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EVALUATION OF THE SUSTAINABILITY OF SETTLEMENTS

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Abstract

The present study investigates the realization of sustainability – which is a way of thinking, life, production and consumption that could guarantee the survival of modern society – on local, settlement level with the help of different comparative methods.

The scope of investigation includes two cities (Debrecen and Nagyvárad) and the settlements of a subregion. The goal of the analysis is to assess comparatively two different types of sustainability attempts and to introduce an assessment system. Accordingly we are trying to compare the long-term development concept of Debrecen city and county center and the Local Agenda 21 programme of Nagyvárad city, located near the Hungarian border. It is to be answered whether a local sustainability programme prepared according to the regulation (LA-21) or decisions made by the local, responsibly thinking city leaders lead to the realization of a liveable settlement. The assessment method serves to evaluate settlements from the aspect of sustainability and to determine the directions of development with the application of an expert rating method. The latter – settlement level measurement and assessment of sustainability – enables settlements to find the way to sustainability, providing a compass for the realization, taking into account the system of complex relations of sustainability, serving as a basis for subregional, municipal and other decision-making.

Keywords: Sustainability, Local Agenda 21, sustainable settlement, measurement and assessment of sustainability.

1. Overview of the Two City Programme Concepts

The long-term development concept of Debrecen was prepared in the framework of the general urban development plan. The present study investigates this concept from the aspect of the criteria system of sustainability programmes. The act about the modification and protection of built environment[1] is similar to the scheme of Local Agenda 21 if we consider the interdependence of different elements (settlement development concept, urban structure plan, local construction regulatory plan). The basis of the long-term development plan is a strategy. This is the basis of the decision-making pyramid, containing the main trends, providing the basis of hierarchical system of more and more determined programmes, special plans and projects, which are in harmony with strategy thanks to continuous, bi-directional feedback.

[1] The long-term development concept of Debrecen, p. 5

In the case of Debrecen, the urban development concept was prepared in parallel with the economic development concept. While in the Local Agenda 21 scheme economic development is integrated with the other two areas (economy and society), there are separated documents for these areas in the case of Debrecen. The original requirement is still fulfilled as according to sustainability criteria present and future needs, well-being of citizens are considered.

The strategic planning begins with the introduction of present situation in both cases, that is, it starts with current state assessment. In the city development concept of Debrecen this is followed by a detailed, multi-sector SWOT analysis, containing the assessment of the up-to-date situation and presenting opportunities and threats. The next section deals with future scenarios by the civil sector as part of the strategy, as a vision. This is followed by the presentation of the so-called breakout points, in order to set the priorities to ensure the highest possible positive effect. Positioning means the narrowing of selected priorities in order to filter inefficient priorities except for the ones that would be risky not to realize. Development aims and strategic programmes are based on these general considerations. This system is very similar to the scheme of Local Agenda 21.

The official development programme of Nagyvárad is the Local Agenda 21, prepared with the support of the United Nations Development Programme. It consists of three main documents:

- Local Strategy
- Local Action Plan
- Portfolio of Priority Projects

The planning started with the establishment of partnerships as it is recommended by the ICLEI. There was a balanced representation of various stakeholders, participants of the process, main economic, social and environmental organizations of the city, but in spite of this, in our opinion, the programme was not properly communicated for citizens and there was not provided enough information about the work phases following the implementation.

The Local Agenda Programme of Nagyvárad – similarly to the long-term development concept of Debrecen – starts with a general introduction of the situation, but this is not taken into consideration in the issue selection and conclusions. The establishment of the theoretical structure of the programme can also be evaluated as incomplete. Natural resources of the city are shortly presented in the framework of the presentation, natural capital and the quality of environmental media is described in detail. The Local Strategy than very shortly presents the elements of human and social capital of the city in a descriptive way. The Local Strategy continues with the presentation of sectoral development directions. These cover infrastructure development, environmental protection, urban renewing, economy, the elimination of poverty, the responsibility toward disadvantaged people, arts and culture and sport and leisure activities. We may miss however the foresight, the assessment of development directions and the establishment of preparation for these. The SWOT analysis of the health of local population can also be described mostly as schematic and there is no background analysis.

2. The Assessment Method

The most critical point of the Local Action Plan is the selection of priorities, as it includes the creation of decision mechanisms that consider the attempts of the whole community – or making it even more difficult, – the attempts of different interest groups. The variability of interest groups determines the wide range of attempts, as several types of interest groups exist, like cultural and traditions associations, environmental and animal protection organizations or industrial chambers that stand for economic attempts.

It is very important that the direction of goals set in programmes, subprogrammes and projects have to fit the general objectives defined in the Local Agenda of Sustainability and that interested parties have to be involved in all processes from planning through implementation phase to the end.

The assessment method applied in this study is based on the principle of the Leopold matrix. On the horizontal axis there can be found the various programmes, and on the vertical axis there are the environmental or environmental related indicators. The rating scale goes from 1 to 10, 1 meaning the lowest and 10 the highest effect.

Theoretically the effect could be negative as well but in our case there are only positive values, as we evaluated investments with positive environmental effect. To make it simpler we do not indicate the positive sign therefore. In order to reach the highest possible effect, it is reasonable to group the projects by the sector or the influenced environmental media so the calculated values within the groups indicate the maximum effects within the sector on the selected media. The last but one column of the table shows the aggregated values for the row that is for the given project, and the last one indicates the efficiency within the sector, in percentage of the highest obtainable points. Percentage values enable sectorial comparison of the projects, and the sectorial evaluation method serves to evaluate the investments according to relevant criteria, reducing the level of subjectivity. In order to reduce subjectivity we recommend to fill in the table by 6–8 experts independently and to leave the highest and lowest points out of the summarization.

Percentage values enable us to determine the order of priority of the programmes and to compare it with the Portfolio of Priority Projects of the Local Sustainability Programme.

We will present two examples followed by a short analysis of projects of higher efficiency.

Table 1 about water management shows that the most crucial problems from this aspect are the lack of proper drainage system and the amortization of the present system. According to the urban development plan of 1994, 65% of delivery-pipes are old, causing a high, 10–17% loss in the system. The sewage system is at the same time incomplete, consequently some sewage is led to river Körös without any treatment. Organic compounds, nitrates and phosphates from the sewage contribute to the temporal eutrophication of the river. The project is subsidized by the European Union because the city does not have the necessary resources for the realization.

Table 1. Water management

Nagyvárad	Elimination of leakages and indirect pollutions	Avoidance of torrential floods	Elimination of direct pollution	Total	Result in %
Development and modernisation of water supply and drainage system	10	0	10	**20**	**66**
Rehabilitation of the moisture drain system	4	0	1	**5**	**16**
Construction of river wall for Pece, Vad, and Párizs brooks	0	6	0	**6**	**20**
Leading the sewage of economic units not provided with sewage system to cesspools	8	0	10	**18**	**60**

Source: Branner

Mapping polluting economic agents belongs to the competency of the Environmental Agency, and depending on the volume of the pollution, this authority can impose a fine on the agent or even order to stop its operation. The coverage of river walls with lawn stone is not only for aesthetical reasons, but also strengthens river banks and prevents the overflow of brooks in case of torrential rains. There will be constructed a separated moisture drain system covering the whole city except for the North-Western part to unburden the operation of the City Sewage Farm. It would be necessary to restore this system too, but this investment is not as crucial as the others.

The most crucial traffic problem is the transit traffic through the city, as it is also represented by the very high point in *Table 2*. In order to solve this problem, the development project 'Development of the access to IV Pan-European corridor – Construction of a bypass beltway around Nagyvárad' was initiated. E 60 international highway crossing Nagyvárad causes a significant traffic load for the city. Therefore it is crucial to construct the beltway in order to reduce transit traffic. The

Table 2. The development of traffic infrastructure and related programmes

Nagyvárad	Air pollution	Noise	Vibration	Dust pollution	Total	Result in %
Modernization and maintenance of urban road system, establishment of new parking places	2	4	4	8	**18**	**45**
Finalization of the construction of the beltway around the city	9	8	9	9	**36**	**90**
Construction of a highway to eliminate transit traffic in Nagyvárad	?	?	?	?	?	?
Modernization of public transport vehicle fleet	8	7	4	3	**22**	**55**
Project to electrify the railway	4	4	0	3	**11**	**27**
Construction of noise barrier walls	2	7	1	4	**14**	**35**
Plantation of defensive plants along heavy traffic roads and 'hot points'	7	8	1	7	**23**	**57**

Source: Branner

traffic load is a problem not only because of the air pollution but the noise causes stress for the citizens and the vibration may damage the buildings. The above-mentioned beltway is ready but it is only a two-lane road instead of the previously planned 4 lanes and the quality of the road leading to Nagyvárad-Szatmárnémeti and Nagyvárad-Arad is poor.

The following programmes aim to reduce the factors of the internal traffic load of the city by the modernization and maintenance of the city road network,

establishment of new parking places and plantation of defensive plants. The maintenance of the 'green corridor' and the road network could reduce dust pollution and noise significantly, and the modernization of the road network could contribute to the maintenance of the good technical status of the vehicles. The modernization of the public transport vehicle fleet has started, too. Unfortunately the new buses do not use alternative fuel as it was originally planned, but the new Mercedes buses fulfil European technical standards.

We could not evaluate the construction of the trans-European motorway leading near Nagyvárad, because by the construction of the beltway, negative effects of the traffic have been reduced significantly. The construction of the motorway – that was decided to be built near Nagyvárad instead of Arad after hard lobbying – is of economic importance for Nagyvárad. For the modernization of the railway – that would have positive environmental and economic effects not only locally - governmental support is needed.

3. The Measurement Possibilities of Settlement Sustainability

The measurement of local, rural or settlement level sustainability focuses first of all on the assessment of natural environment, and is in relation with the living conditions, livelihood possibilities, the introduction of local social-economic conditions and the determination of development directions. Accordingly we do not analyse the various programmes, strategies by sustainability criteria, but we are looking for the answer to the question, what is the meaning of the sustainability of a given countryside settlement and how can it be measured, assessed, compared and how can it be used to support the most complete realization of sustainability.

The starting point of the analysis was an indicator system worked out by the Hungarian Statistical Office, used to measure the development of settlements and their modification, extension according to sustainability criteria. The indicator system developed by the Statistical Office is a system of 19 indicators (Faluvégi, 2000). The indicators shown in *Table 3* have been calculated for all settlements of the country. The average of the complex indicator is 3.91 for the whole country. Settlements with higher results are considered as developed ones and those with lower are considered as underdeveloped, but the idea or aim system of sustainability is not considered at all.

One of the starting points for the creation of an indicator system to measure local sustainability was the complex indicator developed by Central Statistical Office, the other basis was the realization of Bellagio principles (SZLÁVIK, [11]), and the third one was the consideration of sustainable countryside and rural development as this issue is closely related to the analysed area.

Tisza-lake and its neighbourhood is a special and particular area of Hungary. It is special as it is a result of human activity, it was built in 1970 as the river barrage at Kisköre. The area is also special because parts of this region belong to two statistical regions, four counties and eleven subregions, and this is not advantageous from the

Table 3. The complex settlement development indicator system by the Central Statistical Office

1. Population density	11. Number of guestnights
2. Rate of population aged above 60	12. Personal income
3. Migration indicator	13. Flats built
4. Level of education	14. Water supply
5. Agricultural employment	15. Drainage
6. Tertiary employment	16. Gas supply
7. Industrial employment	17. Number of automobiles
8. Unemployment rate	18. Telephone supply
9. Number of economic organizations	19. Transport circumstances
10. Average land quality (Gold Crown-value)	

point of view of development possibilities. It is particular because this artificial lake is the second largest water surface in the country, with an important role in flood protection, water storage, water quality protection, holiday and leisure, economy and nature and biodiversity conservation. It is also particular because one-third of the 2262 km^2 area is protected, belonging to the directorates of Bükk and Hortobágy National Parks. How these facilities of not only local importance can be utilized in everyday life, largely depends on the inhabitants of the 73 settlements of the area. This is the point where sustainability comes into the picture as a way of thinking, economic activity, life and production that can influence and guide the everyday life of Tisza-lake area on all levels (global, regional, local, in our case settlement, subregional) and in all dimensions (natural environment, social, economic). The scope of the research is a group of six settlements located on the Northern beach of Tisza-lake, in Southern Heves county.

The quality of natural environment and the availability of natural resources used to be the only important determinants of economic-social development. By nowadays, innovation potential and knowledge have become the most important factors step by step with social and economic development after several changes. In spite of this in the recent past it has become more and more obvious that natural environment is valuable as it turned out that the degradation of natural environment endangers human existence and on local level the development or existence of a certain settlement. It can be seen from our sustainability analysis that sustainability – which means the preservation of natural capital quality, its regeneration and sometimes restoration – serves the interest of local society and economic opportunities and finally the competitiveness of the settlement on the long run. In other words, only regions, subregional areas or settlements that are in sustainable relationship with their natural environment can develop on the long run. Other settlements will lose not only their competitiveness but also the liveability of their population, while

basic attempts of the European Union are trying to prevent it.

Considering all these, we focused on the natural environment, the assessment of natural resources and their state, and the setting of sustainable development directions when creating the system of sustainability indicators.

The role of rural area and settlement development is very important for the permanent improvement of regional and national competitiveness, especially in Hungary, where the rate of rural areas is high, comparing to the EU average. Besides satisfying the criteria of sustainability, hopefully rural areas will have various positive impacts on the whole region and can realize a profit from selling products and services within and outside the region and thereby will be able to contribute to the competitiveness of the region. Competitive products, services and enterprises will draw the picture of a sustainable subregion and region.

The indicator system created also reflects the main criteria of sustainable countryside and settlements. The determining characteristics of a liveable settlement are as follows (CSETE–LÁNG [3]):

- Living conditions are preferable, people like to live in the settlement
- The settlement is financially sustainable, that is there are no liquidity problems and it has the necessary resources to achieve strategic goals
- The income level is high enough to eliminate differences between urban and rural income
- Agricultural production and land use is sustainable
- The level of knowledge and education is improving
- It is possible to meet health, cultural and information needs of local people

The criteria described formed the theoretical basis of the indicator system, and considering these, we managed to create an index number and indicator system that proved capable of measuring sustainability and its changes, preferably improvement and made possible the comparison of settlements.

The following elements have been investigated and analysed on the level of settlements, on the basis of indicators for all three dimensions of sustainability:

1. Natural resources, state of natural environment and landscape.
2. Social development of the settlement, living conditions, social state, culture, traditions.
3. Economic and infrastructural development, organizational and institutional background.

Main elements of the three groups can be found in *Table 4*. The hypothetic information and indicator system measuring sustainability proved appropriate. The source of information was diverse from statistical databases to expert consultations, on-site visits and interviews. We gained on average 98 index numbers or indicators for all settlements. We could draw some general conclusions by comparing and analysing settlement data.

The systematized data and information were additional, new information for local governments and proved useful for future decision-making.

Table 4. Simplified structure of sustainability indicator system

I. State of the environment, natural resources and the landscape
1. Natural values, sights, parks, arboretums, values of built environment etc.
2. Characteristics of biodiversity
3. Natural resources utilized to satisfy human needs
4. Hydrography, drinking water supply
5. Characteristics of agricultural areas
6. Characteristics of the weather
7. General characterization of the environment
II. Living conditions, culture, traditions
1. Characteristics of the population
2. Characteristics of families
3. State of Roma population
4. Conditions of living on the settlement
5. Culture, traditions
III. State of infrastructure and economy on the settlement
3. Financial sustainability of local government
4. State of enterprises
5. Level of self-sufficiency of the settlement
6. Infrastructure

Source: SZLAVIK–CSETE [12]

The basic contradiction, namely that these settlements are seriously disadvantaged but situated in an important holiday area, is a barrier to reach sustainability. Without any support from the society this problem could be solved very slowly. In addition to the support from the society there is also a need for *own initiatives, self-organization* and *self-support* within the settlements. 'Settlements mirrors' investigated serve as an aid for these initiatives. The realistic basis of sustainable countryside and settlements could be the sustainable management of natural resources, the improvement of liveability, tourism especially health tourism and sustainable agricultural production. The standard of water management, floods, inland waters and droughts influence these factors significantly.

However, for the sake of receiving external support and improving self-initiatives it is essential to *eliminate deficiencies*, namely the lack of co-operation, the lack of potential for successful tendering, the lack of successful handling of the Roma issue and the lack of an integrated programme for sustainable management of natural resources etc. Solving or softening these problems would mean a progress

toward competitiveness and would contribute to the rise of the region in harmony with the modern concept of sustainability.

In the near future we extend the analysis to the whole Tisza-lake region and in parallel we will develop the indicator system. We will take into consideration more aspects and reconsider the current aspects and evaluate the imponderables in a less subjective way. It is indispensable that the settlement policy should support sustainability in order to make a settlement really sustainable (RUZSÁNYI, [10]). The attempt to create a sustainable settlement structure, regulate the rate of built-up area – both influencing several factors of settlement liveability in all dimensions of sustainability, like the efficiency of public services and infrastructure or the level of air pollution – can also contribute to this aim.

We will study the essay entitled 'The Autonomous Subregion' that takes sustainable landscape management as a basis. Autonomy actually means partial self-support that is the settlement should satisfy its own energy demand as far as possible, taking into account the available measures. It is necessary to assess the improvement possibilities of these factors of sustainability in the Tisza-lake region, too.

4. Summary

During our research we raised several challenging questions. These questions included for instance: What makes a settlement really sustainable? To what extent is Local Agenda 21 different from a complex urban structure plan? It is a further question what is or what will be the practical significance of the Local Agenda programme for Nagyvárad. It is true, that some of the development plans had been discussed earlier, so they are not only the results of the Local Agenda 21, and unfortunately it seems that as the financial support is over, the enthusiasm is less abundant. But starting from the example of Debrecen, in our opinion it is not important to call a local sustainability programme Local Agenda, it will work otherwise as well, if it contains the elements of sustainability criteria system. In the extreme, there is the danger that any development plan can be called 'sustainable'. Our questions will be answered by time. Present programmes seem to be successful so far, but it will turn out later, in practice, how they really contribute to the sustainable development of the city.

We did not narrow the notion of sustainable settlement to eco-villages or settlements or subregions using alternative energy sources, as these criteria can be found among the indicators. We intended to create a system that enables the assessment of sustainability from the aspects of all dimensions and can be applied for various subregions and settlements.

The focus of our analysis was local initiatives in both cases, following different approaches but with the same purpose. The common purpose was to assess the current situation. This is indispensable in order to support an established sustainability strategy and various programmes and projects. These attempts can contribute to the solving of present economic, social and environmental challenges in the future.

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