

SPATIAL MANAGEMENT POLICIES IN THE COMMUNITY OF TOMICE IN THE CONTEXT OF DEVELOPMENT DIRECTIONS OF INVESTMENT AREAS

Barbara Prus, Tomasz Salata

Summary

The fundamentals for sustainable development are constituted by spatial management policies expressed in the study of conditions and directions of spatial management as well as in the local spatial management plan. Polish agricultural lands are more often reclassified as non-agricultural areas. For example, this is confirmed by statistical data from the Polish Central Statistical Office. Also, there is an increasing number of non-agricultural and non-forest areas in spatial management studies. Ensuring access to technical infrastructure is an important argument in favour for development of investment areas. This article analyses, land zoning patterns in the community of Tomice, with particular consideration to investment areas. This paper also takes a close look at local spatial management policies and discusses the location of investment areas in the context of their access to utilities network.

The article applies geoprocessing methods, including geometric and spatial analysis of selected basic evaluation fields.

Keywords

investment areas • access to utilities network • spatial analysis

1. Introduction

The Polish Act of 23 March 2003 on spatial planning and management [Ustawa... 2003] defines principles of creating spatial policies by local governmental bodies. The concept of spatial planning is defined as activities aimed at defining land use and plans for land management, with the assumptions of sustainable development and spatial order. One of the main documents in the context of local spatial planning is the study of conditions and directions of spatial management prepared by the local head of the regional government bodies. It is supposed to define local spatial policies and directions for land use. The object of the study should be approved by the local self-government which is responsible for the document in front of local inhabitants. The study consists of “declarations” and “commitments” of local authorities to implement the approved spatial policies. These activities also need to include promotion and marketing of spatial

policy initiatives [Śleszyński 2012]. Moreover, the study has a strategic character. It may serve as a basis for local spatial management plan developed for the entire community. The study of conditions and directions of spatial management includes all elements that should become the part of a few-year local development strategy. It also includes information on development objectives and hierarchy of actions in order to achieve the planned directions of development, including indispensable land use changes. In general, this document plays a major role in the system of spatial planning.

The local spatial management plan serves as a tool in the implementation of spatial policies defined in the study of conditions and directions of spatial management for the given community. When there is no local spatial plan, resolutions regarding spatial management are communicated through decisions on land development and spatial conditions. Local spatial management plan is the only document that defines land use and land management principles. In this respect it cannot be substituted by either the study of conditions and directions of spatial management or regional or national documents. The only exception is internal regional regulation issued by the province governor when local community authorities act indolently and the local spatial management plan is obligatory [Ustawa... 2003]. The decisions of the local spatial management plan have legal and financial consequences related directly to land use changes. If a local spatial plan designates areas for building development, this means that in the future these areas will be fitted with technical and utilities infrastructure. Quite often this happens as part of local spatial management policies.

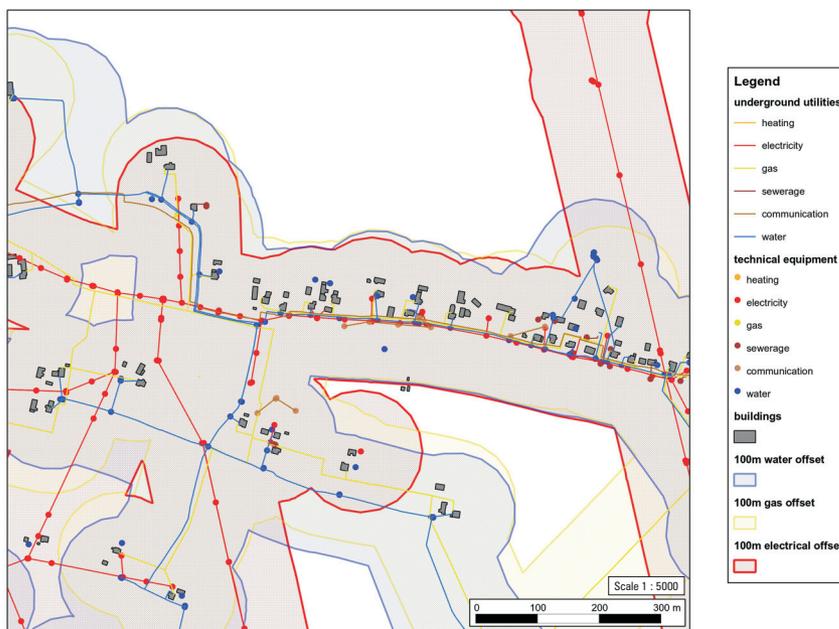
Spatial planning requires searching for compromise between economic exploration of space, protection of environmental aspects and architectural assumptions. Another important element of the local planning process is confronting the needs of local communities for areas of particular type with real possibilities. If a local spatial plan defines a given area as non-agricultural land (residential, commercial or industrial), it is necessary to install adequate utilities infrastructure.

A number of authors discuss needs for the development of technical infrastructure in rural areas [Salamon 2002, Kwapisz 2002, Gruszczyński 2002]. Suitable technical infrastructure influences attractiveness of communities or regions for investment, economic development, increase in the number of workplaces and improvement of standards of life. The level of utilities infrastructure in a given area conditions entrepreneurial development. This article presents certain aspects related to the evaluation of condition of space development in the context of equipping investment areas with utilities network [Kwietniewski 2009] and secluding areas for the needs of spatial planning [Cyganik et al. 1996]. Spatial analyses were conducted with the help of the following applications: QuantumGIS [Nowotarska 2009], Open Jump, GRASS [Longley et al. 2006], based on PostgreSQL database extended with PostGIS [Gotlib et al. 2007, Lis et al. 2007, Iwaniak 2005].

2. Researched area

The community of Tomice occupies an area of 41.5 km² and it is located in the Malopolska region, in the district of Wadowice. The area consists of 6 administrative units called *sołectwo*: Lgota, Radocza, Tomice, Witanowice, Woźniki and Zygodowice. The area is inhabited by approx. 7 580 people. The commune has mainly agricultural lands, which cover approx. 73% of the total land area. Local spatial management plan passed in 2004 [Uchwała... 2004] defines several types of land use other than agricultural or forest. For the purposes of this work, they are called investment areas.

The study used GIS tools to identify invested areas: that is with water, electricity and gas. The studies do not included telecommunications networks and the heat-lines, which was not necessary considerations for the investor, especially during the start of the investment process. Based on the media geographical location, authors separated areas within 100 m of each element or industry. The authors made an assumption, that 100 meters is the distance, that generate the lowest network connection cost, which have favorable conditions for investor. This is presented in Figure 1.

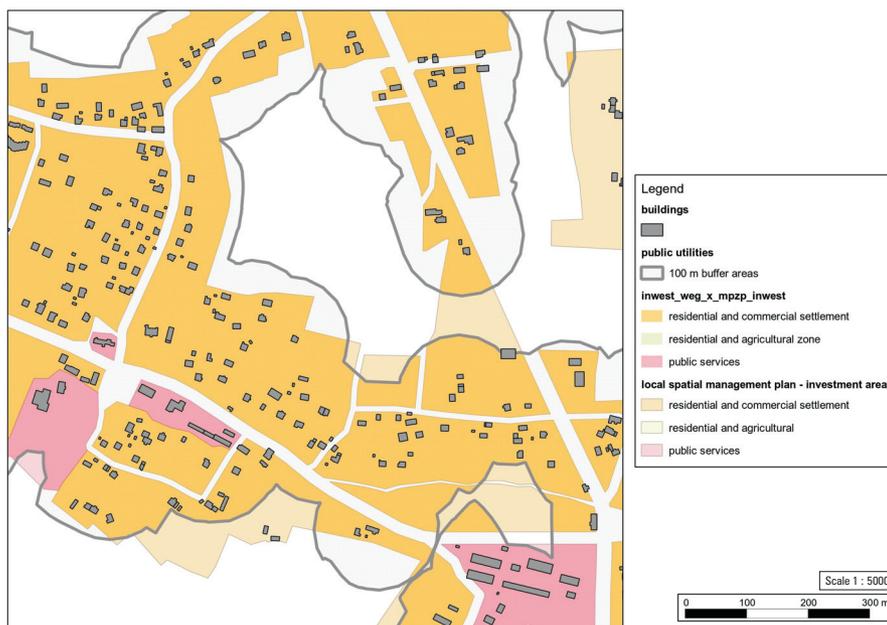


Source: authors' study

Fig. 1. Separated areas within 100 meters from the industry

These areas are divided into three types: water, gas and electricity. In order for the area to be of interest to the investor, it should contain all the elements together.

Authors separated common (industry) areas, included water, gas and electricity and confronted them with the local spatial management plan, investment areas by using GIS geoprocessing tools [Iwaniak 2005, Gaździcki 1990]. The effect of the over lapping of layers is shown in Figure 2.



Source: authors' study

Fig. 2. Identification of investment areas of industry background (variant with all industry)

Areas with stronger shades of color within areas equipped with industry background were separated in Quantum GIS application on a layer: "inwest_weg_x_mpzp_inwest" as the product of two layers: "public utilities" and "local spatial management plan – investment areas".

3. Analysis of spatial data

Spatial data characterizing the area of Tomice community consisted of the layer with information about the function of particular areas in the local spatial management plan [Uchwała... 2004]. The analysis was conducted for the layer of technical infrastructure including information on utilities networks in the area. For the clarity of the work, the following have been defined: settlement zones and zones of commercial activities of strategic importance for the Tomice community. The analysis was conducted for the zone of residential and commercial settlement, including tourist and recreational areas

(Table 1). This is defined as MN, MU1, MU1X, MU2, MP; residential and agricultural zone, including farms, small commercial activities defined as MRX, MR, RM, RMX; the zone of public services defined as follows: UC1, UC1X, UC2, UK, UP, US.

Table 1. Size of investment areas in the local spatial management plan in Tomice, by investment zones

Investment zone symbol	Size of investment areas		The number of zones	Min area [ha]	Max area [ha]
	[ha]	[%]			
RM	47.22	5.08	16	0.13	9.32
UC1X	14.32	1.54	4	0.35	10.62
MN	13.11	1.41	5	1.33	5.85
MP	5.21	0.56	5	0.49	1.82
US	3.76	0.40	4	0.66	1.37
RMX	5.81	0.63	6	0.25	1.58
MU1X	59.76	6.43	14	1.35	8.85
UK	1.93	0.21	6	0.09	1.15
MRX	12.79	1.38	7	0.10	8.21
MR	298.94	32.16	104	0.03	11.63
UC2	5.31	0.57	1	5.31	5.31
MU2	14.10	1.52	7	0.17	4.39
MU1	421.69	45.37	114	0.04	29.76
UC1	10.80	1.16	12	0.27	2.11
UP	14.68	1.58	12	0.09	7.76
TOTAL	929.43	100%	317	-	-

According to the local spatial management plan, the most common zones among investment areas in Tomice include residential and agricultural development. Altogether they cover over 77% of the total investment area. The highest percentage of investment areas is located in the village of Tomice (29%), Radocza (25.4%) and in Witanowice (16.8%) (Table 2). Almost 55% of Tomice's investment areas include those for residential development and services. The highest percentage of these is located in the village of Tomice: 85%. A similar situation can be observed in Radocza, where residential and service-related areas cover 67% of all investment areas. The remaining villages are different because they have a stronger agricultural character. They are dominated with agricultural areas: in Lgota this type comprises as much as 92% of all investment areas, in Witanowice 72%, in Zygodowice 62% and in Woźniki more than 50%.

Table 2. Size of investment areas in the local spatial management plan in Tomice, by particular villages

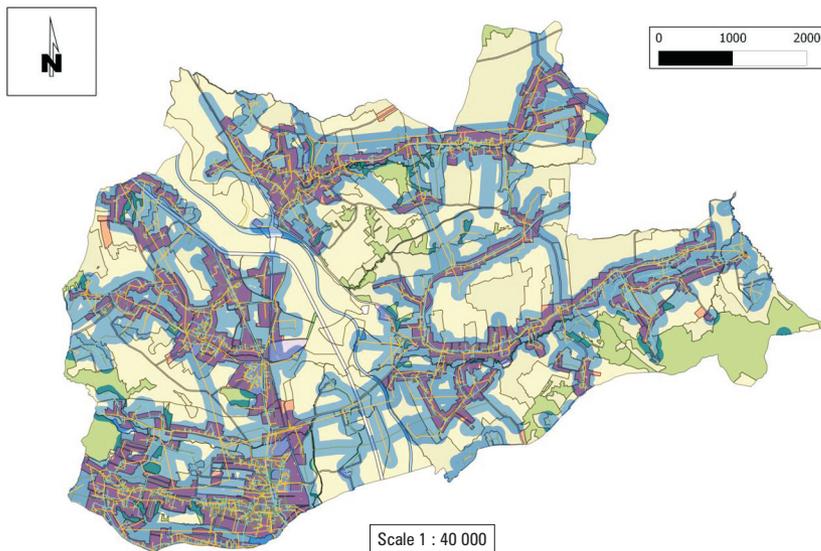
Village	Size of investment areas		The number of zones	Min area	Max area
	[ha]	[%]			
Tomice	269.54	29.0	97	0.09	18.09
Zygodowice	74.57	8.0	31	0.09	14.31
Woźniki	115.61	12.4	49	0.03	9.81
Witanowice	156.53	16.8	58	0.24	11.63
Radocza	235.85	25.4	55	0.15	29.76
Lgota	78.20	8.4	27	0.27	9.09
TOTAL	930.30	100%	317	–	–

The establishment of utilities networks in investment areas designated in the local plan should be performed by community authorities [Ustawa... 1990]. Providing the local communities with access to water, sewage, gas, electricity and telecommunications networks makes it possible to connect houses to these networks. Table 3 presents the density of underground utilities network [$\text{km} \cdot \text{km}^{-2}$].

Table 3. Density of selected utilities networks in Tomice

Village	Size area [km ²]	Water		Sewage		Gas		Electricity	
		[km]	density	[km]	[density]	[km]	[density]	[km]	[density]
Lgota	4.92	18.59	3.78	0.39	0.08	8.76	1.78	9.94	2.02
Zygodowice	4.20	7.99	1.90	0.26	0.06	10.25	2.44	12.86	3.06
Radocza	9.58	22.08	2.30	9.54	1.00	34.45	3.60	29.35	3.06
Witanowice	9.47	20.80	2.20	2.34	0.25	27.26	2.88	26.61	2.81
Tomice	7.67	41.36	5.39	25.84	3.37	49.30	6.43	45.81	5.97
Woźniki	5.71	12.08	2.12	2.39	0.42	17.22	3.02	17.84	3.12
TOTAL	41.55	122.90	2.96	40.76	0.98	147.24	3.54	142.41	3.43

The density of utilities networks in the community of Tomice is highest in the main village which is equipped with the best technical infrastructure. A number of investment areas do not have access to the basic networks: the water supply and electricity networks. This can be observed in the north-western part of Radocza, south-eastern part of Woźniki and in the southern parts of Lgota and Witanowice (Figure 3).



Source: authors' study

Fig. 3. The community of Tomice: road network, land use types, building development types, investment areas with access to electricity, water supply and gas network

After applying the spatial product on geometrical objects, the common parts of the thematic layer of the local plan were excluded, including utilities layer. The remaining represent areas for investment purposes which have access to the utilities network.

Figure 3 represents areas designated for investment purposes in the local plan. These areas have access to the electricity and water supply networks. The resulting map, created as a digital map in the SHP format, presents spatial objects which are spatial products (common part) of layers which were taken for comparison. The methodology of creating the resulting map was based on creating buffers around the utilities network. First of all, the analysis was conducted for the buffer zones around the utilities and electricity networks, which are critical for investment. The analysis of the layer of the local spatial management plan concerned selected investment areas. The spatial product for two layers, generated geometric objects which constitute the common part of major objects in both layers.

For the purposes of this work, it was assumed that the simultaneous presence of two network types (electricity and water supply) decides whether investment will be launched. It was also assumed that the maximum distance enabling the connection to the utilities network is 100 m, this control is called access to the utilities network. The subsequent assumption was that access to three utilities networks: electricity, water supply and gas enables faster investment. Spatial analysis of utilities network distribution in relation to the location of investment areas revealed that a large part of Tomice

community complies with the requirement to have access to two or even three basic utilities networks (Table 4).

Table 4. Analysis of investment areas in Tomice with access to utilities networks

Village	Zone	Zone area [ha]	[%]	Size area of zones without access to electricity and water [ha]	[%]	Size area of zones without access to electricity, water or gas [Hectares]	[%]
Lgota	MU	5.21	6.66	2.69	51.57	3.51	67.32
	RM	72.11	92.22	10.84	15.03	18.03	25.01
	U	0.87	1.11	0.00	0.00	0.00	0.00
Radocza	MU	158.35	67.21	19.14	12.09	26.51	16.74
	RM	54.80	23.26	22.38	40.85	25.1	45.80
	U	22.45	9.53	5.58	24.86	7.47	33.27
Zygodowice	MU	28.22	37.90	2.62	9.30	4.47	15.83
	RM	46.00	61.78	11.51	25.02	14.74	32.04
	U	0.24	0.32	0.00	0.00	0	0.00
Witanowice	MU	37.00	23.64	2.37	6.42	3.11	8.41
	RM	111.92	71.50	17.84	15.94	23.42	20.93
	U	7.61	4.86	3.15	41.44	3.87	50.86
Tomice	MU	230.78	85.79	30.27	13.12	38.41	16.65
	RM	21.86	8.13	4.89	22.37	4.96	22.67
	U	16.38	6.09	2.41	14.73	2.93	17.89
Woźniki	MU	54.68	47.29	4.89	8.95	6.64	12.16
	RM	57.72	49.92	11.89	20.61	14.17	24.54
	U	3.23	2.79	1.02	31.68	1.25	38.79
TOTAL		929.43	-	153.50	16.52	198.59	21.37

MU – residential and commercial zone, RM – zone of agricultural settlement, U – services

After conducting the spatial analysis it was concluded that 83.48% of investment areas have access to both electricity and water supply networks at the distance which does not exceed 100 m. This percentage also exists at the same rate in all villages of the Tomice community, exceeding the number of 80%. Moreover, 78.63% of investment areas in Tomice have access to three utilities networks (electricity, water supply and gas) at the distance which does not exceed 100 m.

4. Conclusions

Thanks to the application of GIS tools which use topographic indexes and the application of geometric and spatial analysis of selected basic assessment fields, it was possible to single out areas for investment purposes without access to utilities networks.

Spatial analysis of technical infrastructure density helped to point out areas most and least favourable to investment. Less favourable areas are defined as those where ensuring access to technical infrastructure would require significant financing. At times, it is better to change investment localization.

Local spatial management plan of the Tomice community localizes investment areas close to urban areas along existing communication lines. The size of areas without access to two utilities networks (electricity and water supply) equals 153.50 hectares, which comprises 16.52% of investment areas. The highest percentage of investment areas without access to two utilities networks was observed in the village of Lgota (51.57%) and it is related to areas of residential and service-related character. The access to three utilities networks is not provided for 198.59 hectares of investment areas, which is 21.37% of their size area.

The results of the developed analyses, lead to the conclusion that the community of Tomice can be attractive for potential investment based on access to utilities networks of investment areas. The community has a good utilities network which is available in areas marked as investment areas in the local spatial management plan.

The applied information processing tools make it possible to single out problem areas and ensure proper implementation of local spatial policies. The tools for spatial data analysis applied in this work are available as open source applications on the web.

The results of the spatial analysis of technical infrastructure density have been submitted to the municipal office in Tomice under the mutual information exchange agreement between the Agricultural University in Kraków and the Tomice commune.

References

- Cyganik P., Głowacki W., Komenda J.** 1996. Wybrane możliwości zastosowania GIS w gospodarce przestrzennej gminy. *Człowiek Środow.*, 1, 20, 45–54.
- Gądzicki J.** 1990. Systemy informacji przestrzennej. PPWK, Warszawa – Wrocław.
- Gotlib D., Iwaniak A., Olszewski R.** 2007. GIS Obszary zastosowań. Wyd. Naukowe PWN, Warszawa.
- Gruszczyński J.** 2002. Rozmieszczenie przestrzenne infrastruktury technicznej w województwie świętokrzyskim. *Komitet Techniki Rolniczej PAN. Inżyn. Roln.*, 3, 36, 121–128.
- Iwaniak A.** 2005. Od GIS do SDI. *Infrastruktura danych przestrzennych inaczej*, cz. I. *Geodeta*, 11, 39–42.
- Kwapisz J.** 2002. Nasycenie infrastrukturą wodno-ściekową województwa małopolskiego w latach 1990–2000. *Komitet Techniki Rolniczej PAN, Inżyn. Roln.*, 3, 36, 141–148.
- Kwietniewski M.** 2009. GIS w wodociągach i kanalizacji. Wydawnictwo Naukowe PWN, Warszawa.

- Lis N., Mikrut S., Guzik M.** 2007. Możliwości wykorzystania darmowego oprogramowania w budowie bazy danych GIS dla Tatrzańskiego Parku Narodowego. *Archiw. Katedry Fotogram. Kartogr. Teledet.*, 17b, 463–472.
- Longley P., Goodchild M., Maguire D., Rhind D.** 2006. GIS: Teoria i praktyka. Wydawnictwo Naukowe PWN, Warszawa.
- Nowotarska M.** 2009. Wprowadzenie do Quantum GIS. Szczecin – Wrocław.
- Salamon J.** 2002. Stan infrastruktury technicznej powiatów województwa małopolskiego i podkarpackiego w aspekcie poziomu bezrobocia. *Komitet Techniki Rolniczej PAN, Inżyn. Roln.*, 3, 36, 21–33.
- Uchwała nr XIX/115/2004 Rady Gminy Tomice 31 sierpnia 2004 r. w sprawie miejscowego planu zagospodarowania przestrzennego sołectw gminy Tomice. *Dziennik Urzędowy Woj. Małopolskiego*, nr 306 z 2004 r., poz. 3271.
- Ustawa z dnia 27 marca 2003 r. o planowaniu i zagospodarowaniu przestrzennym [Dz. U. 2003, nr 80, poz. 717].
- Ustawa z dnia 8 marca 1990 r. o samorządzie gminnym [Dz. U. 2001, nr 142, poz. 1591].
- Śleszyński P.** 2012. Analiza stanu i uwarunkowań prac planistycznych w gminach na koniec 2010 r. Instytut Geografii i Przestrzennego Zagospodarowania PAN, Warszawa.
- Wańkiewicz W.** 2010. Planowanie przestrzeni o wysokich walorach krajobrazowych, problemy ekonomiczne. Komisja Krajobrazu Kulturowego PTG, Sosnowiec.

Dr inż. Barbara Prus
Uniwersytet Rolniczy w Krakowie
Katedra Gospodarki Przestrzennej i Architektury Krajobrazu
30–149 Kraków, ul. Balicka 253 c
barbara.prus@ur.krakow.pl

Dr inż. Tomasz Salata
Uniwersytet Rolniczy w Krakowie
Katedra Gospodarki Przestrzennej i Architektury Krajobrazu
30–149 Kraków, ul. Balicka 253 c
tomasz.salata@ur.krakow.pl