of a hierarchical system ("hierarchy theory")
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Elaboration of spatially explicit indicators for identification and monitoring of Austrian agricultural landscapes with different “degrees” of sustainable land use
1. Which kind of landscapes do we have?

delineation and classification of landscape types

Result: 12 Types and 47 Subtypes
2. What is the current state of our agricultural landscapes?

landscape structure on local, regional and national level

supervised classification
3. Which attributes of landscape structure depict (un)sustainable agricultural land use?

eg. deviation from regular field pattern in a specific landscape type
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Which kind of landscapes do we have?

Spatial Regional Reference Framework

10 regions * 3 samples
= 30 sampling sites
What is the current state?

- indices-calculation with V-LATE 1.1

mainly CONFIGURATION metrics describing:

- spatial character (e.g. size, shape)
- arrangement, position, orientation

COMPOSITION metrics: Shannon’s Diversity and Shannon’s Evenness
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example results
example results - univariate analysis

Hypothesis: Mean Shape Index of „Arable land“ differs significantly between European Regions

- each structure index depicts differences in regions per land cover
example results - multivariate analysis

- discriminant analysis to filter differences between regions
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landscape level (examples)

- no relationship visible between diversity indices and structure indices
- proportion of „urban“ LC-classes

![Graph showing the relationship between SRRF and % of urban classes.](chart)

little significance of indices on landscape level
class level (examples)

- in principle – YES (recent literature!)

- f.ex. „if Shape Index in arable land is higher than average (median), then it is more ‘sustainable’“
discussion points (1)

- landscape metrics show a high variability within the cluster regions
- but there are clear differences in regard to single indices and classes between the regions
- a clear set of rules allows the estimation of sustainability indicators in regard to the average
discussion points (2)

- a better spatial resolution of land cover data (CLC2000 insufficient) would add to the refinement of structure in regions and assessment of indicators – BUT: currently not operational as sustainability impact indicators on the European scale

- field validation in sample landscapes would lead to substantial improvements in indicator development (landscape structure is an indirect measure for sustainability)
Thank you for your attention!

references:


www.sensor-ip.org
3. Which attributes of landscape structure depict (un)sustainable agricultural land use?

- Direct assessment of robust and widely used DPSIR indicators (e.g., Fragmentation, percentage of built up area,..)

- Formulation of expert knowledge based rules and application of fuzzy logic algorithms

- Determination of human impact by calculating the deviation from an average situation of a certain Cultural landscape type