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ASSESSMENT OF THE SPATIAL CAPACITY OF RURAL AREAS, AS ILLUSTRATED BY THE EXAMPLE OF THE NOWY TARG MUNICIPALITY

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ABSTRACT

The accelerating development of rural areas makes it necessary to look for ways to control that development, and steer it in the right direction. The current planning and strategic instruments should be complemented with spatial capacity indicators. The aim of this article is to define these indicators, and to assess the spatial capacity of rural areas, as per the example of the Nowy Targ municipality, located in the Podhale region of Poland. The sources of information for the analyses were derived from statistical data from a period of over a dozen years, concerning the socio-economic, economic, and natural (environmental) spheres. Complementary to the research, we have conducted the analysis of the existing planning, strategic, and cartographic studies. The application thereof is to help maintain the proper quality of the rural environment, and to preserve the cultural and natural heritage, which constitutes an important element in the implementation of the sustainable development policy.

Key words: spatial capacity, sustainable development, cultural and natural heritage, Nowy Targ municipality

INTRODUCTION

In most urban agglomerations in Poland, we are witnessing a noticeable "spilling" of the built environment outside the main cities, and the allocation of increasingly larger parts of agricultural areas for investment development (i.e. urban sprawl). This kind of development absorbs considerable portion of rural areas, and generates high costs when expanding the infrastructure and service networks. Often when assigning new areas for investments, the costs of these activities incurred by the region, the city, and the whole population are not included in the calculation [Fogel and Kistowski 2005]. Cities are growing in a chaotic manner, destroying the natural environment, and losing the cultural values of the given place. This kind of development consumes considerable portion of rural areas, and it generates high costs when expanding the infrastructure and service networks.

In connection with the revitalization of rural areas (areas, which are often rich in natural and cultural heritage resources), there is a need to look for appropriate tools to control and steer their development. Spatial capacity indicators could complement the existing planning and strategic instruments. The document evaluating the spatial capacity of a given place or area could be helpful for all current strategic plans, environmental management plans, and, in particular, for the local spatial development plans (i.e. master plans).

The main purpose of this article is to assess the spatial capacity of rural areas, as illustrated with the example of the Nowy Targ municipality. The issue of spatial capacity as a research topic began to generate interest more than a dozen years ago. To date, this problem has been analysed in the context of cities [Fogel and Kistowski 2005]. Very few reports exist on the question of rural areas (this issue is addressed by, among others, Warczewska 2012 and Krajewski

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2011), therefore in the present paper we attempt to analyse problems related to rural regions as valuable natural and cultural areas.

In a similar context, two groups of terms were used previously, namely sensitivity and resistance, as well as landscape absorbency and capacity [Krajewski 2012]. In the context of issues related to spatial planning, however, experts proposed the introduction of the term "spatial capacity" as the most suitable for the analysis of planning issues concerning areas already developed, or designated for investment and construction. An attempt to determine the correct application of the concepts of "absorbency" and "capacity" was made at the Institute of Land Management and Housing (IGPiM), where the criteria of ecological absorbency for the needs of spatial planning were developed. It has been deemed that the term "absorbency" should be used in relation to analyses and assessments concerning the natural environment, which had not previously developed by humans (this is the case, for example, in the assessment of the natural absorbency of the given area). In turn, the term "capacity" should be used in relation to the environment that had previously been subjected to anthropogenic pressure, such as spatial development [Krajewski 2012]. According to the IGPiM, "the spatial capacity of the territorial unit's environment is the threshold level of anthropogenic pressure, at which spatial planning decisions can be considered compatible with the principles of sustainable development". The level of capacity is determined by comparing indicators of the status of environmental parameters at various stages of development of the studied spatial unit's area, and its forecasted future status, determined in the course of work in the field of spatial planning [Fogel et al. 2005].

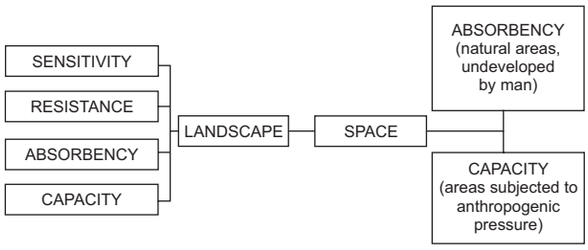

Fig. 1. Terms connected with the notion of spatial capacity [own study]

Spatial planning and environmental impact assessment are the basic, preventive instruments of environmental management and natural environment's protection. The goals that both these instruments should serve are strictly reflected in their statutory definitions. Spatial order and sustainable development are the bases for shaping the space in Poland [Mierzejewska, 2003]. These concepts can be very differently understood and interpreted, despite the fact that they were specifically defined in Polish laws and regulations. Principles of sustainable development and spatial order are closely interrelated, and they complement and permeate each other [Woźniak, 2015]. Shaping space in the settlement sphere, and in the sphere of other human activities, remains one of the main activities in the context of implementing the principles of spatial order and sustainable development, in the matter of securing the protection of natural, landscape, and cultural values, as well as ecological functions of individual areas. It is therefore important to take into account the conditions for designating these areas in spatial development plans (master plans) as well as in any decisions, programs, evaluations, studies, and expert opinions related to these plans [Gil-Mastalerczyk, 2016]. As suggested by the Institute of Spatial Management and Housing, the term "spatial capacity" is a proposition for solutions that would hinder unreasonable, unpremeditated planning decisions. The description of spatial capacity presents a series of indicators aimed at streamlining and objectivizing spatial management processes and spatial planning, in particular at the level of the city/municipality, as well as the assessment of the quality of spatial planning and the spatial, economic, social, and environmental impact of decision making in the field of spatial development in relation to sustainable development goals [http: // www.agenda21.waw. en].

RESEARCH METHODOLOGY

Spatial capacity is determined by means of calculating the indicators of past, current, and desired or planned spatial development, referring to its economic, demographic, social, natural, and technical aspects (including communications), showing the spatial diversity of phenomena within a specific territorial unit. The purpose of using spatial capacity indicators is to stream-

line and objectivize spatial management processes and spatial planning, in particular at the municipal and city level, as well as to assess the quality of spatial planning, and the spatial, economic, social, and environmental effects of spatial planning decisions with regard to sustainable development objectives [Fogel et al. 2006].

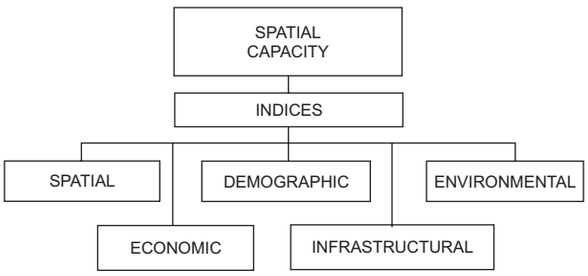

Fig. 2. Indices serving for the evaluation of spatial capacity with the use of statistical data [own study based on Warczewska 2012]

Having followed the recommendations for selecting the indicators from those, which are easily obtainable, and sourced from generally available statistical data, an attempt was made to apply them in the analysis of the Nowy Targ municipality, divided into individual groups, as shown below. In the present research, the period of fourteen years has been examined, from 2002 to 2015.

The key factors taken into account are demographic indicators, which are the basic data about the population and the demographic processes taking place in a given area. This is because the said indicators use the data and statistical markers such as: the municipality's population size, population density, migration balance, birth rate, demographic burden rate, and age structure. Another group of indicators concerns economic aspects. Their determination was based on expenditures and unemployment data. The third group consists of infrastructural indicators, concerning mainly water supply and sewage networks, waste volumes and their storage, water consumption, sewage production and existing sewage treatment plants. Environmental (natural) indicators are also taken into account when assessing spatial capacity. They concern mostly the size of protected areas, the number of nature monuments, as well as environmental contamination and hazards, mainly in terms of air pollution. The last group of the indicators refers to the spatial aspect.

In addition to the statistical analysis, the municipality's planning documents were studied in order to determine the spatial capacity of the researched area, namely: the study of conditions and directions for spatial development [Studium… 2012], master plans/local plans and development strategy [Strategia… 2015–2022]. Cartographic materials representing the analysed area were also collected.

RESULTS

The area of the Nowy Targ municipality, included in the scope of this study, is extremely diverse and rich in terms of its natural and cultural heritage. The spatial policy that the Nowy Targ municipality is conducting is constantly improving, and it aims to solve the most important environmental, social, and spatial problems. The obligatory planning document – the so-called "study of conditions and directions of spatial development" – constitutes the basis for further changes and directions of spatial development for the municipality in question. An important problem is the lack of master plans for open areas. The historical, compact built environments of the villages in the Podhale and Spisz regions are getting blurred and dispersed. This process generates high costs, causes difficulties in the construction of new technical infrastructure facilities, and poses a threat of increased pollution to the natural environment. The location of the municipality around the city of Nowy Targ also involves several types of threat to rural areas. Firstly, Nowy Targ is one of the most polluted cities, due to its geographical circumstances (location of the city in the valley) and due to the high-emission heating systems, typically used in the local households. Moreover, the "fashion" for terraced housing has arrived in the villages of the Nowy Targ municipality: investment areas are growing, more and more city dwellers want to live in the countryside. In this situation, the spatial capacity assessment of rural areas poses many difficulties, however, it remains extremely important, and very much needed from the point of view of further development, spatial order, and the identity of the particular region.

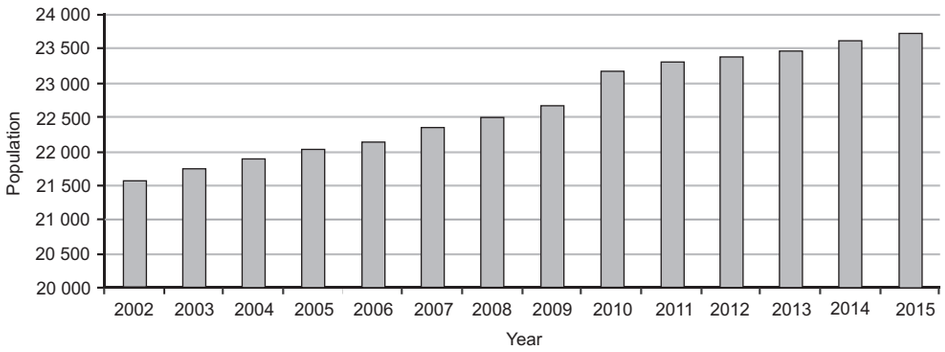

Fig. 3. Population of Nowy Targ municipality between 2002–2015 [own study based on the BDL data]

The fourteen-year period adopted in this study reveals certain trends within the area of the Nowy Targ municipality. The population numbers are exhibiting a steady growth. There are more and more residents from year to year, and the proof of this is a consistently positive birth rate, and a positive migration balance. At the same time, the density of population increases. The analysis shows the increase of one person per every one square kilometre, which – calculated in the scale of the whole area of the municipality – gives approximately a little over 200 people per year. A disturbing fact is the aging of the society. Although it is happening at a very slow pace, this process is definitely taking place, and it is important that the number of people of pre-working age, which is the "foundation" of the future generation, should not be reduced.

Economic indicators, concerning in particular the municipality's budget, which consists of income and expenses, have been used in the analysis in order to obtain information as to which areas the municipality invests in, and where it allocates the largest amounts of capital owned or obtained from external sources. The data obtained for the year 2015 indicates that the largest amount of funds had been spent by the municipality on: education and pedagogy, followed by welfare, transportation and communications, public administration and – what is important – on the municipal economy and environmental protection. The municipality therefore invests in education, which today is the basis for a rational approach to the surrounding space. The municipality also attempts to find solutions for negative social processes taking place within its territory, and to take care of the needs of residents. The increase in the expenditures on municipal services as well as transportation and communications is another proof of slow socio-demographic and economic development.

The third group of indicators (infrastructural ones), mainly concerning the water supply and sewage networks, the amount of waste and its storage, water consumption, sewage production and existing sewage treatment plants, confirms previous indicators referring to the municipality's expenditures. Within the period of fourteen years, 30% of all residential buildings gained access to the sewage removal network, while the length of the network increased fourfold. Waste management and segregation processes were also improved in the municipality. The process of water use rationalization was introduced, and a significant decrease in water consumption for production purposes was achieved, which contributed to reducing water consumption for the needs of the municipal services, and the population.

Table 1. Areas protected by law within the area of the Nowy Targ municipality (as of 20 October 2016)

Areas protected by law	Area, km^2	Share in the total area of the municipality
National Parks	5.98	2.88%
Nature's Reserves (within Protected Landscape Areas)	0.09	0.04%
All Protected Landscape Areas	201.70	97.12%
Total	207.68	100%

Own study based on the BDL data

Environmental indicators, in the case of the Nowy Targ municipality, constitute a very important source of information for the purposes of spatial capacity assessment. The whole area of the studied municipality is protected due to valuable natural assets. Protected landscape areas constitute over 97% of the total area of the municipality, while less than 3% are occupied by the Gorce National Park. Nature's reserves and nature monuments are also listed. The municipality of Nowy Targ, covering only rural areas, is characterized by high share of natural resources. We should also mention the rich cultural heritage of this area. Numerous historical monuments and rich folklore are only a few, albeit very important features of the studied municipality.

The last studied group are spatial indicators. The analysis covered data on the land classification and land use in the municipality, as well as information on the housing resources. According to data for the year 2015, 57% of the total area of the municipality is made up of agricultural land, whereas forests, groups of trees and shrubbery cover 36.66% of the area. Such a presentation of data illustrates the typically agricultural character of the municipality under investigation. Barren land, land under surface waters, and other types of land constitute approximately 3.59% of the total area of the municipality. Other areas (about 2.75%) are built-up and urbanized areas. The existing master plans for the Nowy Targ municipality additionally designate new investment areas, which result in an increase of the developed areas from 2.75% to approx. 10.40%. At the same time, this determines the spatial capacity of the municipality. Therefore, we can conclude that area under consideration has huge developmental reserves. The problem is, however, that open areas are not covered by master plans, which may result in a negative phenomenon of unduly increasing built-up and urbanized areas.

When assessing the spatial capacity of the Nowy Targ municipality – that is, when referring to those issues, which are related to spatial planning – it should be affirmed that the municipality has large development span. The difficulty lies in maintaining the correct proportions of land use (in this case, in mountainous areas) so as not to disturb the natural balance; to be consistent in decision making; and to plan for present and future generations, striving for sustainable development. The Nowy Targ municipality is an example of a typical agricultural area with a rich natural and cultural heritage. In the Municipality Development Strategy for the years 2015-2022, three directions of development have been delineated, taking into account its potential, in the following aspects:

- Territorial/spatial,
- Cultural heritage,
- Environmental.

Table 2. Land use in the Nowy Targ municipality (as of 2015)

Breakdown of land	Area hectares
Arable land	11 838
Forests, areas overgrown with trees and shrubbery	7 614
Land under surface waters	529
Developed (built-up) and urbanised land	572
Ecological sites	–
Barren land	207
Other	8
Total	**20 768**

Own study based on the BDL data.

Thus, the most important directions of activities were defined, thanks to which the municipality is able to develop. Spatial capacity assessment is very important in this matter. It helps to identify, and to accomplish planned tasks. Based on this, and on the forecasted changes, various areas of the municipality should be organised and managed.

In the Nowy Targ municipality, there is a tendency to increase investment developments, population size, and population density. It can be assumed that this trend will be maintained in the near future; therefore we should expect investment pressure, especially on open rural areas. It is important to manage the municipality's potential and resources properly wisely, and comprehensively, in an integrated approach, so as not to lose the value of the space – and this is linked with the postulate that the limit of spatial capacity should not be exceeded.

DISCUSSION AND CONCLUSIONS

The purpose of the article was to assess the spatial capacity of rural areas, as illustrated with the example of the Nowy Targ municipality. The index method we have applied allowed us to determine the existing condition, and development trends that occur in the studied municipality. Our research was additionally supplemented with the analysis of master plans and strategic documents.

The municipality of Nowy Targ, which consists of 21 villages, is an example of a rural area with a rich history and valuable natural and cultural heritage. Index analysis and review of local and strategic plans showed changes in the area of the municipality, and revealed the existing trends – mainly towards the increase in the size of the population, and in the share of developed areas.

The application of the index analysis to the assessment of the spatial capacity of rural areas can be an effective tool for the planning and monitoring of spatial development and environmental protection, which has not been successfully established in Poland so far. At present, the only coherent document existing in Poland in the field of spatial planning, the implementation of which is obligatory for municipalities, is a "study of the conditions and directions of spatial development." It is at this level that a spatial capacity assessment should be conducted. Those municipalities where local law exists may be an exception. In this latter case, local master plans constitute the main basis for spatial capacity calculations instead. Therefore, it does not seem appropriate to calculate these indicators in other studies, because an important element is the possibility of comparing a full set of indicators calculated for development in two periods: present (existing) and future (planned) – which is not possible with any other documents.

Another conclusion – referring not only to the examined municipality, but also to all other territorial division units – is the necessary requirement to collect data and maintain information resources about space, such as are indispensable for taking responsible decisions in the field of spatial development, and for safeguarding the protection of natural and cultural heritage in a reliable manner. The basic condition for the fulfilment of this task, and for conducting the spatial capacity assessment, is the collection of basic information made available to planners in the form of maps and statistical data. It is important that this information is easy to obtain, and that it does not generate additional costs, which could create restrictions for local governments in the implementation of planning activities.

The set of indicators adopted for the spatial capacity with reference to the Thematic Strategy on the Urban Environment (2006), can of course be treated merely as ordered, albeit raw input data, which may be further processed at the level of the *poviat* (district), region and the whole country, respectively. The vast majority of the proposed indicators of spatial capacity is assigned to the category of sustainable spatial management, and it can significantly support the Polish spatial planning system.

However, in the search for spatial capacity criteria, the lack of much of the necessary quantitative and qualitative data is a significant barrier. Without that data, it is impossible to determine the correct level of the indicators. Available statistical data refer to the area of the municipality as a whole, which is spatially diversified. In addition, as a result of statistical analyses, indicators are set for the larger area within the administrative boundaries, and not for specific areas [Warczewsk 2012]. This form of data only provides an overview of the current condition as well as – thanks to the analysis across more than a dozen years – it demonstrates the existing trends in the municipality. Detailed information could only be obtained through spatial analysis, using the GIS tools. These analyses would facilitate the determination of areas with varying degrees of development intensification, and those that should be excluded from zoning. The existence of areas that are subject to strict protection should be taken into account – namely the areas where built investments cannot be introduced, but which can only be made available for learning, education and sightseeing [Ptaszycka-Jackowska and Baranowska-Janota 1998].

Space – as the common, public asset – is scarce, limited, and multidimensional. Therefore, in the capacity assessment, it is necessary to apply not only purely statistical indicators, but also make due references to nature, and to spatial information. Based on the analysis of statistical data, it is possible to describe only certain states and processes taking place within

the socio-economic space, which provide us with an overview of the direction of development. However, if we refer additionally to environmental and spatial data, the spatial capacity of the municipality can be determined with more exacting precision, that is, we will be able to determine the maximum possible area designated for development, without violating the natural balance, and to indicate limit values, taking into account the principles of development processes.

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OCENA POJEMNOŚCI PRZESTRZENNEJ OBSZARÓW WIEJSKICH NA PRZYKŁADZIE GMINY NOWY TARG

ABSTRAKT

Coraz szybszy rozwój obszarów wiejskich wywołuje konieczność poszukiwania sposobów jego sterowania. Obecnie stosowane instrumenty planistyczne i strategiczne należałoby uzupełnić o wskaźniki pojemności przestrzennej. Celem niniejszego artykułu jest wyznaczenie tych wskaźników i ocena pojemności przestrzennej terenów wiejskich na przykładzie gminy Nowy Targ, położonej w regionie podhalańskim. Źródło informacji do analiz stanowią dane statystyczne z okresu kilkunastu lat, dotyczące sfery społeczno-gospodarczej, ekonomicznej oraz przyrodniczej. Uzupełnieniem badań jest także analiza obowiązujących opracowań planistycznych, strategicznych oraz kartograficznych. Jej zastosowanie ma pomóc w utrzymaniu właściwej jakości środowiska terenów wiejskich oraz w podtrzymywaniu dziedzictwa kulturowego i przyrodniczego, stanowiąc istotny element w realizacji polityki zrównoważonego rozwoju.

Słowa kluczowe: pojemność przestrzenna, zrównoważony rozwój, dziedzictwo kulturowe i przyrodnicze, gmina Nowy Targ