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Application Geoprocessing Tools for Investment Background Analysis and Evaluation at the Commune's Level**

1. Introduction

The space taken up by territorial units is the common weal. In view of its limited character, it should be used rationally and according to the sustainability rule. Spatial planning is described as a spatial politics tool. One of definitions points out that it is the number of systematized actions which define effective space usage that joins interests of various groups of people and realizes diverse goals as its imperative purpose [3]. In Poland, three-stage planning system (local planning, regional planning and national planning) is in force. Space management, in other words, fulfilling mentioned spatial politics takes place at the lowest level – in the commune which as “a space section” that adjoins the other territorial units staying in inter-communal relations is subject to forming its individuality.

The valid Law on Spatial Planning and Development of 27 March 2003 determines local plans of spatial development as the acts of local law targeting areas' purpose to certain goals and describing the ways of their development and building conditions [4, 9]. Increasing spatial chaos is continually criticized and as Cymerman says [1] – limitations in properties' usage are caused by decisions of local plans. One of the most important tasks of spatial planning in the local level is location of technical infrastructure. According to commonly prevailing opinion however, the planning system is not quite correct and does not work properly. There are two main accusations. The first one concentrates on stating that the planning system restricts or even brakes intending areas for buildings (insufficient building space in relation to demand). The second criticized element is continually increasing spatial chaos. Emerging investments are located in the areas without access to a technical infrastructure system and even if it exists, it is not conformed to the needs (e.g. too small network capacity, roads quality ill-suited to traffic intensity) [2]. As long as

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the second accusation can be recognized as correct and accurate, the first one cannot be treated likewise. Local plans of spatial development elaborated for rural areas are in many cases used to determine big building reserves which are not necessary (taking occurring demographic tendencies into consideration) – contrary to the idea of entering spatial order. The problem does not concern only local plans. When there are not any, the communes issue decisions about building conditions and area development that allow building over almost every area without consideration of its surroundings in spatial and functional aspects. Such behaviour can also have financial background. The owners of agricultural plots often want to change the status of farmland due to the quick growth of its value and possible significant income in case of sale.

2. The Aim and Range of This Paper

Springer's [6] opinion becomes significant for the analyzed problem as he pays attention to the tendency of excessive intending areas for housing.

Demographic forecasts which say that the population will gradually decrease (2030 – 36 M people, 2050 – 30 M people) are contrary to the above tendency.

Investment activities in the range of equipping in technical infrastructure that are run by the communes are of great importance for the environment' state (considered not only through the lens of the commune itself but also in the broader context) [10].

Communes' investment activities in the technical infrastructure range are of great importance for the natural environment' state not only in the area of the commune that carries out investments but also adjacent communes as well as the district and the province where the commune-investor is located. Therefore, it seems reasonable to take communal infrastructural investments in much broader context than through the aspect of nature protection on the commune's grounds.

The aim of the present paper was to analyse and estimate the investment background in the chosen commune. Having that in mind, it should be mentioned that performing spatial analyses which includes infrastructure potential arrangement is important because it enables the estimation of the current situation and introduces possible changes and modernizations.

Areas designed for investment goals cover 1,051 ha [MPZP digital map for Skała commune] [7, 8]. Taking recommended [6] value of population density factor per ha of the area designed for housing and oscillating between 40 persons/ha into consideration, it was compared with local parameters. In the case of Skała commune, it is 4 times lower and amounts to 10 persons/ha. The thesis can be drawn that most of investment areas will not be invested and their territory – overestimated in relation to the needs. The aim of this paper is to check investment conditions of the areas

intended for investment goals. The method was based on preparing the precise map of investment areas according to the drawings of the Local Plan of Spatial Development of Skała commune and comparing it with the areas of zones which represent the grounds invested in media.

3. Materials and methods

Materials included in the Resolution of the City Council in Skała [7, 8] as well as the primary digital map obtained from the District Centre of Geodesy and Cartography in Krakow were used for the spatial analysis process.

MPZP drawing was performed in a raster form which required a format change. This process was carried out in the following stages:

1. Georeference giving – the process was based on 10–15 points of adaptation, the average error of point's location – 0.8 pixel, pixel's field resolution – 2.4 m.
2. Vectorization of raster material – screen resolution for the scale 1:1000 corresponded to 1 m for objects' node location.
3. Conversion of DXF multilayered vector files format to delaminated topic layers recorded in SHP format.

The elaboration area includes urban-rural commune of Skała situated in the southern part of the Kraków-Częstochowa Upland. Administratively, it is located in Krakow province, Krakow district in the distance of about 21 km from Krakow, 24 km east from Olkusz. Taking neighbourhood into consideration, Skała borders with Gołcza and Trzyciąż communes from the north, with Sułoszowa, Wielka Wieś and Jerzmanowice-Przebinia communes from the west, with Zielonki from the south and with Iwanowice from the east. It is an essential fact that the south-western part of the commune (1,223 ha which makes 16% of the area) is situated within the borders of the Ojcowski National Park [5]. As the report of the Statistical Office in Krakow makes known [9], the Skała commune was in 2014 inhabited by 10,463 persons (slight increase in relation to the previous years: of 185 people in relation to 2012 and 109 people with reference to 2013). Due to its character, Skała is the agricultural and touristic commune. As in most administrative units in the south of Poland, individual farms are characterized by significant fragmentation (domination of farms with the area varying from 1 ha to 2 ha which constitute over 40% of all farms) [4].

The local plan of the commune's spatial development distinguishes the following usage categories [7, 8]: MN1, MN1/e – the areas of single-family farm and service housing development, MN2 – the areas of single-family and service housing development, MN3 – the areas of single-family housing development, MN4 – the areas of central buildings, PP – the areas of public space, RM1, RM1/e, RM2, RM3 – the

areas of farm buildings, U1, U2, U3 – the service areas, UP1, UP2, UP3 – the public service areas, UK – the areas of religious worship services, UT – the areas of touristic services, US – the areas of sport and recreation, P1, P2 – the areas of production objects, storehouses and bases, T – the areas of technical infrastructure – telecommunications.

Reclassification of the above division was performed according to the needs of the paper allocating investment areas which were brought together in the groups according to the scheme:

- M* matches: MN1, MN1/e, MN2, MN3, MN4;
- P* matches: P1, P2;
- RM* matches: RM1, RM1/e, RM2, RM3;
- T matches: T;
- U* matches: U1, U2, U3, UP1, UP2, UP3, UK, UT, US.

The grounds determined as M* are the areas of single-family farm and service housing development which were divided into five separate classes in MPZP. The areas of production objects, storehouses and bases were combined into one category signed as P*. Four kinds of farm buildings were grouped in RM* category. Owing to the fact that the areas of technical infrastructure – telecommunications included only one category, they were not modified. The areas described with U* symbol are the grounds of services of all kinds.

Invested areas were set aside according to the needs of the paper, based on the following methodology:

- Creating a buffer of a 30 m diameter from the ducts of underground utility structure – in case of underground terminals, network administrators do not require the main network extension.
- Creating a buffer of a 50 m diameter from the overhead lines (pile stanchions) – to such distance, location of in-between pillars is not required – maximal length of a pendant overhead line.
- Creating aggregated invested area for electricity and telecommunications lines where connection of the grounds restricted by underground and overhead lines was performed, therefore the width of the zones can vary in the range from 30 m to 50 m.
- Calculating the factor of invested area share to the general investment area according to the formula (1):

$$Z = (100\% \cdot N_{areas} / I_{areas}) \tag{1}$$

where:

- Z – parameter of investment’s share,
- N_{areas} – iNvested areas (the area of the zone of technical investment),
- I_{areas} – Investment areas (the surface of investment area).

Table 1. Specification of capital and invested areas

Land purpose	Purpose area [ha]	EN areas		WAT areas		GAS areas		WAS areas		TEL areas	
		area [ha]	share [%]	area [ha]	share [%]	area [ha]	share [%]	area [ha]	share [%]	area [ha]	share [%]
1	2	3	4	5	6	7	8	9	10	11	12
M*	917.6167	679.3330	74.0	574.2674	62.6	543.0374	59.2	516.2265	56.3	423.5813	46.2
P*	31.4799	12.4332	39.5	7.6509	24.3	6.3809	20.3	5.6396	17.9	6.8082	21.6
RM*	22.0670	17.5843	79.7	14.4395	65.4	13.8796	62.9	13.0123	59.0	5.7620	26.1
T	0.2346	0.2346	100.0	0.2346	100.0	0.2346	100.0	0.1977	84.3	0.2346	100.0
U*	80.5888	27.6225	34.3	16.4664	20.4	13.8671	17.2	13.6156	16.9	17.4036	21.6
Sum:	1051.9870	737.2077	70.1	613.0588	58.3	577.3996	54.9	548.6917	52.2	453.7897	43.1

The specification of capital and invested areas in the Skala commune was presented in Table 1 which describes areas the presence of which is essential (obligatory) to obtain building permission (they are the main media types). The first two columns show reclassified types of area purpose in the local plan of spatial development together with their total areas. Columns from 3 to 12 include data concerning areas occupied by particular investment types with designation of their areas and also percentage share with reference to particular purpose types. The areas invested in electric energy (EN areas), water supply system (WAT areas), gas network (GAS areas), sewage system (WAS areas) and telecommunication (TEL areas) were allocated. The areas of single-family and service housing development have access to energy network at the level of 74%. The lowest values of the factor of equipping in that kind of network falls on the areas of production objects, storehouses and bases as well as the service areas. The medium level of providing all invested areas with energy network is 70.1% (737.2077 ha). Similar tendency was preserved in case of the remaining networks of technical equipment (the areas of production objects, storehouses and bases as well as the service areas are characterized by low access to the networks – which results from the way they are used).

The mean value of the water supply systems access factor for Skala commune is 58.3%, from which 62.6% concerns the areas of single-family farm and service housing development, whereas 65.4% – the areas of farm buildings. The values of the remaining factors are similar to the discussed ones.

The remaining media presented in Table 2 were determined as optional ones but with significant influence on appointed investment areas quality.

Table 2. Areas and shares of combined areas investment

Land purpose	Purpose area [ha]	EN + WAT areas		EN + WAT + GAZ + WAS + TEL areas	
		area [ha]	share [%]	area [ha]	share [%]
1	2	3	4	5	6
M*	917.6167	543.0374	59.2	374.3549	40.8
P*	31.4799	6.3809	20.3	2.5128	8.0
RM*	22.0670	13.8796	62.9	2.7996	12.7
T	0.2346	0.2346	100.0	0.1919	81.8
U*	80.5888	13.8671	17.2	4.6401	5.8
Total:	1051.9870	577.3996	54.9	384.4993	36.5

The data presented in Table 2 show the areas of the grounds and their percentile share with reference to the purpose types of the given areas in the Local Plan of Spatial Development which are taken by particular kinds of area investments grouped in two categories. "EN + WAT areas" category includes the total area of energy and water supply systems presumed essential to start the investment and to obtain the building permit. It is the obligatory utility infrastructure. Columns 5 and 6 present summary areas covered by the zones common for all kinds of networks together. This zone was called optional utility infrastructure. The areas of single-family farm and service housing development are distinguished by obligatory equipment on 59.2% level, whereas for the zones of optional utility infrastructure (all media types) this value decreases to 40.8%. Downward tendency can be observed in case of all the purpose types. The average value of the factor of water supply and energy systems density (obligatory) for the commune is 54.9% and decreases to barely 36.5% in case of optional equipment analysis.

4. Results and Discussion

Reading of The Local Development Plan of Skała Commune [5] allows for paying attention to problems that concern spatial sphere which means necessity to provide spatial order by the administration organ. This problem is significant on the grounds of Skała Commune in view of the great dispersion of buildings and decisions made in the last years unequivocally indicate predominant interest in building areas [2].

Utility infrastructure of the areas destined in MPZP for investment purposes is in diversified level but it does not show the high standard. It is 70.1% for the areas equipped with electricity system (EN areas, Tabs 1, 2), whereas for water supply system (WAT areas, Tabs 1, 2) it is only 58.3% of all areas for building and investment.

For the remaining kinds of media, the average factors are increasingly lower:

- areas with gas utilities (GAS areas) – 54.9%,
- areas with sewage systems (WAS areas) – 52.2%,
- areas with telecommunications cables (TEL areas) – 43.1%.

No doubt that the reasons for that state is “extravagance” in intending completely unprepared and unbuilt areas for investments and improper determination of the back boundary.

Remarkable is its uneven intensity in particular villages [5] and also the situation when the areas destined for building exceed the needs in that range. As a result, deficits of area reserves to realize public and commercial services and also areas to locate small firms occur [4]. The most interest in building areas appears with reference to plots from the areas of Skała, Cianowice, Szczodrkowice and Maszyce which is the south part of the commune characterized by outstanding landscape and environmental values – situated within the Lagging of the Ojców National Park and in the close vicinity of Nature 2000 Area.

5. Summary and Conclusions

Socio-economic development of the communes that indicates their investment attractiveness is largely determined by the investments undertaken by self-government authorities. Their realization to a certain extent enables evolution of approach to territorial self-governments as “local development initiators”. Therefore, it can be stated that the commune’s development partly becomes a derivative of its investment activity [1].

Significant decreases of improved land investment share in obligatory variant with necessary kinds of networks (water supply and electricity systems) (EN+WAT areas, column no. 4 – Tab. 2) to 54.9% of the general area of investment grounds can surprise – even if the similar result was expected. Likewise, the areas fully equipped (EN + WAT + GAS + WAS + TEL areas, column no. 6 – Tab. 2) make 36.5% of all investment areas in the commune’s MPZP. It means that finding new investment ground in the commune is problematic because of the high investment factor of areas already built-up which are a determinant for not built-up areas. The factors’ values are significantly lower there. It is confirmed by the factor of people’s amount to the investment area which is four times lower than the standard proposed by the well-known literature. It causes considerable dispersion and underinvestment of the grounds appointed in MPZP for investment purposes.

Summing up, it is worth using Zimny's opinion [11] which says that consideration of communal investment in technical infrastructure exclusively as a factor that influences improvement of inhabitants' life level is a mistake. The problem should be considered to a greater extent as it determines commune's progress of civilization and contributes to its territorial integrity.

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