University of West Hungary
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Theses of doctoral (PhD) dissertation

National and European Union landscape policy impact assessment

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Background and objectives

Landscapes are formed by human activities, which are highly determined by policies implemented throughout strategies. The term landscape in the dissertation is interpreted according to the European Landscape Convention, in which landscape means: "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (EUROPEAN COUNCIL, 2000).

The impact assessment of landscape policies, national and European Union environmental and nature conservation and spatial development programs, landscape protection, landscape management strategies (summarized in landscape policies) has a great importance, as future decisions can be made only with the knowledge of landscape impacts. The survey topic is actual, because the accession to the European Union resulted in the implementation of landscape protection and landscape management programmes and strategies which form the landscapes throughout measures related to different sectors like agriculture, industry, forestry, mining, water management, tourism. Finally, the landscape impacts from various sectors are present together and shape the landscape character. Very little has been done in practice to develop landscape impact assessment methodologies. In Hungary there is no practice in the complex examination of landscape impacts.
The doctoral dissertation aims to carry out tasks that are although related to three themes, they are closely linked: the analysis of landscape policies and landscape impact assessment methods and developing indicators. The most important research objectives are the following:

- To analyse the landscape-forming strategies, programs, plans (summarized hereinafter as landscape policies), and describe efforts to assess the impacts of policies. The research doesn't aim to analyse the full range of EU policies, it is limited to the analysis of spatial planning, environment and nature conservation, rural development, agri-environment policies. Moreover, one research objective is to assess the local stakeholders' needs and efforts, through which the author

tries to explore the relation of the bottom up and top-up strategies.

- To explore the landscape impact assessment methodologies, then to apply the landscape character assessment in order to determine the key characteristics of landscapes, which changes is being examined.
- To develop landscape indicators to assess the impacts of landscape policies and landscape changes and testing on selected study areas. Moreover, an objective is to analyze database for developing and testing indicators.

Data and methods

Due to the specificities and complexity of the research, several methods were applied. The author analyzed landscape policies after the selection and delineation of study areas. Two methods were applied: the document analysis and interviews with questionnaires.
In parallel, the current state of landscape, including the ongoing landscape processes were revealed with the method of landscape character assessment (including literature review, field surveys, statistical and geographical information systems). Landscape character types were delineated and the key characteristics were summarized for each landscape character type. The author developed landscape indicators based on the key characteristics. Some of them were tested on selected study areas in different time series and on various scales for the assessment of landscape changes and policy impacts.

Theses of the dissertation

1. During the research, the author reviewed the national and European Union landscape policies (programs, strategies, plans) and showed the initiatives of impact assessment. Landscape policies are related to spatial planning, rural development, agri-environmental measures, nature conservation and environmental protection. From literature it has been revealed that the assessment of landscape change due to policies although

increasingly important, there is still no generally applicable methodology to assess landscape impacts.

1.1. Measuring the landscape changes and impacts is an extremely complex task, that's why this aspect of analysis is not widespread. Most researches are sectoral, they analyse the impacts of separated measures, mostly on designated areas, in most cases protected or sensitive natural areas.

1.2. As a result of the European Union agricultural policy, agri-environmental measures and landscape management subsidies became available, which landscape impact assessment covers the changes in landscape components eg. wildlife, soils, waters.

1.3. The outcome indicators in the related landscape policy documents indicate the process of programmes, but they are not suitable to indicate the impacts on landscape resulting from the implementation of measures.

2. The author has collected the most important landscape policies in two study areas (concepts, programmes, plans, in the English literature summarized as policies) and after their content analysis the author concluded that many measures can be related to landscape change.

2.1. In the study area of Zala and Fertő-Hanság, landscape change processes derived from documents are the same type, but there are differences in importance.

2.2. In the study area of Zala and Fertő-Hanság most landscape change processes are related to agricultural and artificial surfaces, however in Fertő region landscape change processes related to wetlands and water surfaces have higher importance. In the latter study area more so-called horizontal, mostly landscape rehabilitation measures were found, what is due to landscape history and the presence of nature conservation of the region. This refers to different landscape change processes and the different implementation of landscape policies.

2.3. In both study areas program elements related to agricultural areas have the highest importance and most varied, as they appear in several land use categories, they reflect the possible changes of arable lands, pastures, vineyards and orchards.

3. The author revealed the local stakeholders' (local governments, NGOs, farmers) view on landscape policies throughout personal interviews conducted with questionnaires.

3.1. Information has been provided about those natural and landscape values, which preservation is needed by landscape policies. It turned out that the main landscape features on both study areas are related to one-one landscape element that forms the character. In Zala the main landscape character is related to the vines, in Fertő-Hanság to the water. The built heritage, the local traditions and products were mentioned between the main features and values of the landscape, which indicates that locals give importance for human activities in the landscape.

3.2. The interviewed groups (local governments, farmers, NGO-s) relate different landscape values to the landscape. The main characteristics of the landscape is the built heritage according to the local governments, the viticulture and local products and traditions according to farmers, and the flora and fauna for NGO-s.

3.3. The most significant problems are the same in different geographical landscapes, designated and non-designated areas: illegal landfills and landfills without recultivation, the threat of drinking water due to the lack of reclamation, the appearance of disturbing elements in the view and abandonment.

3.4. NGO-s put more attention for disturbing elements, while the farmers realise the problems of waste management and abandonment.

3.5. Landscape change processes are different in designated and non-designated areas: in Fertő-Hanság there are more landscape change processes related to artificial surfaces and

wetlands areas, while in Zala more related to the forest and agricultural areas. However, in both study areas the perceived changes in the agricultural areas were predominated.

3.6. It was found that the goals of locals often do not coincide with the top-driven initiatives. The application activities take place not for to solve the real problems, or to achieve objectives. The application possibilities do not, or only very small parts support the objectives of the locals. They would require more targeted resources for the implementation of their ideas related to landscape protection and landscape management.

3.7. The locals' experience in applying for funds is a feedback for policy makers. According this, the administrative loads, the strict conditions and the own contribution for application obstruct the successful activity in applications.

3.8. The participation in decision-making can not be detected from results of interviews conducted in the study areas.

3.9. The respondents in Fertő-Hanság perceived better the landscape changes of settlements, than those appeared in the documents. However, in the recent decades less change was observed concerned the waters and wetlands, infrastructure, industry and agriculture. In Zala bigger differences were found, the respondents in many cases perceive landscape change processes, such as their weight in documents. In particular, a large gap was found in case of forests. Except the industrial and transportation areas, where they have been referred much less landscape change processes.

4. Based on international literature, the author described the methodologies in the field of landscape impact assessment. Then, landscape character assessments were prepared on the study areas. The reason for the use of landscape character assessment that it makes possible to monitor the effectiveness of policies related to landscapes, and to make decisions about landscape changes.

4.1. Landscape character types delineated in landscape character assessment are suitable for testing the effects of policies, as in the different types different processes take place, so different actions are required.

4.2. The key characteristics defined during the landscape character assessment are suitable for indicator development, ultimately, for the policy impact analysis.

5. Applying landscape indicators for characterisation the state of landscapes are becoming more and more popular in landscape research and in policy impact assessment, especially related to the impacts of the agricultural sector. It was revealed that indicators applied on international level primarily developed for agri-environmental concerns.

5.1. The author has reviewed the landscape indicator development initiatives in the recent decades. Content analysis was performed for indicators proposed in literature. It was found that most of indicators related to landscape structure and to the closely related ecological state, the least are the perceptional, and within the visual indicators.

5.2. Landscape indicator development shows a variety of approaches, which could arise from differences in interpretation the term landscape. It determines the location of landscape indicators among other indicators, and indicator development also depends on who is analyzing the landscape. There are several theories for classification of landscape indicators, and for this reason sometimes is not clear that some of the indicators in which classes should be present e.g. changes in land use affect biodiversity, soil, and income as well. It's a problem, that an indicator often can be placed in more sub-categories, therefore, overlap is possible. Furthermore, it was a difficulty that the proposed indicators appeared with the same content, but with different nominations.

5.3. In the process of landscape indicator development they highlight ecological aspects, while others focus on cultural and aesthetic aspects. In most cases, landscape indicators

focus only on the agricultural landscapes, and give information about arable land use. It is revealed that in many cases landscape indicator development is more than development landscape structure indicators, and includes other, e.g. aesthetic characteristics, or they indicate of the value provided for society.

6. The author developed landscape indicators, which show changes of key characteristics of landscape types determined in landscape character assessment. Databases for testing indicators were collected and limitations of applying databases were analysed.
   6.1. The most important landscape indicators for landscape policy impact assessments are derived from land cover, land use and land use intensity, historical and aesthetical (perceptional) indicators. These indicator groups can indicate the effects of human activities and the change of natural factors.
   6.2. Some of the proposed landscape indicators were tested in several time periods and study areas.
   6.3. Indicators derived from land cover:
      6.3.1. The change of main land cover types indicates several landscape change processes identified in content analysis: land use conversions, exclusion of arable land from production, afforestation.
      6.3.2. On both study areas the tendency of landscape change derived from land cover is the same, however in the different landscape character types different landscape changes could be detected. The different landscape change processes in the character types highlights the importance of landscape character types and areas.
      6.3.3. Testing the changes of dominant land cover type in the 5th landscape character type in Fertő-Hanság (Flat, monotonous rural agricultural landscape dominated by arable land) from the III. Military Survey until today it shows a significant change (36.2% reduction).

However in the recent decades, it indicates the constancy of character.

6.3.4. Analysing the conversions of land cover types it revealed that the most important landscape change processes are the same on the study areas, which proves the experiences from interviewing and document analysis. On both study areas the following landscape changes were found: the afforestation (broad leaved forests), the spread of shrubs, arable land conversion to grasslands, the abandonment of orchards, berries. However, between the results of the two study areas, there are significant differences in the extent of landscape change: in Fertő-Hanság the conversion covers larger area and a great variety of conversion types occurs. Examining the spatial location of conversions in Fertő-Hanság it revealed that, more than half (52%) related to a single character type (Forest-pasture mosaic predominantly semi-natural landscape with lakes - Hanság, Tóköz). In Zala 62% of conversions related to 1.a. landscape character type (Hill ridges and valleys, moderate land use intensity, dominated by agricultural areas).

6.4. Indicators of land use and land use intensity

6.4.1. Indicators derived from statistical data allow a comparison of different time series, or between different landscapes, but do not provide sufficient information about the spatial distribution and intensity of land use. Therefore they become applicable only with other indicators to assess the impacts of policies. They are not suitable to indicate changes in the landscape character types as the landscape character type boundaries do not follow administrative boundaries.

6.5. Indicators of historicity

6.5.1. Historicity can be indicated by the stability of land cover types contributing to landscape character. The stability of vineyards and areas of complex cultivation pattern areas tested in the study area of Zala shows the transformation of vineyard landscapes. The abandonement of vineyards and areas of complex cultivation patterns could be observed from the II. military survey until today. By the abandonment the mosaic structure of landscapes are decline as the small plots of vineyards, grasslands, orchards followed by new, more homogenous land cover types.

6.6. Aesthetical (percepcional) indicators

6.6.1. The indicator of openness / closeness tested in both study areas indicates the growth of closedness. Compared the results of both study areas the indicator indicates well the differences in the two landscapes, as in Zala the forests highly determine openness/closedness.

6.6.2. The author proposed a classification of openness/closedness based on CORINE land cover types.

6.6.3. The author examined how greenways are able to modify openness/closedness calculated from spatial land cover data. The density of the greenways from the III. Military Survey in some places contributed to increase the openness, elsewhere to closedness.

7. The author revealed the available databases for the application of indicators, and dealt with their advantages and limitations.

7.1. Application of indicators derived from land cover is possible from the CORINE database initiated by the European Union, however at present only the scale 1:100000 is available for comparison between different time series (1990, 2000, 2006). The period since the database is available is too short for detecting the impacts of policies, and the resolution is insufficient for micro-landscape level

investigations. However, in the future the database will have a key role in indicator development, as other indicators, such as the aesthetical / perceptional characteristics could be detected. From other database, for example. military surveys, and land cover data derived from topographic maps –due to the digitization and the identification of land cover categories- is extremely time-consuming work.

7.2. The data sources for the land use indicators are extremely diverse, that makes difficult to apply the relevant indicators. It is particularly important the coordination of land use databases databases. A good initiative was launched called TeIR (Territorial Information System, TIS) database.

7.3. Testing the indicators of historicity is limited due to the lack of available relevant databases. Widely can be used the land cover stability / continuity indicator derived from CORINE, however the indicators of historicity of the agriculture, horticulture, forestry, industry cannot be tested due to lack of data.

7.4. In the field of aesthetical (perceptional) indicators were found primary the lack of available relevant databases. One part of the indicators can be derived from field observations, others from other databases, for example from land cover database indirectly derived. In future the database TÉKA (national landscape value cataster) can be used for testing indicators of diversity/attractivity, for example the presence and density of the aesthetic landscape values. The use of aesthetical (perceptional) indicators is the biggest challenge, as it is difficult to be combine information from maps and statistics with the characteristics of landscapes from a point of view.

Application of the results

It's essential to have knowledge about the current state of landscape and ongoing processes for planning activities in landscape conservation and management. The results of the dissertation can be widely used in landscape research:

- The dissertation described the role of landscape in spatial planning, environment and nature conservation, rural development and agri-environmental policy and dealt with the methods of impact assessment. The predominantly international literature review of the topic expands the current existing national knowledge.
- The dissertation gave an overview of the initiatives and recommendations in landscape indicator development by various international organizations. A content analysis was presented about landscape indicators in international literature. There is a lack of national literature on this topic, this knowledge can applied in landscape change research and impact assessments.
- The results of the interviews can be used in planning top-down initiatives.
- The landscape indicator list and the related data sources can be used in monitoring impacts of different landscape policies.
- The presented limitations of databases are guidance for further development.
- Landscape character assessment carried out for the study areas can be used as baseline information for planning different development proposals and investments and for preparing development strategies.
- The knowledge of the dissertation, particularly the international literature review and the developed methodology can be used in education, in different subjects (landscape protection, land rehabilitation, preservation of cultural values, landscape research, environmental planning).

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