

## **SUSTAINABLE URBAN DEVELOPMENT INDICATORS CASE STUDY: TÂRGU OCNA TOWN**

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**Key words:** Târgu Ocna, multi-scale analysis, urban functionality, urban development indicators

**Abstract.** Widely used, in a variety of forms, in decisional documents or in national and international scientific papers, the indicators of urban development stay simple attempts of quantification, estimation and standardisation of extremely dynamic and complex realities, thus they cannot offer an integrative image on the town, of its status and functional needs. On different scales of analysis can be identified and calculated indicators that are adapted of some specific local realities. Târgu Ocna town has a privileged position within the Trotuș River Basin, but also sundry contrasting features of the morphological and socio-economic structures that represent it and that hamper, sometimes, a balanced development of the urban body. The proposed indicators have only an orientative aim and a generally character, whenever, when analysed at from an evolutive and comparative point of view at the level of spatial planning where applied, they can become an efficient instrument in the decision making process at local level.

### **Introduction**

The role of sustainable development indicators is to found the decisions by providing the basic information to define the objectives and identify the actions necessary to their accomplishment. Equally, they are usable in order to monitor and evaluate performance in the urban development process and to communicate concrete results, useful for involving social actors and the interested public. Indicators may measure quantitative aspects or qualitatively estimate certain states or phenomena. They are constituted by raw or processed data, but they may be aggregated as to form complex indices qualifying and simplifying phenomena and often having a meaning beyond the one directly associated with the value of the parameters taken into account. On the one hand the urban environment is an extremely complex structural and dynamic reality. That is why it is hard to find the

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correct combination of determinant elements, the optimal rapport between intervention and non-intervention, as well as the right time to take the necessary measures, so that they fit into the functional rhythm of the system. On the other hand any indicator, no matter how elaborated, is a simplification of the reality and just an “indication” regarding a phenomenon that cannot be seen in its integrality (only by accident or in exceptional, thus momentary situations) by an analysis, no matter how minute. In this sense, we believe that it is more useful to find a set of simple indicators, which can be integrated in a system analysis being permanently monitored, instead of “drowning” the analytical approaching complicated indicators sets, whose weight is hard to determine given the internal and external dynamism of hierarchic systems.

After the Summit in Rio de Janeiro and launching Agenda 21 (1992), indicators of sustainable urban development have been elaborated by several institutions and organisms, the most important being World Bank/UN–Urban Indicators Programme (UIP) of the United Nations Centre for Human Settlements (UNCHS) and those of World Health Organization (WHO), the last having as explicit purpose analyzing population health and quality of life in the urban environment.

There is a large variety of sustainable development indicators types, each illustrating certain aspects of the functional or dysfunctional state of the urban system. They may be differentiated into: indicators of the determinant elements in urban functionality (population growth, prosperity level), state indicators (air quality, noise level), indicators of the pressures upon the system (carbon dioxide emissions), impact indicators (percentage of children suffering from various diseases), indicators of the system’s response (number of cars respecting the euro 4 norms), gradual indicators (a decrease in the air quality in time), indicators of the proposed goals (standards for water quality), etc.

A quasi-exhaustive set of sustainable urban development indicators is that of the SUD-LAB European Commission, which has an impressive database at the level of European cities. Sustainable urban development indicators are divided into several categories: air quality, constructed environment, cultural endowments, social disparities, transportation quality, urban administration and waste management. For each of these there is a set of indices reflecting the urban functionality degree. Another programme of the European Commission – TISSUE – uses indicators officially adopted in 15 of the EU countries. The four types of indicators proposed are the following: sustainable urban management (descriptive indicators), sustainable urban transportation, sustainable urban constructions, and sustainable urban design. Complementarily and applied to different analysis scale, we may use in our study certain indicators the degree of urban development in the specialized literature or legislated (cf. *Law 351/2001; Jana Şuler, 2005*).

Interesting in our approach regarding their adapted applicability are also the communitarian indicators of urban development (*Nițulescu, 2000*), as well as the indicators officially adopted at the national, local and departmental administrative level (for e.g. within PATJ Bacău or PATN) as long as they are homogenously obtained and can be integrated in a larger territorial analysis.

Applying these indicators takes into account the analysis scale, thus making the distinction among development indicators in departmental context, town scale indicators, town centre indicators or indicators of the urban habitation vicinities (neighbourhoods).

### 1. Multi-scale indicators of Târgu Ocna town urban development

Târgu Ocna's built-up territory is structured around a central nucleus polarising around some secondary residential, tourists, industrial or sanitary-educational areas. Most of the build-up areas are dispersly inhabited, have semi-rural or rural patterns and are added to the main central sector of the town (Vâlcele, Tisești, Mosoare, Poieni, Gura Slânic, Gălean, Văleni, Gioseni neighbourhoods).

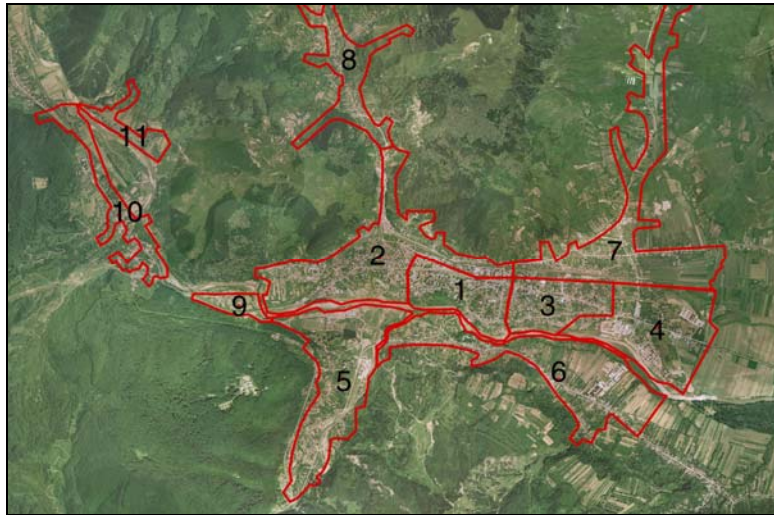


Fig. 1 - Functional urban areas (1- Central area; 2- Văleni-Țărăncuța area; 3- Gioseni; 4- Industrial arew; 5- Gura Slânic; 6-Tisești; 7- Galean-Viișoara; 8-Valcele; 9- Mosoare; 10- Poieni; 11- Păcurele) (Source: Aerial plans of Târgu Ocna territorial unit)

The functionality of the centre as an individuate urban area can be assessed based on a set of communitary sustainable urban development indicators elaborated

by Dana Cornelia Nițulescu (2000), which can provide an objective image, comparable to other similar towns. The central area is predominantly residential (over 80% of the buildings are designed for habitation) in collective residences or in individual houses. In the same time it is the area of maximum functional diversity, where over 50% from the total number of employees work.

Tab. 1 - Târgu Ocna. Central area development indicators (cf. Nițulescu 2000, modified)

Town Centre surface	55 ha = 550000 m <sup>2</sup>
Types of land using (constructions, green areas)	Constructions, green areas, streets, some with pavement, public square, unused lands
Green areas surface from the total town centre's surface	planned 25255 m <sup>2</sup> , 4,59%
Percent of residential buildings from the total number of buildings from the centre of the town	81,5 %
Percent of trade buildings from the total number of buildings from the town centre	11,3 %
Percent of central functions buildings (administrative, international, unique endowment) from the total number of buildings from the centre of the town	7,2 %
The built areas of public utility related to then inhabited areas	4,40
The employment density (number of working places related to the town centre surface)	1781 employees /55 ha = 32,38 employees / ha
The rate of employed population for each sector (industry, trade, services)	industry 370 (20,77%) trade 208 (11,68%), services 823 (46,21%), public administration 380(21,33%)
Number of crossroads for the surface of the town centre	0,42
Surface of pedestrian circulation for the surface of the town centre	1,67/5,5 = 0,03 %
Surface of pedestrian circulation for the surface of roadway	0,36%

The labour force employment sectors are the local administration, industry, trade and other services. The administrative and trading functionalities have the biggest occupied surfaces, while transport and communications areas, green areas and industrial sectors (furniture production, drilling equipment) are less extensive. The last and some of the residential area with old, poor and degraded individual houses are located on the low terrace of Trotuș River, where the flooding risk is considerable at high river flows, in spite of the existing river bank defences.

By its nature, the town centre is enjoying an advantage over the other town's neighbourhoods because of its patrimonial attractions, administrative and services polarising capacity and complete urban utilities. Nevertheless the central area has a

series of dysfunctionalities and risk agents, hard to overcome without taking some radical urban remodelling: inadequate residential buildings and utility networks, intense traffic, unorganised, insufficient and chaotically spread green areas, etc. The renovation of the town centre has to pursue, on the one hand, rising town's attractiveness for the local population and for tourists by improvement of environmental quality, by promoting trade and other service activities and, on the other hand, the conservative revaluation of the cultural and historical inheritance.

If in the central zone, between the railway station and the brook of Vâlceica, we have a relatively high urban character, in the adjacent zone there is a semi-urban, residential area, with ground floor buildings and villas, and outside it a semi-rural area, in Tisești and Gălean, with habitations gathered at the intersection between the main roads and scattered through meadows and vineyards. There is also a specific rural dispersion for the Vâlcele and Poieni peri-urban neighbourhoods. The deficiencies in the coherence and cohesions of the urban space are linked to the low quality of communication infrastructure, characterized by the still low weight of modernized streets (around 35% and only 25% asphalted), by their insufficient width – except for the central area, the circulation takes place on one lane, which makes traffic very difficult, especially when going in and out of the town, not to mention the low quality of street coating. Moreover, the deficiencies in the urban common transportation relatively isolates certain areas (Gălean, Vâlcele, Tisești) from the rest of the town.

Given the information above, we may say that the town territory presents a socio-economic favourability for spatially differentiated development depending on the characteristics of life and urban activity, appreciated according to several indicators. They express the access to the external road and railroad communication network, and the quality of urban environment (habitation quality, the quality of communication infrastructure and public transportation inside the town, municipal endowment, services, cultural-educational, health, commerce, leisure, banking, and public administration infrastructure). All of the above mentioned are related to the functions of the town (residential, industrial, services, tourism, agrarian). These indicators have already been used in a previous paper in order to classify the area inside the town depending on the favourability for sustainable development of the homogeneous areas identified (*Irina Ungureanu, Al. Bănică, 2008*).

For a comparative emphasis and standardization regarding the urbanity aspects of the town of Târgu Ocna and the *urban development indices*, we should start from a set of minimal indicators, even though they are not quite applicable to Romania, as many of the newly declared towns don't meet any kind of urban conditions (for e.g. Murgeni, Liteni, Milișăuți, Dolhasca, Dăbuleni, etc.).

Tab. 2 - Târgu Ocna town. Indicators of urban status (Surces: Şuler, 2005; Law 351/2001)

	<b>Development indicators</b>	<b>Minimum values for municipalities</b>	<b>Minimum values for towns</b>	<b>Indicator value for Târgu Ocna</b>
1.1.	<b>Population and labour force indicators</b>			
	Number of inhabitants	20.000 / 25.000	5.000	<b>13576 (2008)</b>
	Population density (per ha)	50	40	<b>17</b>
	Working places/1000 inhabit.	420	400	<b>361</b>
	Pop. working in services (%)	40	30	<b>49</b>
1.2.	<b>Living and quality of life indicators</b>			
	Number of residential buildings for 1000 inhabitants	320	300	<b>383</b>
	Houses equipped with plumbing (% of buildings)	80	70	<b>56</b>
	Number of personal cars for 1000 inhabitants	120	100	<b>78</b>
	Houses equipped with bathrooms inside the building	75	55	<b>56</b>
	Number of beds in hospitals for 1000 inhabitants	18 / 10	15 / 7	<b>33</b>
	Number of doctors for 1000 persons	2,5 / 2,3	2,0 / 1,8	<b>1,5</b>
	Financial/ banking institutions	Headquarters	Working points	Working points
	Accessibility to lines of communication	Railway station, bus station	Railway station, bus station	Railway station
1.3.	<b>Social, cultural and leisure endowments indicators</b>			
	Education units	Post-secondary school	High school/ secondary school	High school, Post-secondary school
	Secondary school in primary & secondary educational units (%)	90	85	<b>90</b>
	Cultural and sports endowments	Auditorium Theatres, musical institutions Public libraries Stadium, Gyms	Auditorium Public libraries Gyms	Public libraries, (non-modernised) stadium, gyms for two schools
	Accommodation places/ 1000 inhabitants	25	10	<b>26,22</b>
1.4.	<b>Urban utilities network</b>			
	Modernised streets (%)	60	50	<b>52</b>
	Streets with water pipes (%)	70	60	<b>78</b>
	Streets with sewage pipes (%)	60	50	<b>28,83</b>
	Waste water treatment	Functional waste-water treatment plant (wwtp)	Functional wwtp	Functional wwtp
	Household gas distribution pipes (%)	45	35	<b>59,66</b>
	Sanitation motor vehicles for 100 km of streets	7	5	<b>5</b>
	Scavengers for 1000 inhabitants	3	2	<b>3</b>
	Green areas surface m <sup>2</sup> /inhabitant	15 Public park	10 Public garden	<b>13</b> Public garden

*The urban endowment degree* reflects the specific minimal requirement that all settlements aspiring to this title should meet. Starting from an abstract of the law project regarding the urban localities network of 1993 (*J. Şuler, 2005*), we analyzed the way in which Târgu Ocna meets the minimal requirements for an urban settlement. Our approach studied altering certain indicators or eliminating others, not as relevant as they were 15 years ago (the number of telephone subscriptions, number of habitations with central heating, etc.) or updating certain indicators, as that regarding the wastewater treatment plants (in 1993 a wastewater treatment plant had to have the mechanical stage for the towns and the mechanical and biological stages for the municipalities; today, given the technological development, the only criterion is meeting the evacuation quality norms).

If we compare the value of the indicators for Târgu Ocna with the minimal limits imposed by the town status, we arrive to paradoxical situations. Thus, the town has a population density way below the inferior limit, but enough dwellings for the total number of inhabitants, which shows a low percentage of people living in common (less than three persons per dwelling). On the other side, the percentage of dwellings with water supply and canalization is low, but not the total length of the water network (on 78% of the streets length), which shows that not many people actually have access to these facilities, and they prefer, for economic and mentality reasons, to use their own sources. Among the deficiencies in the system we mention the lack of a wastewater treatment plant which meets the minimal quality parameters. As regards the sanitary domain, there is high rate of beds for a thousand inhabitants, but a low percentage of doctors for the total number of inhabitants. The jobs are limited and insufficient in relation to the active population, not to mention the deficiencies in the communication and transportation means (old roads, the lack of a coach station, etc.). All these make the urban accessibility far more difficult. Among the functional domains, the education, the lodging and leisure endowments (except for the lack of an auditorium) create an attractive local environment and the premises for consolidating the status of tourist centre.

Obviously, the sustainable development indicators must be adapted to each situation, depending on the local characteristics and the specific configuration of that particular urban system. Their standardization is useful for comparative and normative reasons, but an applied study would have to take into account the local specificity.

In the specialized literature we find numerous methods to evaluate the urbanity degrees of towns as well as officially determined sustainable development indicators. The term urbanity may also have the broader meaning of general development based upon the endowment with certain urban-type commodities and it can equally apply to all settlements, be they urban or rural.

The development indicators identified for the communes in the department of Bacău – in the Departmental Planning and Development Plan, and in the Sustainable Development Strategy of Bacău County – are classified into three categories, seen as favourable/unfavourable premises of a sustainable development: *Infrastructure* – which includes public utilities, transportation infrastructure, health, education, natural resources, natural environment; *Economy* – with financial services and insurance, economic agents, labour force and public budget; *Public administration* – including public management, services and support for SMEs, urban planning, communication and information dissemination; *Communitarian environment* – indicated by community spirit, the safety of citizens, lodging (tourist) endowments, food and non-food stores, cultural endowments/sports facilities, historical and cultural patrimony (fig. 2).



Fig. 2 - Development indicators matrix for Bacău County communes (extract)  
(PATJ Bacău, 2005)

The evaluation of these indicators was performed on the basis of statistical data, for some communes with questionnaires. Giving to each indicator values



from 1 to 4, we got an extended matrix and, though it analytically illustrates certain aspects, it is hard to operate with it such as such because of the lack of aggregation of the factors analyzed.

Considering that we have to elaborate an integrated indicator, giving a certain weight to each of the elements and offering a synthetic image, that can be shown cartographically, we took into account mostly the visible and, if necessary, quantifiable effects and we gave most of the weight to the infrastructure category (4), followed by economy (3), local community (2) and, finally, public administration (1).

$$I_{dl} = [(I_i \times 4) + (I_e \times 3) + (I_{mc} \times 2) + (I_{ap} \times 1)] / 10$$

*I<sub>dl</sub>* – local development index; *I<sub>i</sub>* – infrastructure index; *I<sub>e</sub>* – local economy index;  
*I<sub>mc</sub>* – local community index; *I<sub>ap</sub>* – public administration index

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The highest values of the indicator taken into account were registered by Târgu Ocna, then Onești and Moinești. If the second and the third place are rather normal, the first position occupied by the “salt town” seems harder to explain. Târgu Ocna has the highest values for indices referring to economy, public administration and communitarian environment; the only reserve being that regarding the infrastructure, as many of the roads are old, and urban transportation are numerous flaws.

After the three before mentioned localities, we have two dynamic communes in the superior basin of Troțuș, Zemeș and Asău, followed by Ștefan cel Mare and Slănic Moldova. We find surprising, but at the same time explainable given the recent evolution, the position of Comănești (13<sup>th</sup>), with a very poor infrastructure and an economy in regress. The last positions are occupied by the communes of

Brusturoasa and Scorțeni, where the local enterprise deficiencies (the poor management of material and human resources) are mixed with the obvious effects of isolation. The first place occupied by Târgu Ocna reflects a certain dynamism, obvious during the last years, but it also represents the proof of certain deficiencies concerning our indicator, as well as the subjectivity and lack of trueness in the data used as basis for the Sustainable Development Strategy of the department of Bacău, obtained not only statistically (also subjective and inaccurate in a certain way) but also using questionnaires “idealistically” completed by the local councils’ members. Moreover, it is hard to compare the evolution of extremely different localities and to dissociate them from their territorial ensemble.

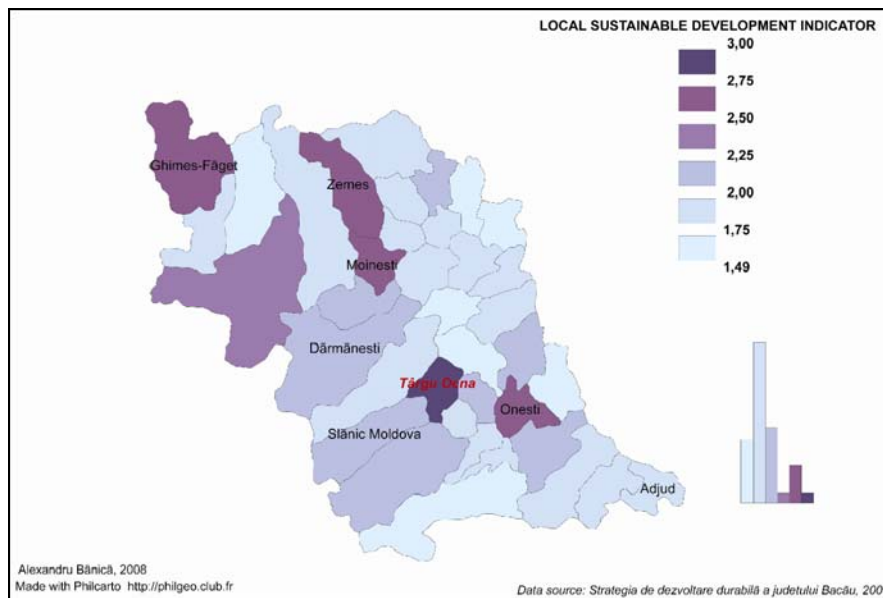


Fig. 3 - Evaluation of development agents in Trotuș Basin communes

It is necessary to find a set of relevant indicators for the specific situation of Târgu Ocna. In this sense, a technical report of the European Commission (2) (2001) **may be a reliable source**, proposing a set of local sustainable development indicators. They may also be related to the model of sustainability obtained on the basis of structural equation systems (*J. Guardia, E. Pol, 2002*) which establishes a direct link between sustainable development and territorial identity and integral expression of element identification, spatial cohesion and human component

Tab. 3 - Sustainable development indicators for Târgu Ocna town  
(Main indicators)

A	Main indicators	Application for Târgu Ocna town
1	<i>The citizen's satisfaction concerning the local community</i> <i>General satisfaction of the inhabitants concerning different futures of the town</i>	Public opinion it is not characterised by homogeneity, because it reflects different the social economic and psychological differences of the population. The opinions can be separated concerning the age (youngsters are more thankful then the elders), sex (women are less content then the men), level of education (those with university are less content then those with high school), occupation (the ones working in services sector are less content then those in industries), residential areas (those from Poieni and Gura Slănic are less content then those from downtown and eastern peri-central area) concerning general aspects of urban life or punctual problems (according to local polls)
2	The dwelling and town infrastructure quality and the integrity of the buildings with patrimony value <i>The sustainability of the materials, the resistance or vulnerability degree of the constructions, projects for density and regeneration of the spatial built areas, the quality and access at urban utilities</i>	The low density of the buildings in the extra-central area, the existence of some buildings placed in risk areas, made of non- sustainable materials, advanced degradation of many old buildings, some with patrimony value, insufficiency valorisation of the local cultural- historical capital, lack of urban utilities in the peripheral quarters indicate evident local dysfunctions. On the other side, the investments in town infrastructure (water, sewage, gas) and the recently approved projects for urban restructuring are proofs of a promising recent dynamic.
3	Local contribution to the climate change <i>Emissions of CO<sub>2</sub>- on long term, when will be identified a simplified methodology, this indicator focus on the ecological impact</i>	Contribution of the local industry to C)2 emission is reduced, because there is a limited number of polluting units, while the emissions from the cars that cross the locality and those from locality and the methane emissions as a result of coal combustion in the private houses contribute on long term to the greenhouse effect.
4	Local mobility and the passenger transport <i>The daily distances for the passenger transport and means of transportation</i>	Daily the population from outskirts commutes towards industrial areas and services areas, placed in the downtown, in the eastern part and on the terraces of Trotuș River, with their own transportation means, by public transport or by walk. It is necessary the efficiency of the public transport, for reducing the distance-time, but the shape of the town is not favourable to realisation of transport circuits, more efficient energetically the linear routes.
5	The existence of public green areas and local services <i>The access of the inhabitants to local green areas from proximity and basic services</i>	Even though reported at the total area of the urban area, the public green areas represent a small percent, the present evolution being positive, through major investments for the modernisation of Măgura park and for the ensuring access to the park (building a bridge over Trotuș River), the area from the northern part of Gura Slănic district turning back to the main area of relaxing for tourists and inhabitants. The other two existing parks in the downtown need, in equal measure, rehabilitation works mainly of the sidewalks, and urban furniture. Basic services- commercial, medical (pharmacies), education are accessible to the inhabitants from the downtown and peri-central areas, but not the peripheral districts and satellite localities that have a low level of urbanisation.
6	The quality of the air in the town <i>The number of the days with air of good quality and healthy</i>	The road transport is the only intern factor that modifies in a negative way the quality of the air. The significant quantity of pollutants are produced mainly in the rush hours, along the central axis of the national road 12A, requesting a ring road. Other dysfunction episodes in what concerns the quality of the air are produced by emissions .

Tab. 4 - Sustainable development indicators for Târgu Ocna town  
(Additional indicators)

<b>B Additional indicators</b>		
7	Transport of the pupils/students to and from the schools <i>The way of transport used by the pupils/students for the transport between the school and home</i>	The pupils from Vâlcele and Poieni (including those from Păcurele and Mosoare), as well as those from Gălean, Viișoara and Tisești, benefit of public transport with minibuses, on schedule, but those from Gura Slănic do not benefit of direct means of transportation towards the central area, neither a kindergarten/school in the district. On the other side, there are not special ways of transport for the pupils to/from the school.
8	The sustainable management of the local authorities and local economy <i>How many public and private organisations that adopt and utilise procedures of social and environmental management exist?</i>	In Târgu Ocna there are a number of 4 associations, 3 trade unions (education, salt mine and drilling company), a civil medical association and 5 non-governmental organisations, but their activity is less visible at the local level decision making. At the level of the town function, in equal measure, two centres for disabilities children, but also a centre of re-education, and the Local Council has a special department for social protection. Even though associations are functional structures, it is necessary their better implication in the community's life.
9	Noise pollution <i>The number of population exposed at a dangerous level of the noise</i>	There are higher exposed at the noise pollution due to traffic, the inhabitants of the residential areas placed at one side and another of the national road DN11A (4884 inhabitants) and those from downtown, peri-central eastern and western areas and Poieni quarter. Through the construction of the ring road their number will decrease to 576 (considering the acceptance of the south ring road, through Tăbăcari- Tisești- Gura Slănic).
10	Sustainable land use <i>Sustainable terrain and urban plot development, restoration and protection</i>	Sustainable use of urban land can be accomplished by cleaning the sites contaminated with oil residues, waste segregation at source, degraded sites from the low terraces of Troțuș river planning, making more frequent the buildings from the central area and from some peripheral areas and reorganising them from town planning point of view, former industrial areas rehabilitation and economic utilisation, new tourist endowment construction (ski path, telegondola, racing track for ATV etc.)
11	Sustainable development promoting products Number of organic products, eco-labeled from total consumption	Today segregation at source and temporary depositing of waste is being sustained by local authorities. There are rural tourist units (for e.g. „Casa Creangă”) promoting organic traditionally made products, but a better revaluation of the internal potential is needed. The fact that some areas are not contaminated by industrial residual products or by pollutants resulting from the mechanisation is a chance for local revaluation (possibly an integrated tourist development with Slănic Moldova) by an “alternative”, “ecological” offer gradually attracting devoted customers

satisfaction. We have considered that the adaptation of the TISSUE and SUD-LAB indicators on the complex issues imposed by the structure and the functionality of the town can offer a perspective regarding the action priorities.

### Conclusions

The urban development indicators are rough guide landmarks and have an obviously general character. They offer a contrasting image of the current state of Târgu Ocna, useful in order to identify the discordant and dysfunctional elements (simple or very complex specific indices have to be analyzed from the *evolution perspective*, depending on the configuration of urban environment). They are also useful for the comparison to other systems or to standard quality values (in this sense, we need to apply common, *comparable* indices, to standardize them for all towns within the same category). According to the urban analysis scale (neighbourhood, within the town; town within the urban regional/national/international urban system) we modify the sets of indicators useful in emphasizing urban development characters. The data availability is essential to elaborate and use the sets of indicators, and, in this sense, the elaboration of an urban management system requires the modification/amending of the current data sets and of computer-based systems.

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Applying the sustainable development indicators to an urban locality, even to a small town as Târgu Ocna, shows important elements at different analysis levels: contrasting characteristics for the neighbourhood level, with a centre having the advantage of its attractive patrimony and its polarizing capacity regarding the administration and services, with a complete urban endowment, but without a municipal fund (habitation space and network), intense traffic, unorganized green areas, insufficient and randomly placed etc. In comparison to the minimal requirements for rural settlements in Romania and to other towns, Târgu Ocna has flaws regarding the quality, sustainability and density of constructions, urban utilities and services, but also an obvious dynamism manifested in the recent improvement of socio-economic indicators and in essential investments in the infrastructure.

The analytic project, statistically structured and also based upon qualitative estimates, should have as purpose concerted actions from the actors within the urban system and rigorously planned measures of the decision makers, for an adequate positioning towards a sustainable development.

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