EVALUATION OF SUSTAINABLE REGIONAL LAND USE

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Abstract: *The novelty in urban planning system in many Europeans countries is implementation of sustainable development principles implementation into urban planning process. The integral part of master plans and other urban planning materials nowadays is sustainable land use assessment. The question is – how is possible measure if the land use in predefined area heads towards or out of sustainability? The methodology for such assessment is not common yet. The following paper describes one possible methodological approach how to evaluate sustainable land use assessment. This methodological approach was created in our research team and with success used for sustainable land use evaluation in two very different territories in the Czech Republic – in metropolitan area of the city of Hradec Kralove and in peripheral agriculture territory (Poličká).*

Our methodology of sustainable land use assessment is based on the thesis that there is impossible to evaluate separately each pillar of sustainability (economical, environmental and social). The sustainability is necessary understand as one entity. Therefore the methodology is based on evaluation of interaction between pillars of sustainability:

Environmental x social (Env x S);

Environmental x economical (Env x Ek);

Social x environmental (S x Ek).

The basements for such evaluation are separate expert's SWOT analysis of territory, whose search and describe "main themes" in area. As a result of such experts SWOT analysis is Complex SWOT analysis with mathematical evaluation of interactions between pillars of sustainability. From the complex SWOT analysis is possible to deduce the global matrix of evaluation, which describes the results of interactions between pillars of sustainability. As a result from this global

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1. Introduction

New approaches in regional planning directed at a greater interconnection of regional planning processes with principles of sustainable development also bring the need to evaluate sustainable regional land use. It is clearly a fundamental theme; however, in terms of broader application in practice it still lacks a methodological foundation. In the following text we present one of the methods on how to approach evaluating sustainable use and how to monitor it over time. The advantage of the described method is primarily noted in its simplicity, and that it is easy to implement

and comprehend. We present the method on examples from the Czech Republic, more specifically of the region of the town Polička.

2. Comprehensive expert SWOT analysis

Evaluation of sustainable regional development is an inseparable part of processing regional planning documents. According to existing legislative conditions, the foundation of these documents should be to conduct an expert SWOT analysis, or rather an analysis of weaknesses and strengths, opportunities and threats. Our presented method perceives a comprehensive expert SWOT analysis processed according to individual pillars of sustainable development, as the very foundation of evaluating sustainable regional development. Basically, what is important is that the processor of the "evaluation" assembles a micro-team of experts comprising of: an environmentalist (ecologist), social geographer, (regional) economist, regional planner (urbanist), and local environment expert. Each of these experts creates their very own SWOT analysis from the aspect of their own profession. Thereby, five specialised SWOTS are created which are further aggregated by a cluster analysis – combined into one analysis, where the frequency of themes, i.e., how many times what theme is repeated in the analysis, is evaluated.

To evaluate the SWOT analysis, the anticipated effects of individual themes on sustainable development are further methodically elaborated, not only in a traditional assessment according to individual pillars, but also implementing the method of interaction between individual pillars. As an ideal foundation you can use the DHV SAM methodology for this interactive methodology, modified and completed for the field of regional planning. DHV SAM methodology was developed for the field of strategic planning and is used here for evaluating the sustainability of Strategies for Brno – the strategic plan for the city of Brno. By applying this method, you can then take the individual areas from the SWOT analysis and classify them into the field of interaction between pillars of RP as follows:

Environmental x social (Env x S);

Environmental x economic (Env x Ec);

Social x environmental (S x Ec).

Apart from classifying the SWOT analysis areas (questions) into interactive relationships between pillars (what areas are mutually affected), the degree of impact is also assessed within the scope of this evaluation. With consideration to the complexity of assessing the region within the Analysis of Sustainable Regional Development, it is a good idea to implement the five-level scale of -2 to 2, thus including a negative scale as well. Classification of interactive relationships between pillars of RP and evaluation of the significance of areas in RP should once again be conducted using an expert method, one pillar at a time, and then aggregated.

Tab. 1: Example of a work version of a comprehensive SWOT analysis – expert evaluation of interaction between pillars of sustainable development

Strengths	**Type of interaction Soc x Eco**					
SWOT analysis theme	**1. exp.**	**2. exp.**	**3. exp.**	**4. exp.**	**5. exp.**	**Aggregated value**
High quality environment incl. preserved regional systems of ecological stability	0	0	-2	1	0	0
Good public transit transportation accessibility – (bus) – existence of stops, or their accessibility is good from the municipality, sufficient frequency of links	2	1	2	2	2	2
No greater environmental pollution is recorded in general	0	2	0	0	0	0
Existing possibility for the travel and tourism industry of natural and cultural character	2	1	1	2	1	1
Wealthy cultural life, offer of social and cultural events, and other offers for leisure time activities in the majority of municipalities of Municipalities with Extended Powers	2	1	2	2	1	2
Good natural immigration increase in 2003–2007	1	2	2	2	1	2
Low long-term unemployment and work opportunities in certain municipalities	2	2	2	2	2	2

Source: own composition

Interactive relationships of individual SWOT analysis themes between individual pillars of sustainable development assessed in such a manner are then processed into a comprehensive SWOT analysis with a total evaluation of interactions and degree of impacts on individual themes in the region – see following example in tab. 2.

Tab. 2: SWOT analysis of the overall evaluation of the interaction and the severity of the impact of individual subjects in the area

Weaknesses		**Relationships between pillars**		
	Frequency	**Soc x Eco**	**Soc. x Envi**	**Envi x Eco**
Insufficient facilities of regional technical infrastructure – water pipes, sewerage with connection to waste water treatment plant	5	-2	-2	-2
Insufficient quality of local roads and class III motorways	5	-1	-2	-1
Existence of brownfields incl. old ecological burdens	5	-1	-2	-2
Insufficient public transit transportation accessibility of certain municipalities	4	-2	-2	-1
Insufficient social facilities in certain municipalities	4	-2	-1	0

Source: own composition

SWOT analysis themes which repeat themselves more than twice are further processed into so-called main themes of the region, as they are "problems defined for solution" in the region this way.

For the model regional town Polička, it is the following 11 themes e.g.:

Region facilitated with sufficient and capacitive technical infrastructure in the area of water management and sewerage, incl. connection to the water treatment plant;

Quality of class III motorways and local roads;

Disparity in the region's accessibility by public transit;

Accessibility of social facilities to all inhabitants of the region;

Preservation of landscape character;

Unsuitable conditions in the area of employment and job opportunities in the region, incl. wage development;

Gradient of development in the travel and tourism industry (development of ecotourism, agrotourism etc.);

Development in the number of inhabitants and their age structure;

Absorption capacity of the region in the area of acquiring financial sources for the development of municipalities;

Existence and other establishment of brownfields;

Quality and capacity of energy supply of municipalities.

Based on the evaluation of a comprehensive SWOT analysis and the main themes of the region it is then possible to create an overall evaluation table, which summarises the results of interactions between individual pillars and provides the degree of "sustainability" both within the scope of individual pillars and in consideration to their interactions.

Tab. 3: Matrix of the evaluation of interactions between individual pillars of RP

ENV	-	-	-	+	+	+	-	+
EC	-	-	+	-	+	-	+	+
SOC	-	+	-	-	-	+	+	+
	Significantly unsustainable	Unsustainable			Sustainable with reservations			Sustainable

Source: own composition

The main themes of the region are then repeatedly evaluated in terms of relationships between pillars of sustainability and their actual state is determined in the solved model region on a scale of:

Significantly sustainable

Sustainable

Unsustainable

Significantly unsustainable

Tab. 4: Evaluation of main themes of the region from the aspect of sustainability

	Main themes of the region	**Soc x Eco**	**Soc. x Envi**	**Envi x Eco**	**Evaluation**
1	Region facilitated with sufficient and capacitive technical infrastructure in the area of water management and sewerage, incl. connection to the water treatment plant	-2	0	-1	Slightly unsustainable
2	Quality of class III motorways and local roads	-2	-1	-2	Significantly unsustainable
3	Disparity in the region's accessibility by public transit	-2	-2	-1	Significantly unsustainable
4	Accessibility of social facilities to all inhabitants of the region	-2	0	-1	Slightly unsustainable
5	Preservation of landscape's character	1	2	2	Significantly sustainable

Source: own composition

Using the above presented method you can repeatedly aggregate the results of the evaluation of individual main themes and, thereby, establish the overall state of the region from the aspect of sustainable development.

For example in the model region Polička it is possible to state that only one of the 11 assessed main themes of the region can be considered as significantly sustainable (the state of the landscape and quality of environment). The majority of other suggested themes of the region show an unsustainable tendency in either the social and/or economic pillars. The state in terms of transportation proves to be significantly unsustainable, and even the lack of investment in the region's technical infrastructure etc. is also significant. The evaluation also shows that, in general, the region of Polička can be viewed as a region with preserved, quality natural environment (significant positives in terms of the environment); nevertheless, with an inadvertent tendency to unsustainable development mainly in social and economic aspects. (In this regard, it is necessary to keep in mind that the principle concept of ongoing sustainable development is to have a balance between individual pillars and just preserved natural values on its own in the region cannot fulfil this concept.

3. Indicators of sustainable regional development

Another significant element which the evaluation of sustainability must obtain is the deduction of a system of indicators for sustainable development and unsustainability (within limits) for regional development, a description of the summary of indicators of sustainability, a definition of limits of sustainability with recommendation for monitoring other data, and parameters of regional development.

Therefore, in order to enable more than just the dynamics of regional development TOWARDS or FROM sustainability to be evaluated, so that even the impacts of planning procedures and other measures of public administration and local governments in the region can be evaluated, indicators of sustainable development, respectively sustainability, can be implemented. Thus, for the selected "main themes of the region" it is necessary to further determine indicators, with which the impacts of specific objectives of regional planning on sustainable development and development of the region as a whole will be evaluated.

Tab. 5: Examples of indicators for the main themes

Main themes of the region	Indicator
Region facilitated with sufficient and capacitive technical infrastructure in the area of water management and sewerage, incl. connection to the water treatment plant	1.1 Number of inhabitants/homes connected to public water pipes
	1.2 Number of inhabitants/homes connected to sewerage with water treatment plant
Quality of class III motorways and local roads	2.1 Annual level of investments in repairing and constructing class III motorways and local roads in the region
	2.2 Number of kilometres and days per year when roads are not impassable (e.g. winter maintenance)
	2.3 Transit time IAD to Polička from individual municipalities

Source: own composition

A measuring unit was determined for each indicator, thereby, the source from where the monitored data can be obtained and the frequency with which the data should be monitored. When determining indicators it is recommended to base them mainly on existing data sources, e.g., the Czech Statistical Office, the Czech Hydrometeorological Institute, CENIA and others. The proposed indicators are monitored directly by the regional planning office only in cases where an adequate public source of information does not exist. The measuring frequency is aimed at a two-year interval – in relation to the update of regional analytical sources and evaluation of the analysis of sustainable regional development. And once again, only a handful of indicators should by followed annually; those indicators where the situation can change very dynamically, and where data is accessible from existing databases monitored by public administration (measuring noise, unemployment, numbers of persons accommodated overnight within the travel and tourism industry).

Tab. 6: Indicators and their technical parameters

Main themes of the region	Indicator	Unit	Source	Measuring frequency
Region facilitated with sufficient and capacitive technical infrastructure in the area of water management and sewerage, incl. connection to the water treatment plant	1.1 Number of inhabitants/ homes connected to public water pipes	Number of persons/ homes	Czech Statistical Office	2 years
	1.2 Number of inhabitants/ homes connected to sewerage	Number of persons/ homes	Czech Statistical Office	2 years
Disparity in the region's accessibility by public transit	3.1 Transit time of PT to Polička and Pardubice from individual municipalities	Isochrone in time intervals of 20,40 and 60 min.	Calculation – regional planning office	2 years
	3.2 PT transport service (frequency of links)	Number of links/days	Calculation of municipali-ties/regional planning office	2 years

Source: own composition

Considering that the significance of indicators of sustainable development is to monitor the region's development in time, it is necessary to establish a time sequence for the indicator group and to measure and evaluate them at regular intervals of time. Only on the basis of real data and monitoring their development can real and realistic regional planning documentation be proposed, and can activities in the region be coordinated and used in the sense of sustainable development.

4. Conclusion

Evaluation of sustainable regional land use waits (not only in the Czech Republic) further lengthy development, as we are basically just at the beginning of this discipline. Practical experience is relatively limited thus far. Therefore, methodological manuals, recommendations and specifications have all the greater significance, as how principles of sustainable development in regional planning will actually be implemented depends on them. This article was also established as a contribution to the long and complex journey which is ahead of us.

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