CONTENTS

Foreword .................................................................................................................................... 5

Kamila Dedio
Classification of communes of the Małopolskie Voivodeship as regards selected factors of local development ................................................................. 7

Joanna Gil-Mastalerczyk
Stylistic changes in contemporary sacred architecture against the background of the ideological and artistic trends prevailing at the time (1945–1970) ............... 25

Joanna Gil-Mastalerczyk
Stylistic changes in contemporary sacred architecture against the background of the ideological and artistic trends prevailing at the time (1971–2000) ......... 35

Tadeusz Głowacki, Piotr Grzempowski, Ewa Sudol, Jarosław Wajs, Marcin Zając
The assessment of the application of terrestrial laser scanning for measuring the geometrics of cooling towers .......................................................... 49

Klemens Godek, Waldemar Krupiński, Agnieszka Szeptalin
Analysis of the curvature of the river bend for regulation purposes ....................... 59

Julia Gorzelany, Justyna Janiczak, Magdalena Wilkosz-Mamacrycz
Impact on investment projects on the spatial order and the image perception of Zakopane town .................................................................................... 71

Sylwia Guzdek, Agnieszka Petryk
Cooperation of agricultural producers in Poland ....................................................... 89

Jarosław Janus, Ewa John
The issue of zoning fees – case study in Kraków ..................................................... 101

Jarosław Janus, Magdalena Łopacka
Real estate cadastre versus land and buildings register in Poland, with the view to concepts’ identification ............................................................. 115

Joanna Jaroszewicz, Lidia Piotrowska
Implementation of the inspire directive in Poland in the scope of spatial data ‘land use’ theme ......................................................................................... 125
Contents

Magda Pluta
Spatial planning in Poland in the context of 'inspire' rules and amendment to the spatial planning and development act ................................................................. 159

Barbara Prus
Exclusion of lands from agricultural production and urban pressure – case study ................................................................................................................. 169

Reviewers (year 2016) ......................................................................................................................................................................................... 183
FOREWORD

Geomatics, Landmanagement and Landscape (GLL) has been available since 2013 thanks to the extensive work, enthusiasm and perseverance of the Editors. During the last three years, the journal has provided a platform for scientific ideas exchange and discussions, for presenting the results of research conducted by both young and experienced scientists. The idea of the journal is in line with the trend of internationalization of Polish universities. Authors publishing in the GLL include international scientists, and the editorial board consists of both national and foreign experts from Austria, China, Germany, Slovenia, UK and Ukraine. Access to the journal is free thanks to the open-access licence, which significantly broadens the audience and affects its actual Impact Factor.

Ten papers presented in the coming issue cover scientific topics in technical domain but also with elements of art and culture.

Three papers can be grouped as land management related. They concern: the classification of municipalities in the Małopolska region using selected factors of local development; cooperation of agricultural producers in Poland; and exclusion of land from agricultural production as the phenomenon of urban pressure. Classification of Małopolska municipalities was performed based on 5 thematic categories: demographics, economics, infrastructure, environmental land management and spatial land management. It was found that the main factor determining the local development of municipalities is the environmental land management. The problem of fragmentation of the agrarian land, discussed in the second paper, remains a key problem of the Polish agriculture. The aim of the article published in this issue is to present the nature of cooperation between farmers in the form of so-called ‘agricultural producer groups.’ The third paper concerns former agricultural land converted into areas of single-family housing, recreation and communication areas. The research made it possible to determine similarities between the municipalities in terms of land excluded from agricultural production.

The next two papers touch upon elements of art and culture, namely the stylistic changes of modern church architecture in the context of ideological and artistic trends between: 1945–1970 and 1970–2000. In those periods, we experienced large-scale political, economic and social transformations, which influenced the proper functioning and development of church architecture. Analysis of the effect of the transformation is the main topic of both these papers.
On the other, technical side, are placed the following two papers, concerned with surveying and cadastre: one, the analysis of the curvature of the river bank for river control purposes; and the other, discussing conceptual problems linked to cadastre and land and building records in Poland. The main aim of the first paper from this group was to present the conclusions of the analysis for finding the most suitable curve approximating the object (i.e. the river). The second issue in the group relates to the current problems in Poland, associated with cadastre, concerning the changes in the functioning of the institutions of the latter. The problems are a consequence of the parallel and interchangeable use of the two terms: ‘land and buildings registry’ and ‘cadastre’, which nevertheless have their distinct historical, legal and technical references.

The last group of papers concerns spatial planning which includes: the ‘planning fee’ – a case study of Kraków in Southern Poland; implementation of the INSPIRE directive in the ‘land use’ topic of spatial data in Poland; and spatial planning in Poland in the context of the INSPIRE provisions and amendments to the Law on Spatial Planning and Development. The aim of the first paper is to analyse the theoretical and practical aspects of zoning, based on the procedures conducted in Kraków for a property covered by two local plans: West and East Opatkowice, in terms of the ‘planning fee’ charged if the property price increases due to changes in land-use (zoning) plan. The last two papers concern the INSPIRE Directive and its implementation in Poland. In the second paper in the group, the problem of implementation of the INSPIRE Directive in the ‘land use’ theme of spatial data in Poland is discussed at length. In the third paper, the spatial planning system in Poland is analysed in the context of the applicable law, along with a SWOT analysis showing strengths, weaknesses, opportunities and threats. The most urgent needs for change were identified, referring to the on-going work on the amendments to the Act.

In conclusion, I strongly encourage you to read the publications in this issue, as well as to start cooperation, initiate joint research projects, and publish their results in the GLL journal.

Dr hab. inż. Beata Hejmanowska, prof. AGH
AGH University of Science and Technology
Faculty of Mining Surveying and Environmental Engineering
Department of Geoinformation, Photogrammetry and Remote Sensing of the Environment
CLASSIFICATION OF COMMUNES OF THE MAŁOPOLSKIE VOIVODESHIP AS REGARDS SELECTED FACTORS OF LOCAL DEVELOPMENT

Kamila Dedio

Summary

The study is an attempt at classification of 182 communes (gminy) of the Małopolskie voivodeship from the point of view of chosen factors influencing their local development. The adopted set of variables included 5 thematic categories: demography, economy, infrastructure, environmental management and land management. The scope of the variables is related to availability of statistical material. The data were acquired from public statistical sources – CSO (GUS) Local Data Bank for 2013–2014. The classification was carried out by Ward's hierarchical clustering method. The analysis led to isolation of factors shaping local development of a group of communes. It was demonstrated that in prevailing part of the studied area one main factor determines local development of these communes, namely environmental management.

Keywords

classification of communes • local development • Małopolskie voivodeship • Wards’ method • multivariate objects • study of communes

1. Introduction

Local development, depending on factors that shape it, is a process of diverse changes taking place in a studied territory. It is most frequently characterized by desirable and positive transformations of quantitative, qualitative and structural characteristic of a given arrangement [Sztando 1998]. If the arrangement is a singled-out socio-territorial composition, having a set of characteristic economic, land and cultural features expressing its own needs and hierarchy of values, then the development has a local [Sztando 1998] or a regional scale. The concept of local development is also defined as a particular form of regional development, in which endogenous factors play a central role [Coffey et al. 2005]. In local government practice local development refers to territorial units of lower administrative levels – communes and districts, whereas regional development indicates units of higher level – voivodeships. Local development is also regarded as a harmonized and systematic effort of local community, local authorities and other entities functioning in a commune, aiming at creation of new and improve-
ment of existing utility values of the commune, designing favourable conditions for local management and ensuring spatial and environmental order [Brol 1996].

Commune is a principal unit of state's territorial or administrative subdivisions and a basic local government unit, comprising local government community and a territory it occupies. Commune possess adequate material resources, official bodies and appropriate competences that allow it to fulfil public tasks of local significance [Brunka et al. 2003].

Considering the issue of defining and choice of factors determining the development potential of studied communes, the attention has been paid to processes of local development, described in literature, that are the result of combining economic, socio-cultural and political phenomena [Hryniewicz 2000]. Therefore local factor should reflect commonly accepted goals of local development, encompassing features like: natural utility values and material values, products of human activity, labour force, local economic traditions, institutions specializing in promoting the area etc. [Wojtasiewicz 1997]. Another set of factors determining local development can include: natural resources, labour resources, capital, local and external companies, productive and service potential, transport and communication management, technologies and values of natural environment [Szymla 2005]. One can look at local development from the perspective of many different factors that shape it.

Having in mind the above considerations related to a theoretical aspect of the idea of local development, an attempt has been made to classify communes in the Małopolskie voivodeship according to factors determining their local development. On the basis of chosen features and measures and with help of taxonomic, combinatorial agglomerative Ward's method [Ward 1963], groups of communes have been singled out that were homogeneous with respect to factors (segments) that shape their local development. Moreover, spatial classification of analysed areas (location map of homogeneous types of communes as regards analysed factors determining their local development) has been made.

2. Research object and methods

The study covered smallest units of administrative subdivisions, that is 182 communes located within the Małopolskie voivodeship. The chosen areas are multivariate, which is a result of manifold character, state, function, status and spatial development of the communes. These features have diverse influence on local development. To determine diverse state of local development in particular communes according to factors that influence it, adequately chosen indicators were used as research tools. As a substantive criterion a principle was established that ultimate set of features will contain variables (measures) representing current state of a commune and domains influencing their development. The choice and measures of adequacy of used indicators were conditioned by the availability of data. The set of variables that allows for differentiation between factors influencing development of communes was acquired from public statistical sources – CSO (GUS) Local Data Bank for years 2013–2014.
As a result of the substantive analysis, five groups of factors influencing conditions and state of local development of communes have been determined (Tables 1–5). The first segment included social factors (changes in population and demographic structure, standard of living). The second segment comprised factors characterizing size of market of goods and services and financial state. The third segment consisted of factors of state and quality of infrastructure. The fourth one – factors related to environmental management together with state and protection of environment and tools for shaping environmental order. The fifth segment encompassed factors representing land management, including functional, territorial and structural state of a commune.

Table 1. Demographic segment. Description of features and their metrics

<table>
<thead>
<tr>
<th>Population</th>
<th>Density of population [person · 1 km(^{-2})]; share of people at: pre-working age, working age, retirement age [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered unemployment</td>
<td>Total registered unemployed by sex [persons]</td>
</tr>
<tr>
<td>Number of people using sewage treatment plant</td>
<td>Total population using sewage treatment plant [person]</td>
</tr>
<tr>
<td>Percentage of people using systems</td>
<td>Total population using water supply system, sewage system, gas supply system [%]</td>
</tr>
</tbody>
</table>

Table 2. Economic segment. Description of features and their measures

| Revenue and expenditure of communes’ budgets | Total budget revenues; total budget expenditures [zł] |
| Purchase of water | Purchase of water: total; from municipal waterworks for production purposes [dam\(^{-3}\)] |
| Expenditures on waste management | Expenditures on: collection of waste and its transportation; collection of municipal waste and its transportation; neutralizing and removal of dangerous wastes; neutralizing and removal of non-dangerous wastes; neutralizing and removal of dangerous of other wastes than dangerously stored; recycling of wastes; rehabilitation of slag heaps, tailing ponds and landfills and other devastated areas and degraded [thousand of zł] |
| Expenditures on fixed assets for water management | Expenditures on: intakes and supply of water; construction and modernization of water treatment plants; reservoir and barrages; regulation and reinforcement of mountain rivers and streams; flood embankments; pump stations in caves-in and depressions [thousand zł] |
| Expenditures on sewage management | Expenditures on: sewage networks; networks for discharging precipitation water; industrial wastewater treatment; treatment of municipal wastes [thousand zł] |
Table 3. The infrastructure segment. Description of features and their measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sewage treatment plants</strong></td>
<td>Industrial sewage treatment plants: mechanical; chemical; biological; with enhanced removal of biogenic compounds [items]</td>
</tr>
<tr>
<td><strong>Flow capacity of sewage treatment plant</strong></td>
<td>Designed flow capacity of sewage treatment plant: mechanical; chemical; biological; with enhanced removal of biogenic compounds ( \text{m}^3 \cdot \text{day} )</td>
</tr>
<tr>
<td><strong>Mains ramification network</strong></td>
<td>network: water supply; sewerage (total); natural gas (total) [km]</td>
</tr>
<tr>
<td><strong>Roads</strong></td>
<td>Roads with paved surfaces; paved improved ones; unpaved ones [km]</td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td>Cesspools; household-level treatment plants; sewage stations [items]</td>
</tr>
</tbody>
</table>

Table 4. The environmental management segment. Description of features and their measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atmospheric emissions</strong></td>
<td>Pollutant emissions: dust; gas (total) [t per year]</td>
</tr>
<tr>
<td><strong>Sediments</strong></td>
<td>Sediments: from industrial sewage treatment plants, total amount produced per year; stored until now (accumulated); used from hitherto stored (accumulated); used in agriculture; used in land reclamation, including lands for agricultural purposes; used for cultivation of plants intended for production of compost; thermally transformed; stored jointly; stored temporarily [t]</td>
</tr>
<tr>
<td><strong>Industrial waste water</strong></td>
<td>sewage: discharged to sewerage network; discharged directly to waters and ground; discharged directly to waters and ground – cooling waters (that do not require treatment); containing substances particularly harmful to water environment; discharged directly to waters or ground and requiring treatment; treated (total); treated mechanically; treated chemically; biologically; treated with enhanced removal of biogenic compounds; not-treated; recycled ( \text{dam}^3 ); share of treated waste in waste requiring treatment [%]; loads of pollution: ( \text{BOD}_5 ); ( \text{COD} ); suspended solids; volatile phenols; nitrate; phosphorus in waste discharged to waters or ground [kg per year]; sum of chloride and sulfate ions in waste discharged to waters or ground [kg per year]; saline waters (total) ( \text{dam}^3 ); waste treated together with seepage waters and delivered waste ( \text{dam}^3 )</td>
</tr>
<tr>
<td><strong>Consumption of water</strong></td>
<td>Consumption of water for industrial purposes; consumption of water: underground water; surface water ( \text{dam}^3 ); water from draining mines and construction works (used for production or sold) ( \text{dam}^3 ); consumption of water for agriculture and forestry ( \text{dam}^3 )</td>
</tr>
<tr>
<td><strong>Wastes</strong></td>
<td>Waste subjected to: recycling; recycling – composting ; neutralized (total); thermally; in another way [thousand t]; waste: temporarily stored [thousand t]; share of stored waste in waste produced [%]; stored up to now (accumulated) in own waste stockpiles; handed over to other entities [thousand t]; mixed collected in a year form households [t]; units taking away waste by area of activity [item]; municipal waste collected during liquidation of illegal landfills [t]</td>
</tr>
<tr>
<td><strong>Illegal landfills</strong></td>
<td>Area of existing illegal landfills; existing illegal landfills ( \text{m}^2 ); liquidated illegal landfills; illegal landfills per 100 km² (total) [item]; area of illegal landfills per 100 km² (total) ( \text{m}^2 )</td>
</tr>
</tbody>
</table>
Table 5. The land management segment. Description of features and their measures

<table>
<thead>
<tr>
<th>Feature Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wooded areas</strong></td>
<td>Wooded areas: public (total); private [ha]</td>
</tr>
<tr>
<td><strong>Forests</strong></td>
<td>Forests: public (total); private (total) [ha]; woodiness [%]</td>
</tr>
<tr>
<td><strong>Non-wooded areas intended for forestation</strong></td>
<td>Forestation: public forests (total); private (total) [ha]; forestation [%] area (total) [%]</td>
</tr>
<tr>
<td><strong>Areas protected by legislation</strong></td>
<td>National parks; nature reserves [ha]; landscape parks (total); reserves and other forms of nature protection in landscape parks; protected landscape areas (total); reserves and other forms of protected landscape areas; ecological lands [ha]; documentary sites; nature and landscape complexes [ha]; nature monuments [items]</td>
</tr>
<tr>
<td><strong>Agricultural land</strong></td>
<td>Arable lands; orchards; permanent meadows; permanent pastures; lands: agricultural developed; under ponds; under ditches [ha]</td>
</tr>
<tr>
<td><strong>Submerged lands</strong></td>
<td>Lands under waters: internal sea waters; surface flowing waters; surface standing waters [ha]</td>
</tr>
<tr>
<td><strong>Developed and urbanized lands</strong></td>
<td>Developed and urbanized lands; residential areas; industrial areas; other developed areas; urbanized non-developed; recreational and leisure; transport: roads, railroad, other; developed and urbanized lands – fossil lands [ha]</td>
</tr>
<tr>
<td><strong>Croplands, wastelands, various lands</strong></td>
<td>Ecological lands; wastelands; various lands [ha]</td>
</tr>
<tr>
<td><strong>Green areas</strong></td>
<td>Share of green areas in total area [%]</td>
</tr>
</tbody>
</table>

Basic statistical features of variables juxtaposed in five thematic segments for 182 communes of the Małopolskie voivodeship have been calculated. Then multivariate space was reduced by a point method (using normalization of variables’ values by a standardization method). The standardization was applied to transform different variables (with incomparable measures) into one comparable statistical measure. The data presented this way were then used to determine synthetic developmental indicator for all 182 communes according to five thematic groups (Table 6). The constructed synthetic indicators, also called meta-features or meta-indicators, allowed for organizing multivariate objects, or for aggregation of possessed information. The essence of aggregation was to construct one synthetic meta-feature in a studied group of spatial
units, based on standardized values. The higher the values of an independent variable, the higher the values of a synthetic indicator. Their interpretation consisted in the assessment of the level of phenomena described by independent values [Nowak 2004]. The use of synthetic indicators allowed for presentation of large set of data in the form of one value [Dziechciaż 2006]. As a developmental measure of synthetic meta-features composed into five thematic segments, an arithmetical mean of normalized values of statistical variables was adopted in analysing the phenomenon of local development.

### Table 6. Meta-synthetic indicators

<table>
<thead>
<tr>
<th>Communes / meta-features</th>
<th>D</th>
<th>E</th>
<th>I</th>
<th>EM</th>
<th>LM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bochnia (1)</td>
<td>35.02</td>
<td>52.45</td>
<td>40.78</td>
<td>349.72</td>
<td>66.75</td>
</tr>
<tr>
<td>Bochnia (2)</td>
<td>19.91</td>
<td>21.22</td>
<td>16.12</td>
<td>8.78</td>
<td>63.98</td>
</tr>
<tr>
<td>Drwinia (2)</td>
<td>11.91</td>
<td>6.72</td>
<td>7.54</td>
<td>68.74</td>
<td>60.26</td>
</tr>
<tr>
<td>Lipnica M. (2)</td>
<td>12.66</td>
<td>8.58</td>
<td>6.84</td>
<td>20.45</td>
<td>30.80</td>
</tr>
<tr>
<td>Łapanów (2)</td>
<td>14.70</td>
<td>21.18</td>
<td>19.91</td>
<td>4.72</td>
<td>31.07</td>
</tr>
<tr>
<td>Nowy W. (3)</td>
<td>14.87</td>
<td>12.95</td>
<td>12.93</td>
<td>11.30</td>
<td>46.73</td>
</tr>
<tr>
<td>Rzezawa (2)</td>
<td>17.17</td>
<td>10.55</td>
<td>15.38</td>
<td>19.50</td>
<td>41.90</td>
</tr>
<tr>
<td>Trzciana (2)</td>
<td>12.88</td>
<td>3.53</td>
<td>14.69</td>
<td>4.12</td>
<td>24.36</td>
</tr>
<tr>
<td>Żegocina (2)</td>
<td>16.35</td>
<td>10.30</td>
<td>14.65</td>
<td>3.06</td>
<td>16.27</td>
</tr>
<tr>
<td>Borzęcin (2)</td>
<td>11.83</td>
<td>6.99</td>
<td>9.67</td>
<td>20.78</td>
<td>55.33</td>
</tr>
<tr>
<td>Brzesko (3)</td>
<td>26.26</td>
<td>23.40</td>
<td>152.15</td>
<td>476.61</td>
<td>68.06</td>
</tr>
<tr>
<td>Czchów (3)</td>
<td>15.01</td>
<td>6.52</td>
<td>19.42</td>
<td>3.95</td>
<td>45.14</td>
</tr>
<tr>
<td>Dębno (2)</td>
<td>19.42</td>
<td>8.66</td>
<td>22.97</td>
<td>9.03</td>
<td>36.97</td>
</tr>
<tr>
<td>Gnojnik (2)</td>
<td>12.71</td>
<td>4.42</td>
<td>13.42</td>
<td>53.88</td>
<td>26.61</td>
</tr>
<tr>
<td>Iwkowa (2)</td>
<td>11.06</td>
<td>5.81</td>
<td>8.71</td>
<td>74.24</td>
<td>23.58</td>
</tr>
<tr>
<td>Szczurowa (2)</td>
<td>12.28</td>
<td>277.77</td>
<td>12.39</td>
<td>14.36</td>
<td>83.60</td>
</tr>
<tr>
<td>Alwernia (3)</td>
<td>17.68</td>
<td>34.14</td>
<td>96.21</td>
<td>258.59</td>
<td>55.54</td>
</tr>
<tr>
<td>Babice (2)</td>
<td>14.82</td>
<td>1.85</td>
<td>16.52</td>
<td>2.16</td>
<td>40.17</td>
</tr>
<tr>
<td>Chrzanów (3)</td>
<td>36.53</td>
<td>49.12</td>
<td>47.00</td>
<td>185.48</td>
<td>111.27</td>
</tr>
<tr>
<td>Libiąż (3)</td>
<td>23.86</td>
<td>46.74</td>
<td>56.06</td>
<td>970.48</td>
<td>241.29</td>
</tr>
<tr>
<td>Trzcinia (3)</td>
<td>28.71</td>
<td>852.13</td>
<td>51.10</td>
<td>649.43</td>
<td>160.05</td>
</tr>
<tr>
<td>Bolesław (2)</td>
<td>14.98</td>
<td>5.33</td>
<td>12.96</td>
<td>10.49</td>
<td>15.66</td>
</tr>
<tr>
<td>Dąbrowa Tarn. (3)</td>
<td>23.73</td>
<td>329.59</td>
<td>16.90</td>
<td>17.68</td>
<td>49.10</td>
</tr>
<tr>
<td>Gręboszów (2)</td>
<td>11.33</td>
<td>10.05</td>
<td>12.35</td>
<td>1.48</td>
<td>18.27</td>
</tr>
<tr>
<td>Mędrzechów (2)</td>
<td>13.28</td>
<td>8.70</td>
<td>11.02</td>
<td>1.59</td>
<td>28.30</td>
</tr>
<tr>
<td>Olesno (2)</td>
<td>16.02</td>
<td>11.84</td>
<td>16.54</td>
<td>3.91</td>
<td>35.10</td>
</tr>
<tr>
<td>Radgoszcz (2)</td>
<td>15.45</td>
<td>8.29</td>
<td>14.39</td>
<td>2.80</td>
<td>29.55</td>
</tr>
<tr>
<td>Community</td>
<td>Population</td>
<td>Green Space</td>
<td>Cultural Heritage</td>
<td>Agriculture</td>
<td>Total Score</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
<td>-------------</td>
<td>------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Szczucin  (3)</td>
<td>16.56</td>
<td>2.55</td>
<td>10.00</td>
<td>6.71</td>
<td>67.89</td>
</tr>
<tr>
<td>Gorlice  (1)</td>
<td>38.07</td>
<td>93.83</td>
<td>81.20</td>
<td>219.16</td>
<td>47.01</td>
</tr>
<tr>
<td>Biecz  (3)</td>
<td>15.77</td>
<td>3.77</td>
<td>15.79</td>
<td>6.34</td>
<td>36.02</td>
</tr>
<tr>
<td>Bobowa  (3)</td>
<td>14.49</td>
<td>1.85</td>
<td>10.00</td>
<td>3.85</td>
<td>19.43</td>
</tr>
<tr>
<td>Gorlice  (2)</td>
<td>17.68</td>
<td>24.59</td>
<td>27.16</td>
<td>4.46</td>
<td>44.59</td>
</tr>
<tr>
<td>Lipinki  (2)</td>
<td>14.13</td>
<td>5.57</td>
<td>17.16</td>
<td>7.10</td>
<td>27.61</td>
</tr>
<tr>
<td>Łużna  (2)</td>
<td>11.00</td>
<td>5.83</td>
<td>9.90</td>
<td>3.62</td>
<td>23.28</td>
</tr>
<tr>
<td>Moszczena (2)</td>
<td>14.22</td>
<td>5.47</td>
<td>15.26</td>
<td>3.21</td>
<td>11.01</td>
</tr>
<tr>
<td>Ropa  (2)</td>
<td>9.80</td>
<td>11.25</td>
<td>8.75</td>
<td>1.16</td>
<td>23.93</td>
</tr>
<tr>
<td>Sękowa  (2)</td>
<td>13.95</td>
<td>3.80</td>
<td>19.77</td>
<td>2.90</td>
<td>83.87</td>
</tr>
<tr>
<td>Uście Gorlickie  (2)</td>
<td>11.11</td>
<td>14.45</td>
<td>13.65</td>
<td>8.10</td>
<td>119.82</td>
</tr>
<tr>
<td>Czernichów  (2)</td>
<td>14.71</td>
<td>31.33</td>
<td>14.69</td>
<td>9.52</td>
<td>43.33</td>
</tr>
<tr>
<td>Igolonia-Wawrz.  (2)</td>
<td>11.59</td>
<td>10.69</td>
<td>12.33</td>
<td>1.96</td>
<td>27.90</td>
</tr>
<tr>
<td>Iwanowice  (2)</td>
<td>12.73</td>
<td>1.31</td>
<td>14.58</td>
<td>3.44</td>
<td>27.04</td>
</tr>
<tr>
<td>Jerzman.-Przeg.  (2)</td>
<td>16.53</td>
<td>1.67</td>
<td>16.83</td>
<td>52.94</td>
<td>30.41</td>
</tr>
<tr>
<td>Kocmyrzów-Lub.  (2)</td>
<td>15.17</td>
<td>4.87</td>
<td>24.57</td>
<td>16.50</td>
<td>29.40</td>
</tr>
<tr>
<td>Krzeszowice  (3)</td>
<td>23.34</td>
<td>10.69</td>
<td>73.22</td>
<td>261.37</td>
<td>244.25</td>
</tr>
<tr>
<td>Liszki  (2)</td>
<td>18.64</td>
<td>15.92</td>
<td>32.65</td>
<td>34.56</td>
<td>72.46</td>
</tr>
<tr>
<td>Michałowice  (2)</td>
<td>15.36</td>
<td>1.98</td>
<td>23.36</td>
<td>3.96</td>
<td>25.22</td>
</tr>
<tr>
<td>Mogilany  (2)</td>
<td>18.78</td>
<td>11.47</td>
<td>24.00</td>
<td>9.00</td>
<td>24.18</td>
</tr>
<tr>
<td>Skała  (3)</td>
<td>17.68</td>
<td>5.71</td>
<td>42.63</td>
<td>107.42</td>
<td>32.55</td>
</tr>
<tr>
<td>Skawina  (3)</td>
<td>28.15</td>
<td>73.39</td>
<td>111.91</td>
<td>1758.00</td>
<td>94.47</td>
</tr>
<tr>
<td>Słomniki  (3)</td>
<td>13.41</td>
<td>3.44</td>
<td>15.26</td>
<td>3.41</td>
<td>32.19</td>
</tr>
<tr>
<td>Sułoszowa  (2)</td>
<td>15.17</td>
<td>14.76</td>
<td>13.22</td>
<td>2.55</td>
<td>15.90</td>
</tr>
<tr>
<td>Świątniki Górne  (3)</td>
<td>17.94</td>
<td>5.93</td>
<td>22.62</td>
<td>108.47</td>
<td>10.21</td>
</tr>
<tr>
<td>Wielka Wies  (2)</td>
<td>19.04</td>
<td>3.96</td>
<td>18.74</td>
<td>13.03</td>
<td>36.36</td>
</tr>
<tr>
<td>Zabierzów  (2)</td>
<td>24.09</td>
<td>15.60</td>
<td>29.35</td>
<td>170.92</td>
<td>138.12</td>
</tr>
<tr>
<td>Zielonki  (2)</td>
<td>22.92</td>
<td>16.62</td>
<td>30.40</td>
<td>71.49</td>
<td>33.50</td>
</tr>
<tr>
<td>Limanowa  (1)</td>
<td>28.12</td>
<td>5.62</td>
<td>29.41</td>
<td>35.91</td>
<td>31.93</td>
</tr>
<tr>
<td>Mszana Dolna  (1)</td>
<td>19.04</td>
<td>9.38</td>
<td>13.49</td>
<td>21.72</td>
<td>19.91</td>
</tr>
<tr>
<td>Dobra  (2)</td>
<td>12.77</td>
<td>15.10</td>
<td>18.13</td>
<td>3.48</td>
<td>61.18</td>
</tr>
<tr>
<td>Jodłownik  (2)</td>
<td>12.00</td>
<td>30.73</td>
<td>11.18</td>
<td>3.80</td>
<td>35.77</td>
</tr>
<tr>
<td>Kamienica  (2)</td>
<td>11.36</td>
<td>3.80</td>
<td>10.83</td>
<td>2.81</td>
<td>50.42</td>
</tr>
<tr>
<td>Laskowa  (2)</td>
<td>13.77</td>
<td>15.95</td>
<td>9.25</td>
<td>3.41</td>
<td>32.19</td>
</tr>
<tr>
<td>Limanowa  (2)</td>
<td>17.75</td>
<td>9.80</td>
<td>29.25</td>
<td>19.29</td>
<td>71.08</td>
</tr>
<tr>
<td>Łukowica  (2)</td>
<td>11.34</td>
<td>23.46</td>
<td>27.20</td>
<td>1.13</td>
<td>35.92</td>
</tr>
</tbody>
</table>
Table 6.

<table>
<thead>
<tr>
<th>Communes / meta-features</th>
<th>D</th>
<th>E</th>
<th>I</th>
<th>EM</th>
<th>LM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mszana Dolna (2)</td>
<td>16.17</td>
<td>9.61</td>
<td>7.82</td>
<td>7.79</td>
<td>78.04</td>
</tr>
<tr>
<td>Niedźwiedź (2)</td>
<td>12.30</td>
<td>7.22</td>
<td>9.03</td>
<td>4.17</td>
<td>43.68</td>
</tr>
<tr>
<td>Słopnice (2)</td>
<td>13.75</td>
<td>25.69</td>
<td>6.82</td>
<td>1.52</td>
<td>29.68</td>
</tr>
<tr>
<td>Tymbark (2)</td>
<td>15.41</td>
<td>28.40</td>
<td>70.32</td>
<td>145.92</td>
<td>20.34</td>
</tr>
<tr>
<td>Charsznica (2)</td>
<td>13.07</td>
<td>3.43</td>
<td>38.09</td>
<td>8.34</td>
<td>36.60</td>
</tr>
<tr>
<td>Gołcza (2)</td>
<td>12.07</td>
<td>2.48</td>
<td>39.53</td>
<td>44.92</td>
<td>20.16</td>
</tr>
<tr>
<td>Kozłów (2)</td>
<td>9.44</td>
<td>1.72</td>
<td>6.66</td>
<td>1.33</td>
<td>51.53</td>
</tr>
<tr>
<td>Książ Wielki (2)</td>
<td>10.77</td>
<td>27.39</td>
<td>18.96</td>
<td>23.05</td>
<td>58.92</td>
</tr>
<tr>
<td>Miechów (3)</td>
<td>17.50</td>
<td>19.09</td>
<td>20.74</td>
<td>42.19</td>
<td>60.48</td>
</tr>
<tr>
<td>Rachawice (2)</td>
<td>9.39</td>
<td>1.08</td>
<td>23.47</td>
<td>1.10</td>
<td>20.42</td>
</tr>
<tr>
<td>Słaboszów (2)</td>
<td>9.38</td>
<td>1.33</td>
<td>15.90</td>
<td>6.68</td>
<td>31.06</td>
</tr>
<tr>
<td>Dobczyce (3)</td>
<td>18.77</td>
<td>46.31</td>
<td>17.49</td>
<td>18.68</td>
<td>47.74</td>
</tr>
<tr>
<td>Lubień (2)</td>
<td>15.42</td>
<td>5.82</td>
<td>8.30</td>
<td>5.50</td>
<td>29.36</td>
</tr>
<tr>
<td>Myślenice (3)</td>
<td>27.51</td>
<td>134.58</td>
<td>22.21</td>
<td>120.46</td>
<td>80.49</td>
</tr>
<tr>
<td>Pcim (2)</td>
<td>11.71</td>
<td>2.75</td>
<td>8.89</td>
<td>42.01</td>
<td>36.15</td>
</tr>
<tr>
<td>Raciechowice (2)</td>
<td>9.72</td>
<td>8.00</td>
<td>9.71</td>
<td>2.52</td>
<td>30.37</td>
</tr>
<tr>
<td>Siepraw (2)</td>
<td>16.93</td>
<td>7.17</td>
<td>23.10</td>
<td>9.71</td>
<td>15.46</td>
</tr>
<tr>
<td>Sułkowice (3)</td>
<td>17.20</td>
<td>56.82</td>
<td>15.52</td>
<td>27.97</td>
<td>40.09</td>
</tr>
<tr>
<td>Tokarnia (2)</td>
<td>11.21</td>
<td>1.01</td>
<td>5.52</td>
<td>3.10</td>
<td>26.78</td>
</tr>
<tr>
<td>Wiśniowa (2)</td>
<td>11.70</td>
<td>6.93</td>
<td>9.71</td>
<td>4.35</td>
<td>30.50</td>
</tr>
<tr>
<td>Grybów (1)</td>
<td>18.33</td>
<td>3.89</td>
<td>13.89</td>
<td>4.64</td>
<td>16.57</td>
</tr>
<tr>
<td>Chelmiec (2)</td>
<td>18.40</td>
<td>21.64</td>
<td>52.47</td>
<td>68.15</td>
<td>69.95</td>
</tr>
<tr>
<td>Gródek nad D. (2)</td>
<td>13.19</td>
<td>12.40</td>
<td>30.76</td>
<td>85.14</td>
<td>106.09</td>
</tr>
<tr>
<td>Grybów (2)</td>
<td>15.72</td>
<td>136.73</td>
<td>32.09</td>
<td>22.30</td>
<td>63.12</td>
</tr>
<tr>
<td>Kamionka Wielka (2)</td>
<td>15.35</td>
<td>9.39</td>
<td>12.61</td>
<td>1.70</td>
<td>30.90</td>
</tr>
<tr>
<td>Korzenna (2)</td>
<td>12.20</td>
<td>14.01</td>
<td>24.10</td>
<td>28.57</td>
<td>46.01</td>
</tr>
<tr>
<td>Krynica-Zdrój (3)</td>
<td>22.82</td>
<td>16.13</td>
<td>17.57</td>
<td>34.58</td>
<td>86.17</td>
</tr>
<tr>
<td>Łącko (2)</td>
<td>10.52</td>
<td>17.61</td>
<td>22.71</td>
<td>2.09</td>
<td>70.67</td>
</tr>
<tr>
<td>Łososina Dolna (2)</td>
<td>12.79</td>
<td>8.90</td>
<td>33.47</td>
<td>26.71</td>
<td>135.08</td>
</tr>
<tr>
<td>Muszyna (3)</td>
<td>18.56</td>
<td>19.63</td>
<td>17.98</td>
<td>50.29</td>
<td>104.96</td>
</tr>
<tr>
<td>Nawojowa (2)</td>
<td>12.05</td>
<td>3.87</td>
<td>7.73</td>
<td>1.48</td>
<td>28.07</td>
</tr>
<tr>
<td>Piwniczna-Zdrój (3)</td>
<td>12.02</td>
<td>10.32</td>
<td>28.51</td>
<td>230.14</td>
<td>97.12</td>
</tr>
<tr>
<td>Podegrodzie (2)</td>
<td>12.20</td>
<td>39.77</td>
<td>25.87</td>
<td>13.34</td>
<td>41.12</td>
</tr>
<tr>
<td>Community</td>
<td>First Value</td>
<td>Second Value</td>
<td>Third Value</td>
<td>Fourth Value</td>
<td>Fifth Value</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>-------------</td>
<td>--------------</td>
<td>------------</td>
</tr>
<tr>
<td>Rytro (2)</td>
<td>12.02</td>
<td>3.35</td>
<td>5.94</td>
<td>2.99</td>
<td>42.94</td>
</tr>
<tr>
<td>Stary Sącz (3)</td>
<td>18.15</td>
<td>63.56</td>
<td>40.63</td>
<td>49.80</td>
<td>59.20</td>
</tr>
<tr>
<td>Nowy Targ (1)</td>
<td>30.34</td>
<td>101.66</td>
<td>24.61</td>
<td>224.69</td>
<td>177.31</td>
</tr>
<tr>
<td>Szczawnica (3)</td>
<td>14.76</td>
<td>2.03</td>
<td>10.00</td>
<td>18.94</td>
<td>90.14</td>
</tr>
<tr>
<td>Czarny Dunajec (2)</td>
<td>11.35</td>
<td>9.96</td>
<td>13.39</td>
<td>14.22</td>
<td>112.45</td>
</tr>
<tr>
<td>Czorsztyn (2)</td>
<td>16.61</td>
<td>4.44</td>
<td>11.33</td>
<td>13.31</td>
<td>53.06</td>
</tr>
<tr>
<td>Jabłonka (2)</td>
<td>15.80</td>
<td>11.43</td>
<td>15.07</td>
<td>18.42</td>
<td>93.20</td>
</tr>
<tr>
<td>Krościenko nad D. (2)</td>
<td>13.35</td>
<td>29.33</td>
<td>8.43</td>
<td>8.68</td>
<td>32.73</td>
</tr>
<tr>
<td>Lipnica Wielka (2)</td>
<td>11.44</td>
<td>17.11</td>
<td>4.90</td>
<td>5.77</td>
<td>40.14</td>
</tr>
<tr>
<td>Łapsze Niżne (2)</td>
<td>13.94</td>
<td>5.02</td>
<td>10.43</td>
<td>25.18</td>
<td>72.53</td>
</tr>
<tr>
<td>Nowy Targ (2)</td>
<td>15.20</td>
<td>22.58</td>
<td>19.31</td>
<td>46.46</td>
<td>107.21</td>
</tr>
<tr>
<td>Ochotnica Dolna (2)</td>
<td>12.23</td>
<td>3.00</td>
<td>7.95</td>
<td>13.18</td>
<td>75.71</td>
</tr>
<tr>
<td>Raba Wyżna (2)</td>
<td>12.67</td>
<td>4.05</td>
<td>12.19</td>
<td>7.98</td>
<td>54.36</td>
</tr>
<tr>
<td>Rabka-Zdrój (3)</td>
<td>18.32</td>
<td>31.07</td>
<td>10.83</td>
<td>33.09</td>
<td>40.33</td>
</tr>
<tr>
<td>Spytkowice (2)</td>
<td>13.95</td>
<td>2.81</td>
<td>19.73</td>
<td>3.17</td>
<td>11.88</td>
</tr>
<tr>
<td>Szafały (2)</td>
<td>11.68</td>
<td>2.36</td>
<td>10.84</td>
<td>6.00</td>
<td>27.99</td>
</tr>
<tr>
<td>Bukowno (1)</td>
<td>20.05</td>
<td>98.87</td>
<td>597.32</td>
<td>1846.34</td>
<td>106.37</td>
</tr>
<tr>
<td>Bolesław (2)</td>
<td>16.73</td>
<td>2.51</td>
<td>12.18</td>
<td>431.42</td>
<td>59.95</td>
</tr>
<tr>
<td>Kłucze (2)</td>
<td>18.46</td>
<td>82.67</td>
<td>74.61</td>
<td>352.24</td>
<td>534.03</td>
</tr>
<tr>
<td>Olkusz (3)</td>
<td>33.33</td>
<td>79.67</td>
<td>26.19</td>
<td>493.72</td>
<td>118.90</td>
</tr>
<tr>
<td>Trzyciąż (2)</td>
<td>12.57</td>
<td>9.38</td>
<td>20.62</td>
<td>3.50</td>
<td>29.46</td>
</tr>
<tr>
<td>Wolbrom (3)</td>
<td>19.31</td>
<td>3.10</td>
<td>25.35</td>
<td>61.88</td>
<td>63.21</td>
</tr>
<tr>
<td>Oświęcim (1)</td>
<td>41.88</td>
<td>143.73</td>
<td>572.11</td>
<td>2183.67</td>
<td>255.42</td>
</tr>
<tr>
<td>Brzeszcze (3)</td>
<td>24.68</td>
<td>369.06</td>
<td>20.67</td>
<td>948.55</td>
<td>86.67</td>
</tr>
<tr>
<td>Chelmek (3)</td>
<td>21.59</td>
<td>22.95</td>
<td>17.72</td>
<td>14.51</td>
<td>38.81</td>
</tr>
<tr>
<td>Kęty (3)</td>
<td>27.89</td>
<td>131.19</td>
<td>222.80</td>
<td>560.80</td>
<td>71.14</td>
</tr>
<tr>
<td>Osieck (2)</td>
<td>16.58</td>
<td>1.52</td>
<td>14.95</td>
<td>73.75</td>
<td>39.85</td>
</tr>
<tr>
<td>Oświęcim (2)</td>
<td>18.26</td>
<td>67.18</td>
<td>34.58</td>
<td>89.84</td>
<td>153.87</td>
</tr>
<tr>
<td>Polanka Wielka (2)</td>
<td>14.77</td>
<td>0.59</td>
<td>7.24</td>
<td>6.21</td>
<td>14.06</td>
</tr>
<tr>
<td>Przeciszów (2)</td>
<td>16.81</td>
<td>10.70</td>
<td>12.89</td>
<td>26.04</td>
<td>44.28</td>
</tr>
<tr>
<td>Zator (3)</td>
<td>19.77</td>
<td>129.14</td>
<td>17.05</td>
<td>104.36</td>
<td>135.78</td>
</tr>
<tr>
<td>Koniusza (2)</td>
<td>14.08</td>
<td>1.42</td>
<td>24.47</td>
<td>4.84</td>
<td>23.11</td>
</tr>
<tr>
<td>Koszycze (2)</td>
<td>12.38</td>
<td>3.54</td>
<td>11.48</td>
<td>7.28</td>
<td>32.08</td>
</tr>
<tr>
<td>Nowe Brzesko (3)</td>
<td>11.43</td>
<td>1.29</td>
<td>10.00</td>
<td>42.76</td>
<td>25.16</td>
</tr>
<tr>
<td>Pałcznica (2)</td>
<td>10.78</td>
<td>1.67</td>
<td>10.48</td>
<td>1.16</td>
<td>9.36</td>
</tr>
<tr>
<td>Proszowice (3)</td>
<td>15.89</td>
<td>112.85</td>
<td>16.18</td>
<td>18.59</td>
<td>39.24</td>
</tr>
</tbody>
</table>
Table 6. cont.

<table>
<thead>
<tr>
<th>Communes / meta-features</th>
<th>D</th>
<th>E</th>
<th>I</th>
<th>EM</th>
<th>LM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radziemice (2)</td>
<td>10.42</td>
<td>0.56</td>
<td>17.56</td>
<td>1.76</td>
<td>10.17</td>
</tr>
<tr>
<td>Jordanów (1)</td>
<td>14.38</td>
<td>3.90</td>
<td>8.84</td>
<td>5.32</td>
<td>24.60</td>
</tr>
<tr>
<td>Sucha Beskidzka (1)</td>
<td>18.34</td>
<td>8.12</td>
<td>15.46</td>
<td>51.39</td>
<td>27.53</td>
</tr>
<tr>
<td>Budzów (2)</td>
<td>8.22</td>
<td>2.63</td>
<td>8.36</td>
<td>1.25</td>
<td>25.10</td>
</tr>
<tr>
<td>Bystrza-Sídzina (2)</td>
<td>8.81</td>
<td>1.71</td>
<td>2.78</td>
<td>1.34</td>
<td>48.00</td>
</tr>
<tr>
<td>Jordanów (2)</td>
<td>11.64</td>
<td>1.84</td>
<td>33.59</td>
<td>7.00</td>
<td>40.53</td>
</tr>
<tr>
<td>Maków Podh. (3)</td>
<td>12.54</td>
<td>9.19</td>
<td>33.92</td>
<td>85.46</td>
<td>48.15</td>
</tr>
<tr>
<td>Stryszawa (2)</td>
<td>10.93</td>
<td>7.06</td>
<td>8.19</td>
<td>5.08</td>
<td>44.38</td>
</tr>
<tr>
<td>Zawoja (2)</td>
<td>9.34</td>
<td>3.28</td>
<td>7.34</td>
<td>1.84</td>
<td>63.49</td>
</tr>
<tr>
<td>Zembrzyce (2)</td>
<td>13.42</td>
<td>1.93</td>
<td>10.09</td>
<td>2.27</td>
<td>39.77</td>
</tr>
<tr>
<td>Ciężkowice (3)</td>
<td>12.38</td>
<td>6.97</td>
<td>18.15</td>
<td>25.27</td>
<td>79.09</td>
</tr>
<tr>
<td>Gromnik (2)</td>
<td>13.19</td>
<td>3.12</td>
<td>10.29</td>
<td>6.43</td>
<td>46.00</td>
</tr>
<tr>
<td>Lśnia Góra (2)</td>
<td>20.20</td>
<td>6.39</td>
<td>17.30</td>
<td>19.55</td>
<td>181.04</td>
</tr>
<tr>
<td>Pleśna (2)</td>
<td>15.24</td>
<td>16.60</td>
<td>21.59</td>
<td>16.72</td>
<td>59.32</td>
</tr>
<tr>
<td>Radłów (3)</td>
<td>15.60</td>
<td>1.37</td>
<td>10.00</td>
<td>11.84</td>
<td>55.52</td>
</tr>
<tr>
<td>Ryglice (3)</td>
<td>11.89</td>
<td>1.76</td>
<td>11.88</td>
<td>1.77</td>
<td>114.67</td>
</tr>
<tr>
<td>Rzepiennik Strzyż. (2)</td>
<td>10.15</td>
<td>3.87</td>
<td>17.69</td>
<td>1.04</td>
<td>366.08</td>
</tr>
<tr>
<td>Skrzyszów (2)</td>
<td>17.80</td>
<td>17.87</td>
<td>63.38</td>
<td>33.71</td>
<td>31.91</td>
</tr>
<tr>
<td>Tarnów (2)</td>
<td>24.33</td>
<td>18.44</td>
<td>53.11</td>
<td>56.98</td>
<td>47.87</td>
</tr>
<tr>
<td>Tuchów (3)</td>
<td>17.37</td>
<td>8.07</td>
<td>26.24</td>
<td>18.42</td>
<td>47.21</td>
</tr>
<tr>
<td>Wierzchosławice (2)</td>
<td>19.98</td>
<td>13.30</td>
<td>13.15</td>
<td>25.01</td>
<td>92.21</td>
</tr>
<tr>
<td>Wietrzychowice (2)</td>
<td>14.90</td>
<td>32.55</td>
<td>19.62</td>
<td>126.11</td>
<td>36.92</td>
</tr>
<tr>
<td>Wojnicz (3)</td>
<td>15.37</td>
<td>1.69</td>
<td>10.00</td>
<td>3.09</td>
<td>66.93</td>
</tr>
<tr>
<td>Zaklicyn (3)</td>
<td>12.67</td>
<td>2.31</td>
<td>10.00</td>
<td>15.14</td>
<td>71.38</td>
</tr>
<tr>
<td>Żabno (3)</td>
<td>20.33</td>
<td>27.49</td>
<td>18.05</td>
<td>51.67</td>
<td>75.04</td>
</tr>
<tr>
<td>Szerzyny (2)</td>
<td>15.33</td>
<td>1.51</td>
<td>9.64</td>
<td>2.12</td>
<td>30.28</td>
</tr>
<tr>
<td>Zakopane (1)</td>
<td>26.17</td>
<td>188.05</td>
<td>218.29</td>
<td>659.48</td>
<td>121.43</td>
</tr>
<tr>
<td>Biały Dunajec (2)</td>
<td>13.10</td>
<td>2.28</td>
<td>6.01</td>
<td>3.35</td>
<td>16.31</td>
</tr>
<tr>
<td>Bukowina Tatr. (2)</td>
<td>12.69</td>
<td>4.82</td>
<td>32.69</td>
<td>21.80</td>
<td>98.89</td>
</tr>
<tr>
<td>Kościelisko (2)</td>
<td>12.75</td>
<td>3.33</td>
<td>7.64</td>
<td>6.03</td>
<td>165.04</td>
</tr>
<tr>
<td>Poronin (2)</td>
<td>15.04</td>
<td>8.57</td>
<td>12.54</td>
<td>5.67</td>
<td>51.77</td>
</tr>
<tr>
<td>Andrychów (3)</td>
<td>31.43</td>
<td>22.92</td>
<td>27.50</td>
<td>114.75</td>
<td>72.75</td>
</tr>
<tr>
<td>Brzeźnica (2)</td>
<td>14.43</td>
<td>96.17</td>
<td>21.72</td>
<td>8.81</td>
<td>37.71</td>
</tr>
<tr>
<td>Kalwaria Zebr. (3)</td>
<td>15.19</td>
<td>56.72</td>
<td>23.85</td>
<td>75.76</td>
<td>52.85</td>
</tr>
<tr>
<td>Lanckorona (2)</td>
<td>11.51</td>
<td>1.74</td>
<td>24.38</td>
<td>34.84</td>
<td>16.40</td>
</tr>
</tbody>
</table>
Explanations:

The objects of research described by the indicators presented above can be compared only after defining the measure of similarity between them. Therefore as a measure of taxonomic distance between objects, Euclidean distance was adopted. The matrix of Euclidean distances was created on the basis of five constructed meta-features (matrix of metadata). The measure of similarity, expressed by Euclidean distance, is presented in the following formula:

\[ d_{ij} = \sqrt{\sum_{j=1}^{n} (z_{ij} - z_{oj})^2} \]

where:
- \( z_{ij} \) – normalized value of a \( j \) feature in an object \( i \),
- \( z_{oj} \) – normalized features’ values of a standard object,

Classification of communes as regards factors influencing their local development was carried out by Ward’s hierarchical clustering method, which is agglomerative combinatorial method for grouping and arranging objects. It uses an analysis of variance in order to assess distances between clusters [Ward 1963]. Ward’s method is aimed at obtaining small clusters and is regarded as highly effective [Nowak 1980]. It assumes that at the beginning of a calculation procedure each object is initially a separate group, then the number of group is gradually reduced by joining into groups of higher order. The process of joining itself was completed at the moment when one group consisting of set of all objects was obtained [Kolenda 2006]. The essence of the agglomeration of clusters by Ward’s method consisted in organizing objects according to an adopted criterion, which was meeting the...
condition of homogeneity of communes with regard to factors (segments) adopted in the analysis. The results were obtained in the form of dendrogram (hierarchical tree). Then classes of communes singled out by Ward’s method were juxtaposed and averages and standard deviations were calculated of meta-features collated into five thematic segments of an adopted classification. Spatial analysis of the results was carried out. The territorial distribution of types of communes homogeneous with respect to studied factors shaping communes’ local development was presented.

3. Results

The synthetic indicators of component factors of local development, obtained as a result, became a basis for grouping communes into homogeneous types with respect to anatomical similarity of their structure.

As a result of applying Ward’s method a diagram of connections was obtained and it is presented in the form of dendrogram in Figure 1.

By using Ward’s method classes of communes were singled out and on this basis ten group of communes were obtained (A–J) and juxtaposed in Table 7.

Table 7. Classes of communes obtained by Ward’s method

<table>
<thead>
<tr>
<th>Group of communes</th>
<th>Commune</th>
<th>No. of communes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Trzebinia (3)</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>Kraków (1)</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>Libiąż (3), Brzeszcze (3), Tarnów (1)</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>Skawina (3), Bukowno (1), Oświęcim (1)</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>Myślenice (3), Dąbrowa Tarnowska (3), Szczurowa (2), Grybów (2), Brzeźnica (2), Proszowice (3), Zator (3)</td>
<td>7</td>
</tr>
<tr>
<td>F</td>
<td>Bolesław (2), Olkusz (3), Bochnia (1), Brzesko (3), Niepołomice (3), Nowy Sącz (1), Kęty (3), Zakopane (1)</td>
<td>8</td>
</tr>
<tr>
<td>G</td>
<td>Krzeszowice (3), Zabierzów (2), Gorlice (1), Alwernia (3), Chrzanów (3), Rzepiennik Strzyżewski (2), Wadowice (3), Klucze (2), Piwniczną Zdrój (3), Nowy Targ (1)</td>
<td>10</td>
</tr>
<tr>
<td>H</td>
<td>Muszyna (3), Łososina Dolna (2), Szczywnica (3), Jabłonka (2), Czarny Dunajec (2), Uście Gorlickie (2), Sękowa (2), Gródek nad Dunajcem (2), Łącko (2), Krynica Zdrój (3), Kościelisko (2), Bukowina Tatrzańska (2), Mucharz (2), Wieliczka (3), Gdów (2), Oświęcim (2), Nowy Targ (2), Lisia Góra (2), Wierzchosławice (2), Ryglice (3)</td>
<td>20</td>
</tr>
<tr>
<td>I</td>
<td>Mszana Dolna (1), Limanowa (2), Zielonki (2), Limanowa (1), Miechów (3), Pcin (2), Tymbark (2), Golcza (2), Świątniki Górne (3), Gnojnik (2), Iwikowa (2), Drwinia (2), Lipnica Murowana (2), Skala (3), Slomniki (3), Jerzmanowice-Przeginia (2), Liszki (2), Andrychów (3), Kalwaria Zebrzydowska (3), Wietrzychowice (2), Żabno (3), Biskupice (2), Kłaj (2), Lanckorona (2), Spytkowice (2), Tarnów (2), Wolbrom (3), Osiek (2), Chełmiec (2), Stary Sącz (3), Maków Podhalański (3), Skrzyszów (2), Nowe Brzesko (3), Sucha Beskidzka (1)</td>
<td>34</td>
</tr>
</tbody>
</table>
Source: author’s study

Fig. 1. Tree diagram for 182 communes of the Małopolskie voivodeship, obtained by Ward’s method
Table 7. cont.

<table>
<thead>
<tr>
<th>Group of communes</th>
<th>Commune</th>
<th>No. of communes</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Dobra (2), Wielka Wieś (2), Jodłownik (2), Laskowa (2), Kamienica (2), Sło-szowa (2), Iwanowice (2), Igołomia-Wawrzeńczyce (2), Kocmyrzów-Luborzy-ca (2), Mogiłany (2), Michałowice (2), Łukowica (2), Śląsobez (2), Racławice (2), Dobczyce (3), Raczechowice (2), Lubień (2), Książ Wielki (2), Niedźwiedź (2), Mszana Dolna (2), Słupnice (2), Kozłów (2), Charsznica (2), Czernichów (2), Czchów (3), Borzęcin (2), Dębno (2), Bolesław (2), Babice (2), Żegocina (2), Łapanów (2), Bochnia (2), Nowy Wiśnicz (3), Trzciana (2), Rzewsza (2), Gręboszów (2), Lipinki (2), Gorlice (2), Łužna (2), Ropa (2), Moszczenica (2), Bobowa (3), Olesno (2), Mędrzechów (2), Radgoszcz (2), Biec (3), Szcuzin (3), Sierpaw (2), Stryszawa (2), Jordanów (2), Zawoja (2), Ciężkowice (3), Zembrzyce (2), Bystra Sidzina (2), Pałczynica (2), Koszyce (2), Radziemiec (2), Budzów (2), Jordanów (1), Gromnik (2), Poronin (2), Biały Dunajec (2), Strysów (2), Wiprz (2), Tomice (2), Szerzyń (2), Radłów (3), Pleśna (2), Tuchów (3), Zakliczyn (3), Wujnicz (3), Koniusza (2), Nawojowa (2), Łabów (2), Podegrodzie (2), Czorsztyn (2), Rytro (2), Korzenna (2), Tókarnia (2), Słtow (3), Wiśniowa (2), Kamanionka Wielka (2), Grybów (1), Krośkienko nad Dunajcem (2), Trzyści (2), Szafiary (2), Chełmek (3), Przeciszów (2), Polanka Wielka (2), Spytów (2), Łapsze Niże (2), Lipnica Wielka (2), Ochotnica Dolna (2), Rabka-Zdrój (3), Raba Wyżna (2)</td>
<td>95</td>
</tr>
</tbody>
</table>

Total number of studied communes 182

Legend: 1 – urban commune, 2 – rural commune, 3 – urban-rural communes

Table 8. Averages and standard deviations of diagnostic features in the classification

<table>
<thead>
<tr>
<th>Group of communes</th>
<th>No. of communes in a group</th>
<th>Averages and standard deviations of diagnostic features (5 segments)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Demography</td>
</tr>
<tr>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
<td>28.71</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>222.38</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>38.07</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>30.03</td>
</tr>
<tr>
<td>E</td>
<td>7</td>
<td>18.48</td>
</tr>
<tr>
<td>F</td>
<td>8</td>
<td>30.38</td>
</tr>
<tr>
<td>G</td>
<td>10</td>
<td>23.75</td>
</tr>
<tr>
<td>H</td>
<td>20</td>
<td>15.84</td>
</tr>
<tr>
<td>I</td>
<td>34</td>
<td>16.94</td>
</tr>
<tr>
<td>J</td>
<td>95</td>
<td>13.87</td>
</tr>
<tr>
<td>Studied community</td>
<td>182</td>
<td>18.00</td>
</tr>
</tbody>
</table>
The calculated averages and standard deviations of synthetic meta-features in groups of communes became a basis for determining the fundamental segments shaping local development of all studied communes in specific groups (Table 8).

Group A (1 commune) and group E (7 communes) are characterized by marked prevalence of economic factors over remaining analysed ones. The basic segment of local development is here an economic segment. Local economic development is determined by financial factors, such as fixed assets. Capital is a prerequisite for all investment processes and therefore the stress should be put on actions that generate local capital [Dobrodziej 2002].

Group B (1 commune), C (3 communes), D (3 communes), F (8 communes), G (10 communes), I (34 communes) are characterized by the prevalence of environmental factors. Local environmental development is determined by state and protection of environment and proper environmental policy. State and quality of environment becomes more and more frequently and with an ever higher degree a criterion for assessment of investment attractiveness. Low quality of environment not only can scare off people, but can also be an obstacle to using modern technologies [Dobrodziej 2002].

Groups H (20 communes) and J (95 communes) show clear prevalence of spatial factors. The basic segment of development of these communes is land management. Local development in this group is determined by usable space, basic resources necessary for proper development of local economy and meeting the needs of people. Utility values of the group can enhance or lower the attractiveness to potential investors. Local authorities can attract investors by creating favourable economic climate in their area, facilitating the development of existing companies and establishment of the new ones [Rosińska 2007].

The totality of studied communes are characterized by the prevalence of environmental factors. Environmental management segment has been recognized as a fundamental one for local development in the Małopolskie voivodeship. The region is oriented mainly towards economy efficiently using natural resources. Around 52.1% of the voivodeship’s area are nature sites and objects [Urząd Statystyczny… 2015]. It has a significant influence on maintaining sustainable development in the region. Local development of communes of the Małopolskie voivodeship is an integrated development, combining domains of demography, economy, infrastructure, environment and space. Local development should be an integrated one, so it should take place harmoniously in the following domains: social, economic, infrastructural, spatial and environmental [Majchrzak and Zalewski 2000].

Spatial distribution of homogeneous types of communes as to factors influencing local development of communes has been presented in Figure 2. Analysing it one can see that singled out types of communes are highly spatially diversified.

The communes where economic factors were prevailing (groups A and E) are located in the vicinity of big cities, industrial centres and by main communication roads (Trzebinia, Myślenice, Dąbrowa Tarnowska, Proszowice and Zator). They are highly active in the economic domain. Communes where environmental factors prevail (groups B, C, D, F, G, I) are located in different places, especially in north-western part of the country, usually in the vicinity of nature sites. They are highly active in the
domain of environmental policy and maintaining sustainable development towards an economy efficiently using natural resources. Most spatially diverse communes (groups H and J) take up around 85% of the voivodeship area. They are very active in implementing land policy and management. It is enormously important when it comes to managing space and using land in such way as to permit sustainable development.

![Spatial distribution of the homogeneous types of communes of the Małopolskie voivodeship](image)

Source: author's study

Fig. 2. Spatial distribution of the homogeneous types of communes of the Małopolskie voivodeship

4. Recapitulation and conclusions

Using Ward’s method allowed for classification of the Małopolskie voivodeship communes into 10 homogeneous groups as to factors of local development. The basis of this typology of communes was their classification according to adopted criteria: demographic, economic, infrastructural, environmental and spatial. Of great impor-
tance in the study was the choice of features and measures, which allowed to differ-
entiate communes within 5 segments shaping their local development. The calculated
averages and standard deviations of meta-features in singled out groups were the basis
for selection and determination of basic indicators influencing local development. The
analysis of spatial distribution of types of communes, carried out by Ward’s method,
showed high diversity of saturation in that respect. The kind of developmental factor
depended on territorial location of a commune. The determining developmental factor
in all studied communes proved to be a segment of environmental management, which
shows positive activity of certain group of communes and their commitment to main-
taining suitable state and protection of nature. Thanks to using synthetic indicators the
analysis of large databases was possible in the study. Ward’s method was used as a basic
tool for grouping and analysis of acquired taxonomic collections. The above classifica-
tion may be helpful in coping with tasks related to environmental policy of local or
regional dimension.

References

Brol R. 1996. Rozwój lokalny – nowa logika rozwoju gospodarczego. [In:] Gospodarka lokalna
w teorii i praktyce. R. Brol, A. Sztando (eds). Wydawnictwo Akademii Ekonomicznej, Wro-
cław, 11–12.

Brunka M., Kumorek B., Łuczak-Kumorek E. 2003. Słownik samorządu terytorialnego. Za-
chodnie Centrum Organizacji, Zielona Góra.

Coffey W., Polèse M. 2005. The concept of local development: a stages model of endogenous
regional growth, Springer Verlag, Canada.

Dobrodziej J. 2002. Rola władz lokalnych w stymulowaniu rozwoju – aspekt teoretyczny. Wy-
dawnictwo Akademii Ekonomicznej, Wrocław, 70–71.

Dziechciarz J. 2006. Wskaźniki syntetyczne. Polskie dokonania a doświadczenia międzynaro-
dowe. [In:] Przestrzenno-czasowe modelowanie i prognozowanie zjawisk gospodarczych.
Wydawnictwo Akademii Ekonomicznej w Krakowie.


Kolenda M. 2006. Taksonomia numeryczna. Klasyfikacja, porządkowanie i analiza obiektów
wielocechowych. Wydawnictwo Akademii Ekonomicznej, Wrocław.

SGH, Warszawa.

PWE, Warszawa.

Nowak E. 2004. Metody klasyfikacji w badaniach geograficznych. [In:] Syntetyczne miary do-
stępności sieci telekomunikacyjnych. Polskie Towarzystwo Informacji Przestrzennej, Rocz.
Geomat., 5(1).

Rosińska J. 2007. Rozwój lokalny a inwestycje komunalne w Polsce. Folia Univ. Agric. Stetin,
Oeconomica, 254(47), 277–286.

Sztando A. 1998. Oddziaływanie samorządu lokalnego na rozwój lokalny w świecie ewolucji

w Bochni, 3, 101–110.


Mgr inż. Kamila Dedio
Uniwersytet Rolniczy w Krakowie
Katedra Ekologii, Klimatologii i Ochrony Powietrza
30-059 Kraków, al. Mickiewicza 24/28
e-mail: kamilakrk23@gmail.com

Joanna Gil-Mastalerczyk

Summary

In 1945, the time of dynamic political and social and economic changes begins in Poland, determining the creation of architecture, and also influencing its aesthetic qualities. This applies particularly to buildings and compounds of religious architecture – the free development of the latter was significantly hindered during this period. In the post-war period, only very few churches, built from scratch, were constructed within the area of the Archdiocese of Kraków. Until 1970, sacred construction projects, in terms of their architecture, were often expression of local capabilities, power of persuasion and perseverance of the designers and investors. Sometimes such projects stretched over a dozen or more years of complex implementations.

Keywords

stylistic changes • artistic movements • Archdiocese of Kraków • post-war sacred architecture (1945–1970)

1. Introduction and background

The problem of stylistic transformations in sacred architecture still remains very topical. Church buildings have become a sign of the ‘Church’s’ presence on earth. They are an expression of the human spiritual needs, as well as the pursuit of the absolute beauty.

Church architecture differs from the residential and service architecture. Often, it is the epitome of historical tradition. In the spirit of Vatican II, it expresses its ancillary character to the community, creating conditions for the full development of religious life.

In the area of the Archdiocese of Kraków, which, topographically, is a very diverse territory, there are important determinants in terms of the context of the landscape – from the mountainous areas of Podhale to the vast and wide valleys around the city of Kraków. Therefore, due to this diversity of the environment, the architecture built in the Diocese seems even more varied, multi-threaded, and thus more interesting [Gil-Mastalerczyk 2013].
The period between 1945–1970 is a time of dynamic political and social changes, determining the creation of architecture in Poland and influencing its aesthetic qualities. This applies particularly to religious architecture, whose free development was significantly hindered during this period. It was most definitely the hardest time in the history of church construction in our country.\footnote{During that period, only about 300 new churches were built throughout Poland. Quoted after: [Wroński 2010, 279; Source: Gryz 2008].} Difficulties associated with the construction process were no doubt hugely influenced by the historical and cultural context, and in particular the prevailing social, political and economic conditions. These impacted the number of the churches built as well as their architecture – in particular, their size, shape and appearance. In the years 1945–1970, any such projects met with numerous difficulties; whereas in architectural terms, they were the expression of local capabilities, power of persuasion and perseverance of the designers and investors. Sometimes these projects stretched over a dozen or more years of complex implementations [Gil-Mastalerczyk 2013].

2. Post-war sacred architecture (the example of the Kraków Diocese 1945–1970)

The post-war church architecture did not yield to systemic considerations or the influence of the national and socialist style; at the same time, it enjoyed a great social significance [Żychowska 2006, 287]. However, during the discussed period, due to the limitations imposed by the political system, this kind of architecture could not be developed freely and, above all, according to the social needs.\footnote{The Church faced new challenges. The new political system, which had been imposed upon Poland, was trying to isolate the Church from society. The most difficult time was the period of 1948–1956, so-called ‘the dark night of Stalinism’. This was the time of public harassment, persecution of the Church and fighting against it, limiting its freedom, and eliminating the influence of the clergy on society. These activities were aimed at destabilizing the Church, which had had a great power of integrating the Polish society. Quoted after: [Wroński 2010, 41–43].}

World War II brought immense material damage of the country, as well as extreme loss of people and talent.\footnote{Losses in national capital were among the most severe throughout Europe – amounting to 38% of the capital value of August 1939. Quoted after: [Kaliński 1986, 13–18].} Also the Catholic Church suffered considerable losses – even though it continued to play a very important role, both in the political and the social life of the country. More than 900 Polish churches were physically damaged or destroyed [Sowa 2001, 46].

The beginning of the post-war period was a time of a certain degree of creative freedom. In the years 1945–1950, as many as 551 religious facilities were rebuilt throughout the country [Sowa 2001, 47]. Many church investment projects of that period, including those unfinished before the war or during the war, saw the conclusion of their implementation by the late 1940s and early 1950s [Żychowska 2006, 287].

The Second World War caused the interruption of certain styles and artistic trends. Due to the socio-political and economic conditions in post-war Poland, attempts to
continue many of the pre-war activities and projects have failed, due to the prevailing tendency towards the economical, sparse forms, and restrained expression [Żychowska 2006, 294].

The beginning of the post-war period was a time of a certain degree of creative freedom. In the years 1945–1950, as many as 551 religious facilities were rebuilt throughout the country. In the early post-war years (1945–1951), which in the Archdiocese of Kraków fall to the last years of the service of Cardinal Adam Stefan Sapieha at the head of the Kraków Archdiocese, efforts were undertaken to complete all works – interrupted during the war – on the construction of churches, as well as provide the necessary outfitting and furnishing of temples built before the war [Wroński 2010, 44]. In subsequent years, due to the severe tightening of relations between the Church and the State, which started in September 1947, there have been increasing restrictions on the development of religious architecture. In the period between 1951–1955, only 86 Catholic churches were built across the country [Sowa 2001, 107].

During this time, post-war church architecture developed in stages [Żychowska 2006, 288]. The first years are characterized mainly by restoration, reconstruction and the so-called ‘resurrection of the monuments of national cultural heritage’ [Quoted after: Żychowska 2006, 288; Source: Łysiak 1981].

In the architecture of the church buildings that were erected in the Archdiocese of Kraków in the years 1945–1970, we see predominantly references to the regional characteristics and to traditionalism, which is a kind of a continuation of the pre-war trends. An example is the church in Dobczyce (1947–1949). The architecture of the building – due to the use of traditional forms – exhibits clear references to the characteristics of traditionalism. The church also has features of eclectic style. It is an example of traditional sacred architecture of high aesthetic and representative values, distinguishing it within its surroundings (Figure 1).

In this period, the regional trend has become quite significant and widespread. Architects and designers were drawing from the national and local realisations to date. Newly constructed churches were decorated using traditional, conventional materials (such as stone or brick), and their stylistics was a continuation of modernist forms. In the architecture of the churches, we note modern, hard geometrical and historical forms, with predominant axial elevation. The architecture of the church in Niegowić (1949–1959) – with its elements of modernism (Figure 2) – uses traditional forms, and therefore clearly refers to the traditionalism. ‘The author tried to link the architecture to the modern life. (...) The traditional forms used herein were not only secondary and eclectic. Instead, the architecture was founded on the wave of romanticism, and despite the characteristics of traditionalism, it remained functional and very much linked to the modern life’ [Białkiewicz 1987, 173–174].

In the post-war period, there also appear forms, which look to the pattern and the principles of classical architecture. Churches of the 1950s are characterized by a formal reference to historical styles derived from the mainstream of modern sacred architecture. An example is the neo-Renaissance church in Michalowice (1952–1963) near Kraków (Figure 3). It is a modern building, embodying compactness and harmony,
most apt for a holy place. The architecture of the church stands out from its surroundings, due to its monumental scale and elegance. Particularly characteristic, and visible from afar, is the dome, granting the buildings its majestic quality.

Fig. 1. Church of Our Lady, Help of Christians [Matki Bożej Wspomożenia Wiernych] in Dobczyce (1947–1949), the view of the church silhouette from the side of the chancel – against the background of surrounding buildings

In the Archdiocese of Kraków, in the city of Kraków itself, ‘free interpretations of functionalist forms’ continued [Żychowska 2006, 287–296].

‘(...) On the one hand, conservative trends, traditional in expression, had a significant social acceptance and were also preferred by a significant group of architects themselves, and on the other hand, modernism and avant-garde groups effectively introduced modern styling’ [Żychowska 2006, 288].

Catholic Church, at that time, was an institution that integrated the society and provided support to the people. This fact could have impacted the stylistic continuity and references to earlier architecture.

The years that followed, up to the year 1956, had been the most difficult time in the evolution of stylistic forms. The creators of religious architecture, in the face of the mounting difficulties, seemed to have completely forgotten about the present (modernity).

After the ‘thaw’ of October 1956, the search for new forms in pre-conciliar architecture began. National traditionalism gave way to solutions that used new materials and expressive forms.
Until 1970, the architecture of churches recalled the tradition of the post-war avant-garde and post-war Western European art trends [Żychowska 2006, 290]. It was also a period of independent creative work. This was reflected in the competition design for the church in Nowa Huta-Bieńczyce, containing modern and unprec-

Fig. 2. Church of the Assumption of the Virgin Mary in Niegowić [Wniebowzięcia Najświętszej Marii Panny], 1949–1959, designed by Bogdan Treter. Technical drawings, approx. 1938, plan of the ground floor, southern and northern elevations, cross-sections

4 The history of the construction of the church goes back to the creation of the parish in 1952 (by Archbishop Baziak), which integrated the local community. In November 1956, the Department of Religious Affairs has agreed for the church to be built. Then, in the beginning of 1957, the authorities agreed on the location – near Teatr Ludowy [the People’s Theatre], in order to maintain peace among the population of Nowa Huta. The workers of Nowa Huta had pastoral support by the then
edented architectural solutions and materials – in both the plan and the shape of the building.\(^5\)

Fig. 3. The church of Our Lady Queen of Poland in Michałowice [Najświętszej Marii Panny Królowej Polski], 1952–1963, designed by Stanisław Murczyński, a perspective view of the church building from the side of the chancel

new bishop – Auxiliary Bishop and Vicar General – none other than future Pope, Karol Wojtyła, who took over the protectorate over the implementation of the Millennium program. He knew the socio-political situation, as well as the techniques of propaganda used by the authorities. On 19 October 1958, he celebrated the holy mass at the site of the future temple. However, on 14 October 1959, the Presidium of the National Council of the City of Kraków repealed the earlier decision on the location of the future church. The money collected for this purpose, in the amount of 2 million Polish złoty, were requisitioned by the Department of Finance of PDzRN in Nowa Huta, and handed to the Fund of Building the Millennium School in Nowa Huta. On 8 February 1960, the Department of Internal Affairs (PRN MK) issued a decision to dissolve the Committee for the Construction of the Church in Nowa Huta. On 22 April of that same year, the Ministry of Internal Affairs reconfirmed the decision. In the location in question, the authorities decided to build a school as a part of the ‘1,000 schools in the Millennium’ campaign. Quoted after: [Wroński 2010, 49–50].

\(^5\) However, the project was not implemented, due to the withdrawal by the authorities of the construction permit that they had issued earlier. “The whole decision-making system of the PRL [People’s Republic of Poland] was limiting to public religious life, within which, after all, the church building holds a special place. As far as the historic churches were treated with a fair degree of tolerance, [the authorities] were seeking to eliminate the modern church construction completely. (...) Architectural competitions were announced for new churches in Nowa Huta (104 entries were received), (...) and the outcome of the competition for the church in the New Huta was known already at the end of August 1957. Of the 104 projects, 14 referenced the pre-1914 style, 27 – returned to interwar style, while as many as 63 were modern architectural explorations. Ultimately approved for implementation, was the project by engineer Wojciech Pietrzyk, who also served as the architect supervisor of the construction; the wait for the commencement of the construction took more than 10 years. Implementation continued for the next decade (1967–1977)”; Information quoted after: [Nadrowski 2000, 58–59]
3. Conclusions

The development of the style of religious architecture, as well as the form and shape of the churches of the Archdiocese of Kraków between 1945–2000, were impacted, above all, by the conditions and the transformations of political, economic, and social nature, taking place in our country over that period. An extremely difficult situation, in which the Catholic Church in Poland found itself, various techniques used to destabilize its strength, as well as the legal and administrative procedures limiting its liberty and its freedom of action, exerted a major influence on the architecture of religious buildings.


Source: author’s study
Against the background of the conditions analysed herein, as well as contemporary ideological and artistic movements of the time, it is clear that the process of stylistic transformation is particularly highlighted in the evolution and pursuit of appropriate forms and functional programs. The systemic, economic, legal, and social transformations occurring in subsequent periods clearly demonstrate and reflect the atmosphere of those times, the aesthetics of the era, and represent the real picture of religious architecture.

The Archdiocese of Kraków at the turn of 1945–1970 was an important creative centre for the Polish architectural thought. Architects’ milieu started their own paths of creative explorations, creating a specific aesthetics of emerging forms of sacred architecture. Many objects from this period provide a perfect reflection of the international and local architectural trends prevailing at the time, while, at the same time, they demonstrate the tastes of the local community and its artists. Church buildings often assume a modern and contemporary character, founded upon profound theoretical basis.

Presented buildings constitute examples of clear concepts and urban compositions, which powerfully define the public space; while their external forms have high aesthetic value. Buildings, which fit into the context of the environment, the fabric of towns and villages, are perceived as especially valuable, as icons of a kind. This is the architecture marked with representative and original designing solutions.

References

Gryz R. 2008. Kościoły z łaski. [In:] Kościół W Polsce pod rządami komunistów, cz. IV: Budowanie kościołów w PRL, Gość Niedz., 32 (suppl.)
Żychowska M.J. 2006. Powojenna architektura sakralna. [In:] Architektura sakralna w kształtowaniu tożsamości kulturowej miejsca [Sacred architecture in shaping the identity of place], E. Przesmycka (ed.). Wydawnictwo Politechniki Lubelskiej, Lublin.
Dr inż. arch. Joanna Gil-Mastalerczyk
Politechnika Świętokrzyska
Katedra Architektury i Urbanistyki
25-314 Kielce, al. Tysiąclecia Państwa Polskiego 7
e-mail: joanna.gil@onet.pl

Joanna Gil-Mastalerczyk

Summary

The phenomenon of transformation in shaping the architecture of churches, observed in Poland after 1970, remains as fascinating as it is unusual. Despite the great crisis in the field of religious architecture, the latter presents a wealth of original and innovative architectural and functional solutions. A radical change in the conditions in which ecclesial investors had to operate when undertaking the construction of temples, coupled with the political, economic and social transformations taking place on a large scale, significantly contributed to the feasibility and functioning of this architecture and the evolution of its forms. Regardless of the solutions applied, it represents a wealth of content, both ideological and material.

Keywords

stylistic changes • artistic movements • Archdiocese of Kraków • contemporary sacred architecture (1971–2000)

1. Introduction

Sacred architecture in the area of the Kraków Archdiocese in the years 1945–2000 underwent dynamic changes, adjusted to the changing socio-political situation. The phenomenon of transformation in the way of shaping the architecture of churches, which continued until late 1990s, remains as fascinating as it is unusual. Despite the great crisis in the field of religious architecture, the latter presents a wealth of original and innovative architectural and functional solutions. The latter were associated with a number of circumstances, which undoubtedly left their mark. Above all, they were under the impact of the prevailing political-economic as well as legal-social situation of Poland at the time.

A radical change in the conditions in which ecclesial investors had to operate when undertaking the construction of temples after 1945, coupled with the political, economic and social transformations taking place on a large scale, significantly
contributed to the feasibility and functioning of this architecture and the evolution of its forms. Regardless of the solutions applied, it represents a wealth of content, both ideological and material.

These buildings have enriched the architectural culture of the region and, in many cases, they have determined the planning direction and systems of the city or the area where they were constructed [Gil-Mastalerczyk 2013].

2. Sacred architecture in the Kraków Diocese: 1970–2000 (Figs 1–10)

In the sacred architecture of the 1970s and 1980s, we see a fundamental change in the aesthetic and intellectual terms, compared to the previous realisations. Suddenly, there is an inflow of information from abroad. The most current ideological and artistic movements can be seen. The architecture designed in this period is in no way inferior to the architecture anywhere else in the world. Intellectual quality remains high, and the projects represent a consistent continuation of the aesthetics. The only delays are caused by practical and technological difficulties, and limited access to contemporary engineering and construction craft – due to the precarious economic situation in the country [Gil-Mastalerczyk 2013].

The guidelines of Vatican II, especially the renewal of the liturgy, resulted in full acceptance of the contemporary artistic trends and currents. Emerging pluralistic trends were immediately used and accepted by the Church, furthermore, this happened even before the recommendations of the conciliar. M.E. Rosier-Siedlecka notes: ‘It is an interesting fact that the reaction to the new theological tendencies happened in church construction almost instantaneously – they were taken into account in some projects already before the Council, which means that some issues, novelties, and sometimes also, some severe perceptions and calls for renewal – existed in the Church many years before Vatican II. The Council revealed and organised that exuberant dynamism – which was sometimes perhaps a little anxious, but which also testified to the eternal youth of the Church (...). The changing mentality, which opened the field to diversity and exploration, is a positive fact, as a more mature stage in the life of the Church’ [Rosier-Siedlecka 1979, 125, 8].

In view of the on-going social changes and the provisions of the council, the search for new architectural solutions, other than the existing traditional types of temples, was initiated. Plurality of spatial forms and architectural solutions seems to have become an important feature of church construction [Rosier-Siedlecka 1979, 125, 8]. Therefore, in the architectural solutions of the churches built in 1970s and 1980s, we note the distinctive individuality of forms, each of which requires appropriate reflection on the new organization of space – also in line with the recommendations of the Second Vatican Council.

A breakthrough example of such work – not only on the scale of the Kraków Archdiocese, but the whole Poland – implementing the provisions of the conciliar functional solutions, is the ‘Lord’s Ark’ church in Nowa Huta. Due to the materials used, the configuration of the architectural forms, the aesthetics, and the use of new
In the years 1971–1989, the architecture of churches was marked by late modernism, and much later by postmodernism, sculptural architecture movement, and the most representative, symbolic movement – particularly evident in the external forms of churches, and also in the elements and features of the interior. Also present are the trends of new geometry, high technology, and the influences of historicism, expressionism and deconstruction (for instance, in the buildings of the Resurrectionist Order in Kraków’s Zakrżówek, see Figure 6).

The stylistic development of religious architecture, in the early 1970s, felt a significant impact of the changing political and economic situation of the country. Ewa Węcławowicz-Gyurkovich wrote: ‘Breaking the monopoly of mass, collectivised construction, opening the possibility for the creation of small companies and cooperatives using their own resources and bank loans, new laws regarding the organization of the project design and implementation, the emergence of individual architects’ offices and private companies in the sphere of construction materials production – all these combined to create favourable conditions for the reception of new aesthetic patterns of postmodernism, and facilitated their assimilation in the Polish architecture of the 1980s’ [Węcławowicz-Gyurkovich 1996b, 468–469].

After 1980, we can distinguish at least two trends in the field of sacred architecture: one, strong historicist movement – referring to the past and to the forms of old, where the form takes precedence over function, dominated by the desire to restore the former importance of the sacred space (as well as opposing simplicity and regular forms of modernism); and the other, the modernity-oriented trend [Wroński 2010, 460]. In the church of St. Albert at Czyżyny Airport (Figure 5), old Gothic forms were used in a new compositional system, and received a new meaning. The solid, and the interior of the church ‘impress with their classical elegance, the purity of the means of expression used, and the consistency in creating the space by subordinating it to the dominance of the sacred’ [Węcławowicz-Gyurkovich 1996a, 325].

During the period of political breakthrough and transition, post-modern movement arrived in Poland. In the Kraków Diocese, it became popular after 1980 [Wroński 2010, 460]. It meant, among other things, a return to tradition, drawing inspiration from the past, as well as from the cultural and regional sources. It was not a universal phenomenon, but it carried the power of intellectual influence. The works of postmodern, symbolic architecture, presented in this paper, are characterized by a wealth of innovative and original solutions, a variety of forms and aesthetic expressions – for instance, the church of St. Jadwiga the Queen in Krowodrza in Kraków (Figure 2), the church of St. Peter the Apostle in Wadowice (Figure 3), or the Centre of Resurrectionists in Zakrżówek in Kraków (Figure 6). Many churches, with simple and geometric composition, become modern objects, albeit traditional in their form (such as the church of St. Albert in Czyżyny).

In the architecture of the churches of this period, we can see the influence of historicism, expressionism and deconstruction. That becomes particularly apparent in the
expression of sculptural shapes and architectural forms (as in the church of St. Jadwiga the Queen in Kraków’s Krowodrza, or in the Resurrectionists’ Centre in Kraków’s Zakrzezówek), but also in sculpture which dominates in the interior furnishings (as in the ‘Lord’s Ark’ church in Nowa Huta, or the church of St. Jadwiga the Queen in Krowodrza).

Next to the sculptural church of ‘Lord’s Ark’ in Nowa Huta, with its fancy, liquid and oval forms, another interesting example is found in the group of churches, presenting individualism of forms and using modern solutions, namely, the so-called ‘tent churches’. An interesting example of a sculptural tent church – ‘roof-shaped’, deriving from the Gothic tradition [Olszewski 1989, 87], is a temple at Olcza in Zakopane (Figure 4) – with a strong, robust form, and perpendicular, as if soaring, tent roof surfaces. An example of the Church of strict geometrical form, and simple, monumental interior, is the church of Saint Jadwiga the Queen in Kraków. In the church of St. Peter the Apostle in Wadowice, built in the postmodern style, interesting design solutions were used in the layout of the interior – namely, in the central part of the temple, at the intersection of the nave and the transept, a rectangular form was designed, supported on immaterial elements – the pillars of light. The design of the Votive Church in Wadowice is among the examples of religious architecture, in which the influence of postmodernism equipped the structure with a decorative role. The trick used by the designers – to undercut and overhang the columns – is an example of subordinating the design logic to certain mannerisms.

Implementation of a building compound of the Religious Seminary belonging to the Congregation of the Resurrectionists in Kraków is particularly striking, surprising the viewer with surreal fragments of architecture, transgressing the categories of fundamental construction principles [Węcławowicz-Gyurkovich 1996a, 328]. Innovative solutions – such as enormous, free-standing and suddenly broken off porches; huge columns that do not support anything or are suddenly broken off just above the ground; spans of screen walls, several storey high, set directly on other walls, suddenly rupturing to form the main entrance to the compound – all make a huge impression on the visitor.

It should be noted that the churches built during the years 1971–1989 represent diverse and varied architectural propositions, interdependent of different socio-political experiences and distinct stylistic assumptions. To quote an example of two very different structures, expressing completely different creative attitudes of their authors: ‘Lord’s Ark’ in Nowa Huta, and the church of Queen Jadwiga in Krowodrza – the first belonging to the sculptural trend, and the second, representing the late modernism and High Tech stylistics. In the church of St. Queen Jadwiga, architects apply geometric forms, which are divisible, exemplifying the end of the modernist era, and the beginning of post-functionalism [Wroński 2010, 457–459].

1 Light is of particular importance in this part of the temple – the light, which is also inextricably linked to the symbolism of the sanctuary. The central part of the temple (transept and choir) has received the strongest illumination. Therefore, the intersection of the nave and the transept has a rectangular form, and is not based on material supports, but instead, supported on the pillars of light [Szafer 1998, 161].
The overview of churches presented in this article, leads us to conclude that the sacred architecture of the Archdiocese of Kraków is diverse and idiosyncratic.

In the sacred architecture, designed in the years 1971–1989, we can find motifs associated with the Basilica of St. Peter’s in Rome. Architectural quotation from the Vatican Basilica were used by J. and E. Gyurkovich and P. Szafer, who incorporated them into their architectural solutions at the Votive Church of St. Peter in Wadowice. The guiding principle of the urban structure and the architectural forms was to combine geometry and logic with historical layouts and symbols [Węcławowicz-Gyurkovich 1996b, 472–473].

International architectural trends also manifested themselves in the local church architecture. In the church of ‘Lord’s Ark’ in Nowa Huta, inspiration is noted (albeit with considerable delay), of a foreign work – Le Corbusier’s Ronchamp chapel. In the context of Polish architecture, this was a significant work, because it testified to the progress of architectural thought in times of mounting difficulties, and numerous obstacles to the creativity of designers.

Le Corbusier’s projects, presenting a consistent continuation of the aesthetics of concrete, have also become a source of inspiration for architects – who represented the Kraków school of architecture – and who created projects using the same material. Concrete ceased to be regarded as a material with purely utilitarian characteristics; instead, it became ‘a means of aesthetic expression to materialize architectural thought’ [Bigaj 2006, 160–165]. Dariusz Kozłowski attributed it with soul: ‘Concrete has soul – initially, this metaphorical statement carries anthropomorphic associations – when watching an architectural object made of concrete, we deal with its exteriority, looking at its ‘skin’ to assess the form. When our reflection or our curiosity requires an insight, an inward look, then we are able to see the power of the material, the forces running inside the structure – sometimes, moulded as the structure which is merely sensed, the system of the steel parts hidden within it. Sometimes you can see the soul of the concrete – when the shape of things reveals the only possible connection – of beauty, purpose, efficacy, durability – of the product of human imagination’ [Kozłowski 2001, 5].

Dariusz Kozłowski used the raw, aesthetic values of the concrete, inherent in its nature, and introduced them into the compound of the Resurrectionist Order at Zakrzówek in Kraków, built in surreal style. The use of the material became particularly apparent in the interiors of the building – both as a construction material, and finishing material, for instance, in the form of revealed reinforced concrete casts [Kozłowski 1992, 67].

Also the church St. Jadwiga the Queen in Kraków’s Krowodrza was built in the reinforced concrete structure, cast with uniformly and consistently imprinted formwork and revealing raw texture of the concrete, which provided the ascetic decoration of both the exterior walls and the interior. The church belongs to the trend of mature, late modernism [Mroczek 1991].

In the last decade of the twentieth century, a reference to the traditional patterns and sober, calm layouts (longitudinal, rectangular, and square-approximating) is often noted in church plans. Architects depart from the dynamic and sculptural forms. Return
to classical forms can be observed. There is a noticeable care for the harmonious fit of the new temples within the existing surroundings, a soft adjustment of the elevation to the immediate environment and the landscape of towns and villages. Shapes of the churches enter the environment and establish a relationship therewith (see the church of St. Adalbert in Bronowice as an example). Still, because of their size, scale and height, these buildings remain visible and dominating in the surrounding landscape.

In conclusion, we can state that the political, economic and social factors, and the transition that Poland experienced, had the tremendous impact on the development of the style of religious architecture at the time, including the form and shape of the churches of the Archdiocese of Kraków during the period of 1945–2000. The extremely difficult situation in which the Catholic Church found itself, various activities aimed at destabilizing its strength, the legal and administrative procedures restricting its freedom of action, exerted a major influence on the architecture of religious buildings.

Against the background of the conditions analysed herein, as well as contemporary ideological and artistic movements of the time, it is clear that the process of stylistic transformation is particularly highlighted in the evolution and pursuit of appropriate forms and functional programs. Occurring in subsequent periods, the systemic, economic, legal, and social transformations, clearly demonstrate and reflect the atmosphere of those times, the aesthetics of the era, and represent the real picture of religious architecture.

Photo by Gil-Mastalerczyk

Fig. 1. The church of Our Lady the Queen of Poland, so-called ‘Lord’s Ark’ in Nowa Huta; 1967–1977, designed by Wojciech Pietrzyk
Fig. 2. The church of Saint Jadwiga the Queen in Kraków, 1978–1988, designed by Romuald Loegler, Jacek Czekaj

Fig. 3. The church of Saint Peter the Apostle in Wadowice, 1986–1991, designed by Jacek Gyurkovich, Ewa Węclawowicz-Gyurkovich and Przemysław Szafer
Fig. 4. Church of Our Lady the Immaculate Revealing the Miraculous Medal in Zakopane at Olcza, 1981–1988, designed by J. Tadeusz Gawłowski, M. Teresa Lisowska-Gawłowska

Fig. 5. Church of St. Albert Chmielowski, Kraków Nowa Huta – Czyżyny, 1986–1994, designed by Witold Cęckiewicz
Fig. 6. Sacred compound of the Centrum Resurrectionis of the Ressurectionist Order at Zakrzówek in Kraków, 1985–1993, designed by Dariusz Kozłowski, Wacław Stefański, Maria Misiągiewicz

Fig. 7. Church of Saint Adalbert in Kraków, Osiedle Bronowickie, 1992–1997, designed by Wacław Seruga, Małgorzata Boratyńska-Seruga
Fig. 8. Church of the Saint Brother Albert, Nowy Targ – Niwa, 1994–1997, designed by Jerzy Głodkiewicz

Fig. 9. Sanctuary of the Divine Mercy in Łagiewniki, Św. Faustyny 3, Kraków, 1998–2002, designed by Witold Cęckiewicz
3. Conclusions

In conclusion, it is clear that creative activity in the field of religious architecture, in the area of the Archdiocese of Kraków, from 1945 to the end of the 1990s, bears the marks of the avant-garde. Ewa Węcławowicz-Gyurkovich believes that: ‘Kraków milieu has always been open to international novelties, and therefore the reception of avant-garde thought here is broad and very conscious. Visual artists are ahead of the architects. In Kraków, surrealist trends prevailed in the visual arts, both before the war (...) and in the post-war period (primarily, in the Kraków Group). Conscious choices and individual creative attitudes of the architects of the young and middle generation became significant; these artists followed current fashions and avant-garde projects in the latest world architecture, and had the ambition to keep up’ [Węcławowicz-Gyurkovich 1996a, 328–329].

Absolute creative freedom after 1989 allowed for the implementation of projects devoid of aesthetic value, in a manner that clearly differs from the traditional assumptions, previously accepted as classical. Many religious buildings reveal the diverse face of modern architecture. Especially when we consider buildings constructed in 1990a, we find different paths of stylistic pursuit. It should also be noted that the total freedom of design, recovered after 1989, led in some cases to rather ill-advised architectural realizations.

References


---

Dr inż. arch. Joanna Gil-Mastalerzyk
Politechnika Świętokrzyska
Katedra Architektury i Urbanistyki
25-314 Kielce, al. Tysiąclecia Państwa Polskiego 7
e-mail: joanna.gil@onet.pl
THE ASSESSMENT OF THE APPLICATION OF TERRESTRIAL LASER SCANNING FOR MEASURING THE GEOMETRICS OF COOLING TOWERS

Tadeusz Głowacki, Piotr Grzempowski, Ewa Sudoł, Jarosław Wajs, Marcin Zając

Summary
The investigation of technical condition of cooling towers is an important engineering issue. Regulations regarding safe operations of high structures force periodic measurements in order to determine technical state of such towers. This paper presents the processing methodology of laser scanning data and shows computation results of cooling tower W-1 shape changes. These results were referred to the designed shape of the tower in question. Tower surface displacements (deformations) are shown by plotting the deviations of the measured shape from the regular one. The determined changes in the surface shape are between –20 cm and 5 cm. This article presents the evaluation of the technical condition of the W-1 cooling tower.

Keywords
TLS • cooling towers • hyperboloidal towers • monitoring • displacements

1. Introduction
Cooling towers, which are large volume structures, constitute essential components of every major processing plant. Such towers may be found adjoining, for instance, steel mills, power plants, etc., and therefore they are a regular feature in the industrial landscape of Poland. Cooling towers play an indispensable part in the proper functioning of power plants - they cool water in a closed circuit. Among many types of cooling towers, hyperboloidal ones are the most common, allowing fair operability with low material and construction expenditure. Most of them are made of reinforced concrete with thin walls, whereas the wall thickness changes with height. The thickness of the tower mantle lowers with the height. Special construction and working conditions of such slender structures are the cause of the special treatment they require, in terms of thorough measurement for the purpose of finding any deviations of the standing structure from its construction plans. For buildings of this kind of shape, it is strictly necessary
to achieve the designed, prescribed dimensions. Any deviation from the planned shape may be and had been the cause of major disasters [Seręga et al. 2013a, 2013b].

Geodetic measurements allow us to determine the actual shape of a hyperboloidal cooling tower. Among the surveying methods used, one can distinguish classical ones, based on distance and angle measurements, and photogrammetric ones, which use images taken from ground level by special cameras. The surrounding tangents method is the one that uses theodolite (or Total Station), and is based on measuring tangents of the contours of the tower surface. The standard approach is to measure the object from three sites located around the structure. This method does not require any marking of controlled points on the surface. It may be used for objects whose shapes can be approximated as second degree functions [Czaja 1984]. The extension of this kind of surveys is to use marked controlled points that are evenly distributed along the selected parallels around the structure.

Photogrammetric methods use ground level images that are taken from the base, thus they can be set up in a stereocomparator, and measured stereoscopically. In this case, it is possible to determine the course of the surface curves. The advantage of this approach is the capacity to store multiple images for documentation purposes during a structure’s lifespan. On the other hand, the major drawback is the cost of such surveys, except for the scenario when the number of points measured with photogrammetric methods greatly exceeds the amount of measurements that need to be taken using classical methods [Gocał 1980].

The limitations in processing of the data are that the contours of the tower visible in the background are not contained on the vertical plane, and that they are slanted due to the field of view. Vertical cross section of the outside surface is not a mathematically designed hyperboloid, the one that is designed and constructed, but the inner surface of the cooling tower, therefore it is the latter that should match the planned shape [Kadaj 1973]. In accordance with the construction technique, the tower mantle is created by building one hundred 1.2 m high cut cones on top of one another.

The surveying results of selected points on the tower surface comes down to the calculation of XYZ coordinates. Typically, 10 mm accuracy level is the standard for this kind of surveying measurements [Gawałkiewicz 2007]. The processing of results, independently of the survey method used, provides the information about any deviations from the designed hyperboloid with perfectly vertical centric axis and the planned dimensions [Zdanowicz 2011].

For direct displacement detection, temporal pairs can be used. All the paperwork, that is numerical data, graphics, and plots of displacement should clearly and conveniently visualize anomalies of the cooling tower’s shape. The subjects of such collations include radial deviations from the nominal circles in horizontal cross sections on certain heights, deviations from the nominal hyperbolas in vertical cross sections, displacements, and deformation components. The visualisation side includes plots and contour maps of the radial deformation components, axonometric views of the radial deviations or deformations, as well as axonometric views of the tower in its skeletal form.
2. Description of the object of study

The test object was a hyperboloidal cooling tower, 60 m in height, and 45.5 meters in diameter at the base. The tower was constructed in 1970s (Figure 1). The survey took place in October 2014. The measurements of geometric condition of the outer surface was taken with a laser scanner with EDM capability. In the course of the survey process, most of the old reference points, marked in 2005 and 2009, had been identified, and any damaged points were reestablished. The modernized reference network constituted the angle and distance grid that resembled the shape of closed polygons, located around the test object.

![Photo by J. Wajs (2.10.2014)](image)

**Fig. 1.** The view of the hyperboloidal cooling tower

The entire network was measured in reference to the centers of benchmark’s head side faces, which were located on the cantilevers of the tower. As those benchmark coordinate centers had been previously determined, they served as reference points. DTM s were used on each point of the network to take two series of measurements on every visible point. Each series constituted measurements in two faces of the DTM, and additionally a dual distance measurement was conducted for each DTM face. Vertical
tie was made using trigonometric levelling with reference to the benchmark heads on cantilevers. Vertical points gained new heights from the adjustment of precise geometric levelling with the accuracy of ± 0.2 mm. For the horizontal network, a precise servo operated DTM was used with accuracy properties of ±2’ of angle determination and (±2 + 2 ppm) distance to the reflector measurement. Subsequently, all survey results have been adjusted using the least squares method [Wiśniewski 2005]. The coordinate adjustment analysis revealed that the maximum error did not exceed ±0.8 mm with the average value of ±0.6 mm, while the vertical position error was not higher than ±0.4 mm with average of ±0.4 mm.

Surveying of the tower mantle was performed with laser scanning placed over network points or on free stations situated in convenient locations around each tower. Points that were not marked were observed; they were distributed evenly on all the external surfaces. Mean error of 3D position measured on the tower (with the attribute of zero error for control points) did not exceed ±5mm.

Points surveyed with laser scanner represented the external side surface of the tower’s mantle. Mathematical model for the cooling tower is a hyperboloid that can be described as:

\[ \frac{r^2}{a^2} - \frac{z^2}{b^2} = 1 \]  

(1)

Assuming that:

\[ r^2 = x^2 + y^2 \]  

(2)

where:

- \(a, b\) – are the hyperboloid’s semi axis;
- \(x, y, z\) – are the hyperboloid’s coordinates in the system where its beginning is the center of the hyperboloid’s symmetry.

The parameters of the cooling tower hyperboloid model, provided by the owners, can be viewed in Table 1. The actual parameters of the real object were determined from the results of a survey performed using classical methods, examining the surrounding tangent during the measurement of reference points. Process results are available in the Report by the Wrocław University of Science and Technology [Głowacki et al. 2014].

### Table 1. Cooling tower W-1 parameters

<table>
<thead>
<tr>
<th>Cooling tower</th>
<th>Mantle height</th>
<th>Radius at the bottom (at intake)</th>
<th>Radius at the top (at exhaust)</th>
<th>Theoretical parameters</th>
<th>Actual parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[m]</td>
<td>[m]</td>
<td>[m]</td>
<td>[m]</td>
<td>[m]</td>
</tr>
<tr>
<td>1(W)</td>
<td>59.0</td>
<td>22.500</td>
<td>13.665</td>
<td>13.000</td>
<td>33.975</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12.990</td>
<td>34.049</td>
</tr>
</tbody>
</table>
Theoretical model location is at the middle of the tower wall, and therefore all measured points on the surface had to be recalculated in such a way that it would represent exactly the middle part of the mantle, while taking into account that the mantle is narrowing as the height increases. The reductions of the locations of points were carried out along the normal to inner surface, with respect to the design documentation, corrections of $dr$ (point location radial correction) and of $dz$ (corrections from the measured height). Because the design parameters of the hyperboloid were not accurate enough, for reliability reasons all comparisons of deviations between the current and the previous surveys were made according to the actual hyperboloid’s semi axis (Table 1).

The test object was measured using Leica C10 laser scanner. In total, 34 thousand points have been collected, evenly distributed on the tower surface. For this purpose, nine survey sites located around tower were used. The coordinate system was established in a way that it is cartesian, homogeneous, and its origin is in the theoretic center of the tower. All coordinates were calculated in this system. The measured points that constitute the theoretical surface of the tower mantle were used for calculating imperfections. The points placed on both the theoretical and the actual surfaces do match in local coordinate system, but they differ according to the value of the radius.

3. Processing of the measured data

The values of the imperfections were calculated as a difference between the radius of the measured point (that represents the middle of the tower wall thickness) and its theoretical counterpart at a certain height. These radiuses were calculated from the theoretical main vertical axis of the hyperboloid. The negative value of the imperfection signals the inward bending direction of the mantle, whereas the positive value signals the outward bending direction. The distribution of the controlled points with imperfection values are shown in Figures 2 and 3. Imperfection values are represented as sizes of points in respect to their theoretical counterparts (in the scale of 0 to 1). Colors from brown to green represent outward bending (negative values) while green to blue show inward bending (positive values of the imperfections). Imperfection values at point locations were calculated as differences between the real and the theoretical radius lengths. In some places, high imperfection values are shown, and this is due to modelling specific conditions, and serves to achieve a clearer visualization. Extreme imperfection values are mildly reduced in comparison to the actual values.

4. Analysis of results

The calculated values of the imperfections of tower mantle surface fall within the –205 mm to +50 mm range. Most of the deviations are negative (87%). This means that the actual surface of the cooling tower is bent inwards compared to the theoretical one. The highest differences can be found at the base of the tower, while most of the imperfection values are greater than 100 mm. No pattern of difference locations can be
found, and they are not evenly distributed, which may indicate that they are caused by an imperfect assembly and faulty construction methods. Most of the positive imperfection values can be found at the exhaust, and they too are distributed unevenly. Also on the remaining surface of the tower, the deviation values are not distributed evenly, instead, we observe that the deviation values decrease from the bottom (where they are negative) to the neck (where they reach zero value), and that they increase towards the top with the most of positive values.

![3D model of the tower's mantle imperfections](Image)

Source: authors' study

Fig. 2. A 3D model of the tower's mantle imperfections

5. Conclusions

The tested cooling tower was measured using two independent techniques, first: radial surveying conducted with distance, horizontal and vertical angle measurements of 28 hyperboloid parallels distributed evenly on the circumference of the tower; and second: automatic laser scanning, where points were distributed evenly on the tower’s side surface. All surveys were referred to the same control points, the characteristics of which had been described in the previous chapter. All survey data were collected on the same day, with the same weather conditions. Results of both survey methods match
closely for repeatable points, while the differences reach just couple of millimeters in value, which is consistent with the equipment’s measurement errors. The classical survey took 24 hours and 420 observations were gathered, while the laser scanning took only 6 hours and 34,000 points were measured. The laser scanning method is obviously faster and gives a full picture of the tower’s mantle condition for further analysis, but only an expert in the field of reinforced concrete construction can determine the real condition of the structure. The results of this analysis are consistent with other laser scanning measurements performed by other authors [Gawalkiewicz 2007]. Comparison with previous records, available at Eurtokods, shows that the described structure is stable and there is no threat of catastrophic failure.

Source: authors’ study

Fig. 3. Imperfections shown in three planes and an axonometric view
References


Dr inż. Marcin Zając
Politechnika Wrocławska
Zakład Geodezji i Geoinformatyki
50-370 Wrocław, ul. Wybrzeże Wyspiańskiego 27
e-mail: marcin.zajac@pwr.edu.pl
ANALYSIS OF THE CURVATURE OF THE RIVER BEND FOR REGULATION PURPOSES

Klemens Godek, Waldemar Krupiński, Agnieszka Szeptalin

Summary

In order to determine the most appropriate geometrical parameters of regulated watercourses, this paper presents some ways to identify the natural course thereof. In addition to analysing the types of curves approximating the test object, the authors have also described the methods of studying the range of these curves. In order to determine the degree of relationships between the variables of the studied watercourses, the authors have analysed the correlation coefficients. The paper presents the findings pertaining to the best-matched curves approximating the given object.

Keywords

approximation • regulation of watercourses

1. Introduction

The need for the modernization of waterways occurs especially when remodelling the geometry of existing routes, whose course was disturbed by the action of natural forces and purposeful human activity.

Issues of design and modernization of waterways were dealt with by many Polish and foreign scholars. Among the especially noteworthy, we should mention R. Grabowski, A. Kobryń, Z. Piasek, J. Czaja in Poland, while international researchers include R. Aüberlen, L. Forque and K. Göldner.

The modernization of water transportation routes is served by identifying the geometric parameters of the route, in order to:

- determine the shape of the individual segments of the route,
- determine the scope of these segments,
- indicate connection points of all kinds approximating curves,
- indicate the possibility of approximating elements of the watercourse on the basis of the data from field measurements or those obtained from the map in the appropriate scales.
An important condition for shaping a given water route is to ensure its smoothness, which is reflected in the selection of a suitable ratio between individual elements of the route.

Among the recommended solutions for curved passages on waterways, the preferable are those that provide the entry into the curve, which is as gentle as possible [Grabowski, Kobryń 1987].

From the point of view of the dynamics of movement on the curve, it is necessary that the angle acceleration of tangent rotation at the starting point of the curve should equal zero [Lambor 1960].

Providing these conditions, especially in the case of larger watercourses with concave banks, prevents a situation in which a sudden rise in the water Table would naturally occur, resulting in a significant deformation of the riverbed [Piasek 1995, Piasek 2000].

Studies by the authors who deal with the aforementioned issues indicate, that it is necessary to shape the regulatory route of the river in such a way that would refer to its direction, and to imitate the natural curves of the watercourse [Forque 1908, Göldner 1961]. Thus the importance of selecting the appropriate curve, approximating the natural course of the river.

2. Objectives of the study

The work has two objectives:

1. Overall objective: to analyse the curvature of the banks of the object (watercourse) with the view to regulation

2. Specific objectives:
   a) to determine the shape of the sections of the studied bank of the river,
   b) to identify the range of individual sections.

Among others, the following approximation functions can be used: parabolas of different degrees, spiral curves like the Archimedes spiral, the logarithmic curve and the Cornu spiral, trigonometric curves, exponential curves, and the lemniscate of Bernoulli.

3. Determining the shape of approximating sections

The starting point in solving the problem is a set of coordinates \( \{x_i\} \) and \( \{y_i\} \) of points representing the studied object. These coordinates are read from the map in the adopted local coordinate system. They can also come from field measurements – classic or satellite.

Regression model should be defined between such variables, for which there is a strong correlation. Measure is Pearson's complete correlation coefficient \( r \) [J. Czaja 1996].

The linear correlation coefficient is expressed with the following formula:

\[
    r = \frac{\text{cov}(X,Y)}{\sigma(Y) \cdot \sigma(X)} \quad [J. \text{ Czaja 1996}]
\]
while non-linear correlation coefficient is expressed as:

\[
 r_0 = 1 - \frac{\sum [y_i - f(x_i)]^2}{\sum [y_i - \bar{y}]^2} \]  

[Krysicki, Włodarski i in. 1996; J. Czaja 1993, 1996] \hspace{1cm} (2)

where:

\[
\sum [y_i - f(x_i)]^2 \]  
is the measure of correlation between the nonlinear regression model and empirical values,

\[
\sum [y_i - \bar{y}]^2 \]  
dispersion of variable \(y_i\) versus its average value \(\bar{y}\).

The closer the absolute value of correlation coefficient is to 1, the stronger the correlation between the studied variables.

Regression equation can be expressed as line regression:

\[
y = a_0 + a_1 x \]  

or as any curve described by the general formula of:

\[
y = f(x) \]  

Parameters of these functions are determined using Gauss's method of least squares. The criterion of least squares makes it possible to find the one line, for which the sum of squares of the deviations of observed values from that line would be the smallest, that is:

\[
F = \sum [y_i - f(x_i)]^2 = \min \]  

In order to approximate the curve of the studied section, the models of the following functions were used:

1. Second degree parabola from the family

\[
y = A \cdot x^2 + Bx + C \]  

2. Logarithmic function

\[
y = A + B \cdot \ln x \]  

3. Exponential function

\[
y = A \cdot e^{Bx} \]  

4. Power function

\[
y = A \cdot x^B \]
Ad 1. Approximation of the studied object using the parabolic function

Out of the family of parabolic functions, the parabola was determined which, for the given set of points, minimises the function:

$$F(A,B,C) = \sum_{i} [y_i - (Ax_i^2 + Bx_i + C)]^2$$  \hspace{1cm} (10)

In order to determine the values of parameters $A$, $B$ and $C$ of the function (10), partial derivatives of the function were calculated and set equal to zero; subsequently, the resultant system of equations was solved.

From solving the system of equations:

$$\frac{\partial F}{\partial A} = 0 \hspace{1cm} \frac{\partial F}{\partial B} = 0 \hspace{1cm} \frac{\partial F}{\partial C} = 0$$

the values of parameters $A$, $B$ and $C$ were derived. The equations were formulated by [Krupiński W. 1997].

For the set of coordinates $\{x_i\}$ and $\{y_i\}$ of points representing the studied object, the function parameters were determined:

$$A = 0.0099, \hspace{0.2cm} B = -3.60, \hspace{0.2cm} C = 441.26$$

Thus the approximated parabolic function takes the following format:

$$y = 0.0099x^2 - 3.60x + 441.26$$  \hspace{1cm} (11)

Ad 2. Approximation of the studied object using the logarithmic function

Function minimisation:

$$F(A,B) = \sum_{i} [y_i - (A + B \cdot ln x_i)]^2$$

$$\frac{\partial F}{\partial A} = 2 \sum_{i} (y_i - A - B \cdot ln x_i) \cdot (-1)$$

$$\frac{\partial F}{\partial B} = 2 \sum_{i} (y_i - A - B \cdot ln x_i) \cdot (-ln x_i)$$  \hspace{1cm} (12)

$$\frac{\partial F}{\partial A} = 0 \iff \sum_{i} A = \sum_{i} y_i - \sum_{i} B \cdot ln x_i$$

$$n \cdot A = \sum_{i} y_i - \sum_{i} B \cdot ln x_i$$
Using formulas (13) and (14), parameters for logarithmic function were calculated for the object:

\[ A = 794.60, \quad B = -131.93 \]

Thus the approximated logarithmic function takes the following format:

\[ y = 794.60 = -131.93 \cdot \ln(x) \]
Ad 3. Approximation of the studied object using the exponential function

This can be done using classical method, via function minimisation:

\[ F(A, B) = \sum_{i} \left[ y_{i} - A \cdot e^{Bx_{i}} \right]^2 \]

Therefore, calculated as:

\[ \frac{\partial F}{\partial A} = 2 \sum_{i} \left( y_{i} - A \cdot e^{Bx_{i}} \right) \cdot e^{Bx_{i}} \]

\[ \frac{\partial F}{\partial B} = 2 \sum_{i} \left( y_{i} - A \cdot e^{Bx_{i}} \right) \cdot A \cdot e^{Bx_{i}} \cdot x_{i} \]

set as zero, and solve the resultant system of equations.

Also, logarithmic method can be used, proposed by professor J. Czaja [J. Czaja 1996], leading to linear function as follows: by logarithmising both sides of the function:

\[ y = A \cdot e^{Bx} \]

we arrive at:

\[ \ln y = \ln A + Bx \cdot \ln e = \ln A + Bx \]

and by introducing the symbols:

\[ \ln A = C \]

we arrive at:

\[ z = Bx + C \]

Formulating equations for regression coefficient for the straight line

\[ a_0 = C \]
\[ a_1 = B \]

[Krysicki, Włodarski et al. 1996] we calculate the approximated parameters of the exponential function.

Thus we arrive at the parameters of the exponential function.

\[ A = 359.95, B = -0.0065 \]

\[ \ln y = \ln A + Bx \]

and the exponential function approximated for the given object takes the following format:

\[ y = 359.95 \cdot e^{-0.0065} \]

Ad 4. Approximation of the studied object using the power function

Just as for the approximation by exponential function, classical method can be applied, by using partial function derivatives:

\[ F(A, B) = \sum_{i} \left[ y_{i} - A \cdot x_{i}^B \right]^2 \]
where:
\[
\frac{\partial F}{\partial A} = 2 \sum_i (y_i - A \cdot x_i^B) \cdot x_i^B
\]
\[
\frac{\partial F}{\partial B} = 2 \sum_i (y_i - A \cdot x_i^B) \cdot A \cdot x_i^B \cdot \ln x_i
\]
and further calculations can be made, as in the previous case.

The logarithmic method can also be used [Czaja 1996] as shown below:
by logarithmising the function:
\[
y = A \cdot x^B
\]
and introducing the symbols:
\[
\ln y = z
\]
\[
\ln A = C
\]
\[
\ln x = t
\]
we arrive at:
\[
z = Bt + C
\]

The estimated parameters of the power function are calculated in the same way as in the case of the exponential function.

Thus we obtain the parameters of the object:
\[
A = 5560.55, B = -0.7519
\]
while the approximated power function takes the following format:
\[
y = 5560.55 \cdot x^{-0.7519} \quad (17)
\]

Reading from Table 1 the values of \(\frac{[y - f_i(x_i)]^2}{n}\) for all functions approximating the studied object, we note that the best approximating function is the parabolic function – having the value of 19.11; the next would be the power function – with the value of 23.45; while the logarithmic and exponential functions would not provide a good approximation of the natural course of the studied object.

Table 1. List of the parameters of the analysed functions and their correlation coefficients.

<table>
<thead>
<tr>
<th>Function</th>
<th>Range of points used for determining the parameters</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>(r_0)</th>
<th>(\frac{[y - f_i(x_i)]^2}{n})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parabolic function</td>
<td>1–32</td>
<td>0.0099</td>
<td>-3.60</td>
<td>441.26</td>
<td>0.9972</td>
<td>19.11</td>
</tr>
<tr>
<td>Logarithmic function</td>
<td>1–32</td>
<td>794.60</td>
<td>-131.93</td>
<td>441.26</td>
<td>0.9852</td>
<td>100.53</td>
</tr>
<tr>
<td>Exponential function</td>
<td>1–32</td>
<td>359.95</td>
<td>-0.0065</td>
<td>441.26</td>
<td>0.9467</td>
<td>171.58</td>
</tr>
<tr>
<td>Power function</td>
<td>1–32</td>
<td>5660.55</td>
<td>-0.7519</td>
<td>441.26</td>
<td>0.9467</td>
<td>23.45</td>
</tr>
</tbody>
</table>
Using the above calculation methods, the sums of square deviations from the functions were analysed, for increasingly smaller fragments (sections) of the object. These values are plotted in Figure 1.

Our conclusions as to the best fit of the parabolic function is also confirmed by Figure 1, showing the graphs \( \frac{[y - f_1(x_i)]^2}{n} \), which have been determined for the parts of the studied section.

Thus we obtained the answer to our first question, that is, the determination of the shape of the studied bank of the river.

4. Identifying the range of the approximating function

At this point we shall focus on the parabolic function, which – according to the investigation presented above – best approximates our object.

The examination of the range of the curves in question is illustrated in Figure 2 and Table 2.

Points 1–28 belong to the approximated function \( f_{p28}(x) \). When values of \( [y - f_{p28}(x)] \) are starting to increase ‘significantly,’ then we can assume that from this point the studied object would be better approximated by another function, for example \( f_4(x) \). This will happen at point P.
Table 2. Examination of the range of the parabolic curve

<table>
<thead>
<tr>
<th>No.</th>
<th>x</th>
<th>y</th>
<th>f_p28(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>57.11</td>
<td>276.56</td>
<td>269.57</td>
</tr>
<tr>
<td>2</td>
<td>56.21</td>
<td>270.73</td>
<td>271.97</td>
</tr>
<tr>
<td>3</td>
<td>58.15</td>
<td>264.94</td>
<td>266.82</td>
</tr>
<tr>
<td>4</td>
<td>62.13</td>
<td>259.41</td>
<td>256.48</td>
</tr>
<tr>
<td>5</td>
<td>62.91</td>
<td>254.42</td>
<td>254.49</td>
</tr>
<tr>
<td>6</td>
<td>62.56</td>
<td>253.89</td>
<td>255.38</td>
</tr>
<tr>
<td>7</td>
<td>62.21</td>
<td>255.42</td>
<td>256.28</td>
</tr>
<tr>
<td>8</td>
<td>67.75</td>
<td>241.89</td>
<td>242.53</td>
</tr>
<tr>
<td>9</td>
<td>73.70</td>
<td>227.83</td>
<td>228.58</td>
</tr>
<tr>
<td>10</td>
<td>76.86</td>
<td>217.92</td>
<td>221.49</td>
</tr>
<tr>
<td>11</td>
<td>81.06</td>
<td>209.23</td>
<td>212.44</td>
</tr>
<tr>
<td>12</td>
<td>87.45</td>
<td>201.57</td>
<td>199.48</td>
</tr>
<tr>
<td>13</td>
<td>90.98</td>
<td>190.00</td>
<td>192.74</td>
</tr>
<tr>
<td>14</td>
<td>97.60</td>
<td>182.87</td>
<td>180.88</td>
</tr>
<tr>
<td>15</td>
<td>102.86</td>
<td>174.02</td>
<td>172.18</td>
</tr>
<tr>
<td>16</td>
<td>107.62</td>
<td>165.71</td>
<td>164.87</td>
</tr>
<tr>
<td>17</td>
<td>111.66</td>
<td>157.09</td>
<td>159.08</td>
</tr>
<tr>
<td>18</td>
<td>122.02</td>
<td>147.03</td>
<td>146.00</td>
</tr>
<tr>
<td>19</td>
<td>129.60</td>
<td>139.59</td>
<td>138.04</td>
</tr>
<tr>
<td>20</td>
<td>134.57</td>
<td>134.21</td>
<td>133.55</td>
</tr>
<tr>
<td>21</td>
<td>139.13</td>
<td>126.62</td>
<td>129.93</td>
</tr>
<tr>
<td>22</td>
<td>148.71</td>
<td>124.83</td>
<td>123.93</td>
</tr>
<tr>
<td>23</td>
<td>154.93</td>
<td>121.25</td>
<td>121.19</td>
</tr>
<tr>
<td>24</td>
<td>162.32</td>
<td>120.12</td>
<td>119.12</td>
</tr>
<tr>
<td>25</td>
<td>168.74</td>
<td>118.88</td>
<td>118.36</td>
</tr>
<tr>
<td>26</td>
<td>175.29</td>
<td>120.84</td>
<td>118.59</td>
</tr>
<tr>
<td>27</td>
<td>181.63</td>
<td>120.81</td>
<td>119.77</td>
</tr>
<tr>
<td>28</td>
<td>186.71</td>
<td>117.45</td>
<td>121.39</td>
</tr>
<tr>
<td>29</td>
<td>191.45</td>
<td>112.67</td>
<td>123.46</td>
</tr>
<tr>
<td>30</td>
<td>196.09</td>
<td>110.97</td>
<td>125.99</td>
</tr>
<tr>
<td>31</td>
<td>200.32</td>
<td>108.40</td>
<td>128.74</td>
</tr>
<tr>
<td>32</td>
<td>204.53</td>
<td>105.48</td>
<td>131.89</td>
</tr>
</tbody>
</table>
In our particular example, on the basis of Table 1, we can conclude that for the approximated parabolic function:

\[ y = 0.0099x^2 - 3.60x + 441.26 \]

this will be point 27 or 28.

In order to verify the result, and achieve a more accurate determination of the point that we are looking for, we have shown, in Table 2, value difference and quotients of the values of \[ \frac{(y - f(x_i))^2}{n} \].

The values were collated starting from point 20, according to the data presented in Figure 1.

Table 3. The list of value differences \[ \frac{(y - f(x_i))^2}{n} \] and value quotients \[ \frac{(y - f(x_i))^2}{n} \]

<table>
<thead>
<tr>
<th>Value differences</th>
<th>Value quotients</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y - f(x_i) )</td>
<td>( y - f(x_i) )</td>
</tr>
<tr>
<td>( n )</td>
<td>( n )</td>
</tr>
<tr>
<td>21–20</td>
<td>0.62</td>
</tr>
<tr>
<td>22–21</td>
<td>-0.26</td>
</tr>
<tr>
<td>23–22</td>
<td>-0.24</td>
</tr>
<tr>
<td>24–23</td>
<td>-0.23</td>
</tr>
<tr>
<td>25–24</td>
<td>-0.20</td>
</tr>
<tr>
<td>26–25</td>
<td>-0.17</td>
</tr>
<tr>
<td>27–26</td>
<td>-0.17</td>
</tr>
<tr>
<td>28–27</td>
<td>0.65</td>
</tr>
<tr>
<td>29–28</td>
<td>2.65</td>
</tr>
<tr>
<td>30–39</td>
<td>2.89</td>
</tr>
<tr>
<td>31–30</td>
<td>3.62</td>
</tr>
<tr>
<td>32–31</td>
<td>4.53</td>
</tr>
</tbody>
</table>

Source: authors' study

Fig. 2. Examination of the range of the parabolic curve
Values contained in Table 3 confirm the previous conclusion that the point 27 or 28 still belongs to the determined parabolic function.

In order to determine more precisely the function approximating the further course of the studied object, one would need to look for another function.

5. Conclusions

General:
1. Activities related to the proper modernization of waterways should begin with the determination of the natural courses.
2. In order to determine the natural course of the waterways, approximation tests should be conducted on various types of curves, from the families of exponential, logarithmic, parabolic, spiral and other curves.
3. Approximation should be carried out on the basis of the coordinates of the shoreline points, derived from site measurements or read from the map in the appropriate scales,

Specific:
4. Studies conducted at the site – on the object of river Wilga – showed that among the parabolic, logarithmic, exponential, and power functions – it is the parabolic function that provides the best approximation; of the following format:
   \[ y = 0.0099x^2 - 3.60x + 441.26 \]
5. Another approximation function can be the exponential function described by the formula:
   \[ y = 5560.55 \cdot x^{-0.7519} \]
6. Furthermore, the investigated functions from the family of exponential and logarithmic functions would not provide a good approximation of the natural course of the studied object.
7. The method for examining the range of the parabolic function, as the one best defining the object shown in Figure 2 and Table 3, shows that points 27 and 28 still belong to the studied parabola, while another approximation would be necessary to determine the curve to which the next points belong.

References

Czaja J. 1996. Wybrane zagadnienia z geodezji inżynieryjnej, skrypt uczelniany AGH, Kraków.


IMPACT ON INVESTMENT PROJECTS ON THE SPATIAL ORDER AND THE IMAGE PERCEPTION OF ZAKOPANE TOWN

Julia Gorzelany, Justyna Janiczak, Magdalena Wilkosz-Mamcarczyk

Summary
The aim of this article is to determine the impact of the investment activities on the spatial order and the image perception of the city of Zakopane. The research is based upon the analysis of spatial planning in Poland, as a comprehensive action related to the rational management of space; as well as the survey (by questionnaire) carried out among 61 respondents. Activities carried out by public authorities and citizens, as well as the investment projects they undertake, have been having a huge impact on the spatial order, and on the perceived image of the analysed town. The changes, which have been made, affected the vertical and horizontal spatial infrastructure of the city, causing many problem situations related to the blurring of boundaries between areas of varying functions, and interfering with the spatial order through improper planning decisions, thus leading to disharmony between the newly created buildings and the already existing built environment.

Keywords
spatial planning • sustainable development • spatial order • investment projects

1. Introduction
When undertaking a business activity, man makes an impact on the functioning of respective areas, while at the same time, he is shaping their structure. It is up to individual investors how to use the land being their property, however, private land development projects may not be in conflict with other participants in the land (space), or with the generally applicable law. Public authorities, as the coordinators of spatial activities, can influence the transformation of space through properly conducted planning and management. Performing tasks in this field is possible thanks to a rational economy, taking into account the specificity of the place and the conditions that exist within it.

Spatial planning is equated with a given type of land use, as well as the degree of transformation of the land via human activity. It is also the result of the activities of
Spatial planning, however, the land planning itself is but one of its instruments, used to manage the development of a given territorial unit. A dynamic and equitable development of all areas is supported by a properly conducted spatial policy, which covers the activities by the governing bodies and agencies, aimed to control, integrate and support development activities, particularly in relation to the formation of space [Baranowska-Janota et al. 1998].

Space is a good (resource), which cannot be described with standard features, as it has a special character. It is subject to the principles of economy, pertaining to achieving optimum effects with the given resources – yet we must keep in mind that it can not be extended. Having the ownership of a particular piece of space (land) puts its owners under an obligation to consider the opinions and interests of other people involved in the shaping of that space (land); therefore it can be concluded that the space (land) is not a “good” subjected to the market laws in an unrestricted way [Gawroński 2012]. That is why it is very important that all the tasks related to the management of space must be carried out in accordance with the principle of sustainable development, that is understood as a “socio-economic development, in which the process emerges of integrating the political, economic and social concerns, while maintaining natural balance and sustaining basic natural processes, in order to guarantee the possibility of satisfying the basic needs of individual communities or citizens of both the present generation and future generations,” [Ustawa... 2001]. This is not forgetting the formation of spatial order, by which we mean “such shaping of space (land) that creates a harmonious whole, and accounts for all functional, socio-economic, environmental, cultural, and compositional-aesthetic conditions and requirements, in structured relationships.” [Ustawa... 2003a].

On the basis of the Act of 27 March 2003 on Planning and Spatial Development (consolidated text: Journal of Laws 2016 item 778), it can be stated that the requirements of spatial order are an essential element of planning and land use. The achievement of spatial order is possible due to the continuation of the functions of individual areas, and by the adaptation to the existing building alignments. New buildings need to be adapted to those buildings already constructed in earlier periods. Mismatch of dimensions, architectural styles, or functions can disrupt the spatial order [Skrenty 2011].

Spatial planning system in Poland is related to, among others, the territorial division of the country, and the decentralization of power. Political transformation entailed a different division of powers between the agencies of public administration. The municipality, which constitutes the basic unit of territorial division, makes the most important decisions related to the functions of respective areas and the changes introduced thereto. Spatial planning also takes place at national and regional levels, but the planning documents drawn up by the government administration and local government of the province do not have the force of law, as opposed to the local spatial development plans, elaborated and issued at the municipal level, which constitute applicable local law, to which all participants in the process of space management must adhere; including: citizens, public authorities and institutions [Gawroński 2007].
Using the instruments of planning and taking action in the field of spatial development as well as meeting the needs of society is possible thanks to the analysis of the given territorial unit, carried out at the initial stage of any given project. The diagnosis of its situation, and identification of the needs of its inhabitants, is the starting point in the formulation of development guidelines for the area in question.

The aim of the present study is to determine the impact of the investment activities, as they are carried out, on the spatial order and the image perception of Zakopane town.

2. Subject and methods of the study

The town of Zakopane, which is the subject of the present study, is a city which doubles as a municipality (city on municipal rights), inhabited by 27,442 people (as of the year 2015) [www1]. Its range covers an area of 8,426 hectares [www1]. It directly adjoins the municipalities of Kościelisko, Poronin and Bukowina Tatrzańska. It is located in the southern part of Poland, in the Małopolska province (region), along the border with Slovakia. At the same time, it constitutes a central part of the Tatra county.

The town has been described on the basis of an analysis-study. The essential part of the work is a questionnaire (survey) that takes into account the opinions of the inhabitants of Zakopane and the neighbouring towns as well as the contributions by the tourists visiting the city. The questionnaire (Table 1) focused on the issues of planning, but it also touched upon the activities related to the management of historic buildings and the transformation processes taking place in the urban space. The results obtained allowed us to determine the impact of the investment activities, as they are carried out, on the perception of the town’s image, and the actual spatial order of the analysed area. On that basis, recommendations were formulated, the implementation of which would improve the status of the town’s development and the way it is perceived, at the same time allowing the pursuit of the spatial order.

The questionnaire consists of two parts. The first comprises general questions (demographics), enabling the identification of the respondent and assigning him/her to the appropriate group. The following criteria were taken into account: gender, age, education and relationship to the analysed area. The second part includes questions related to the promotion and advertising, the use of and access to historical objects, as well as spatial planning with respect to the analysed town. The questionnaire consists of single-choice questions, multiple-choice questions, and open questions. In the two cases of closed-ended questions, respondents were asked to provide specific examples. This solution made it possible, among other things, to identify specific ventures, investment projects, and facilities, which negatively affect the image of the city and its spatial order. The sample comprised 61 respondents – and therefore it is sufficient for the purpose of carrying out the study and drawing conclusions.
Table 1. Questionnaire with results of the study

<table>
<thead>
<tr>
<th>Question number</th>
<th>Question</th>
<th>Responses</th>
<th>Percentage of responses [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gender</td>
<td>Man</td>
<td>60.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Woman</td>
<td>39.3</td>
</tr>
<tr>
<td>2</td>
<td>Age</td>
<td>&lt; 18</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18–25</td>
<td>63.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25–45</td>
<td>26.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45 &lt;</td>
<td>9.9</td>
</tr>
<tr>
<td>3</td>
<td>Status</td>
<td>Inhabitant of Zakopane town</td>
<td>37.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inhabitant of one of the towns located in the vicinity of Zakopane</td>
<td>32.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Person visiting Zakopane town as a tourist</td>
<td>29.5</td>
</tr>
<tr>
<td>4</td>
<td>Education</td>
<td>Primary</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary (1 level)</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary (2 level)</td>
<td>36.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vocational</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Higher (university degree)</td>
<td>57.4</td>
</tr>
<tr>
<td></td>
<td>What impact do the spatial planning activities by the local authorities have upon the perception of the town's image, and the spatial order within it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td><strong>Very positive impact</strong></td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Positive impact</strong></td>
<td>41.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>No impact</strong></td>
<td>18.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Negative impact</strong></td>
<td>29.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Very negative impact</strong></td>
<td>9.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Are the activities for the promotion and advertising of Zakopane town, undertaken by the local authorities, conducted properly?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><strong>Yes, they are sufficient and they fully meet the requirements of such activities</strong></td>
</tr>
<tr>
<td></td>
<td><strong>They are conducted properly, but they are insufficiently comprehensive, and they do not cover a sufficiently large area</strong></td>
</tr>
<tr>
<td></td>
<td><strong>I cannot say</strong></td>
</tr>
<tr>
<td></td>
<td><strong>No, they are not conducted properly, they do not meet the requirements of such activities</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Is the information on the town's heritage (monuments) sufficiently accessible?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td><strong>Yes, the information is readily accessible, it is easy to find the information that we are interested in, the database is extensive</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Yes, although the information does not cover all the monuments/heritage objects, there is no uniform (comprehensive) system, which makes the search a little bit more difficult</strong></td>
</tr>
<tr>
<td></td>
<td><strong>I do not use this kind of information</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Access is difficult, information is presented in a way that is not sufficiently clear</strong></td>
</tr>
<tr>
<td></td>
<td><strong>No, it is impossible to find any information, the search is very difficult</strong></td>
</tr>
<tr>
<td>Question number</td>
<td>Question</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4</td>
<td>Does Zakopane fully take advantage of the potential of its heritage objects/monuments?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>What kinds of infrastructure are missing within the area of Zakopane town?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Would the construction of a multifunctional hall within Zakopane town be a desirable investment project, needed for the proper functioning of the city and its development?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Are there objects within Zakopane town, which are out of sync with the city's character and which therefore disturb its spatial order?

| Yes | 80.3 |
| I do not know | 14.8 |
| No | 4.9 |

Are the investment projects listed below proper and needed within the area of Zakopane town?

| Construction of a shopping mall at Krupówki street | Yes | 13.1 |
| I cannot say | 16.4 |
| No | 70.5 |

| Construction of a services and retail centre at Szkolna street (next to the Roman Dmowski roundabout, below the Gubałówka mount) | Yes | 8.2 |
| I cannot say | 22.9 |
| No | 68.9 |

| Creation of a pedestrian promenade under the Gubałówka mount | Yes | 59.0 |
| I cannot say | 34.4 |
| No | 6.6 |

Are the objects constructed in Zakopane town within the last few years properly combined/blending in with the previously existing built environment?

| Yes, therefore they create a harmonious whole, and positively impact the creation of spatial order | 1.6 |
| Yes, however there are single elements, which to some extent distort the spatial order | 27.9 |
| I cannot say | 9.8 |

| No, many objects were built which negatively impact the spatial order, however there are single investment projects which blend in well with the previously existing built environment | 36.1 |
| No, they completely depart from the character of the previously existing built environment, they distort the spatial order, there are many objects stylistically contrary to the character of Zakopane town | 24.6 |
Table 1. cont.

<table>
<thead>
<tr>
<th>Question number</th>
<th>Question</th>
<th>Responses</th>
<th>Percentage of responses [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Would it be the right decision to introduce the “Cultural Park of the Krupówki street area”?</td>
<td>Yes, it is the right decision that would very positively impact many areas of the town's functioning</td>
<td>36.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes, it may have a positive impact</td>
<td>44.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I cannot say</td>
<td>9.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No, it is not the right decision, it may have negative impact</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No, this would be a wholly wrong decision</td>
<td>3.3</td>
</tr>
<tr>
<td>11</td>
<td>What actions should be undertaken in order to improve the perception (image) of Zakopane town?</td>
<td>Open question</td>
<td>57.4</td>
</tr>
<tr>
<td>12</td>
<td>Are “unauthorised construction projects” (land use violations) a common phenomenon in the area of Zakopane town?</td>
<td>Yes, it is the right decision that would very positively impact many areas of the town's functioning</td>
<td>63.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes, it may have a positive impact</td>
<td>36.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I do not know</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Source: authors’ study
3. Survey results

The local development plan is an essential and important instrument of spatial policy. Table 2 presents information on the area of Zakopane, which had been covered, in subsequent years, with local development plans now remaining in force. You will notice, in the analysed period, the surface of such land in Zakopane has been increasing year by year. In 2010, the share of the area covered by current land use designations in the total area of the town amounted to 19.3%, while four years later, in 2014, the respective share was already equal to 41% (in 2015, the situation in this respect has not changed). This is connected to the fact that about 60% of the city of Zakopane belongs to the Tatra National Park, which is almost entirely covered by the local development plan [www1]. Increasing the area of the city covered by the existing development plans is a positive phenomenon, because it will provide authorities with a greater influence on the shaping of space.

Table 2. Land use designation plans in force within Zakopane town between 2010–2015

<table>
<thead>
<tr>
<th>Indices</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>Area of the town covered by the land use</td>
<td>1630</td>
</tr>
<tr>
<td>designations/plans [ha]</td>
<td></td>
</tr>
<tr>
<td>Share of the area covered by the land use</td>
<td>19.3</td>
</tr>
<tr>
<td>designations/plans in total area [%]</td>
<td></td>
</tr>
</tbody>
</table>


Table 3. Planning decisions issued in Zakopane town between 2010–2015 [number of decisions]

<table>
<thead>
<tr>
<th>Type of decision</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>Planning decisions for investment projects of the</td>
<td>25</td>
</tr>
<tr>
<td>public use</td>
<td></td>
</tr>
<tr>
<td>Total number of planning decisions issued,</td>
<td>207</td>
</tr>
<tr>
<td>including:</td>
<td></td>
</tr>
<tr>
<td>– planning decisions for multi-family residential</td>
<td>18</td>
</tr>
<tr>
<td>areas/housing</td>
<td></td>
</tr>
<tr>
<td>– planning decisions for single-family residential</td>
<td>82</td>
</tr>
<tr>
<td>areas/housing</td>
<td></td>
</tr>
<tr>
<td>– planning decisions for service areas/</td>
<td>34</td>
</tr>
<tr>
<td>infrastructure</td>
<td></td>
</tr>
<tr>
<td>– other planning decisions</td>
<td>73</td>
</tr>
</tbody>
</table>

In a situation when a given area is not covered with the existing local spatial development plans, in order to undertake investment activities aimed at the construction of a building, planning (zoning) decisions are issued. Table 3 lists these planning decisions, issued for the land located within the area of the analysed town.

Planning (zoning) decisions are of utmost importance, and their total number reached the highest level in 2010, when as many as 207 of such documents were issued. Over the analysed period, the number of these decisions decreased steadily. Among other things, this is due to the fact that over time, an increasingly large area of the city was covered with the local plans. The largest share belonged were those decisions concerning single-family housing, whereas decisions related to the multi-family housing were a minority among these. However, due to the large dimensions of the buildings that were constructed on the basis of the latter, the effects of their issue are highly visible in the city.

Issuing planning decisions is conducive to actions taken by investors. In many cases, they are issued in accordance with the requirements of individual entities and prepared with the view to their specific needs. The time to obtain a zoning decision is much shorter than that which is necessary for the preparation of spatial (land use) plans and giving them legal force. In addition, the decisions in question refer to individual investment projects, and they are issued by one of many officials. Unfortunately, this situation can lead to the disruption of spatial order, and loss of harmony through sprawl development, to the destruction of the boundaries between the areas of specific designations, and to lack of adequate protection of valuable natural resources [Czekiel-Świtalska 2011].

Among the surveyed persons, women constitute 60.7%, while men comprise 39.3%. The most numerous age group is that of 18 to 25 years, with 63.9% of all respondents, and the second most numerous group is between the 25 and 45 years of age, with the share of 26.2%. Persons under the age of 18 have not responded, and the oldest age group, which is over 45, covered only 9.9% of all responses. More than half (that is 57.4%) of the respondents are persons with a degree in higher education. Among survey participants, 36.1% are persons with a diploma in secondary education, and 6.5% with a diploma in vocational education. The section of demographic data also included a question about the relationship of the respondent to the analysed town. The largest proportion of the respondents were residents of Zakopane town, who comprised 37.7% of all persons participating in the survey; then residents of towns located in the vicinity of Zakopane; and finally (the lowest share), tourists or visitors to the city – 32.8% and 29.5% respondents respectively. This composition of the survey sample (respondents) may stem from the fact that residents of Zakopane are those who are the most affected by the manner of shaping their town’s space and by actions taken within its territory, and therefore they were the ones to show the most interest in the questionnaire, among all respondents.

The second part of the questionnaire began with the question concerning the impact of spatial planning carried out by the city upon the perception of its image, and its spatial order. Among all respondents, 41% said that the influence was a positive one. This response was favoured by most people from the group of visitors to the city.
as a tourist destination (12 people out of 25 of all those who gave this response). Only 1 person recognized the very favourable impact of these developments, also belonging to the group of tourists. 29.5% said that the developments had a negative impact upon the image perception and the spatial order. Among the 18 people who have given this answer, 8 were residents of the neighbouring municipalities, 6 were the inhabitants of Zakopane, and 4 were tourists. 18% felt that these activities had no particular impact, and 9.8% believed that the impact was very negative. These discrepancies may be due to the fact that people (society at large) are not fully aware of the broad-ranging possibility of creating spatial order afforded by, for instance, the local zoning plans.

The respondents were also asked to assess the activities related to promotion and advertising. Opinion on this subject was divided, as 39.3% of people thought this kind of activity by the municipal authorities relevant, but covering an insufficient scope of operation. On the other hand, a similar proportion of respondents – 36.1% – considered that these activities were not carried out properly and were not adapted to the requirements that must be met. Only 4.9% of the respondents felt that the measures taken were adequate and that they fully met the requirements, while 19.7% had no opinion on this subject. It is advisable to consider the reason for these results. Zakopane is a recognized destination, both domestically and internationally. It has huge potential and the proper use of that potential in the town's promotion could encourage more people to choose it as a place to visit and to stay.

In the city of Zakopane there are many historic buildings, which are located in different parts of the city. The respondents assessed the access to information on these objects of heritage. 34.4% among them considered them to be sufficiently accessible, however, with the reservation that information was not provided on all of historic buildings, and that the search was somewhat difficult due to the lack of a single, uniform information system. The creation of a database containing a list of historic buildings and heritage objects, the prices of admission, opening hours and locations would definitely make it easier to access these places, and it would certainly increase the interest not only on the part of the visitors to the city, but also on the part of the residents – because about 35% of the residents of Zakopane, who participated in the study, admitted that they did not use this kind of studies. It should be emphasized that persons visiting the city of Zakopane as tourists recognized that access to the information on heritage sites was sufficient, but that there were some gaps or deficiencies. Among all respondents, 29.5% of the respondents said that they did not use this kind of information sources, while 19.7% indicated that the access to information was difficult.

The degree of using the potential of the heritage buildings by the city of Zakopane was also assessed. Opinions were very much divided. 36.1% of respondents believed that the potential was being used, however, some heritage objects were neglected. The same proportion of the respondents believed that the potential was not being used sufficiently. Only 3.3% of respondents said that heritage buildings were used constantly, among others, for the promotion of the town. The situation should be changed, among other things, by enhancing the visibility of these objects, by the restoration of the neglected heritage buildings, and facilitating access to them.
One form of the protection of heritage is to create a cultural park, designed to protect valuable areas, in which fixed elements of heritage (monuments) are located, characteristic of the style and architectural tradition of the area [Ustawa... 2003b]. In Zakopane, on 3 September 2015, the Resolution No. XII / 183/2015 of the City Council of Zakopane postulated the creation of a cultural park called the “Cultural Park of the Krupówki street area”, which entered into force on 1 July 2016. [www2]. The establishment of the Krupówki Cultural Park was evaluated by the respondents, of whom 36.1% believe that this was the right decision, with a very positive impact on many areas of the city; while 44.3% of respondents believed that it may turn out to have beneficial effects. There is a small share of other answers: 9.8% of the respondents had no opinion on the subject, while persons who believed that this was the wrong decision and could have negative effects constituted only 6.5%, whereas 3.3% of the respondents said that this decision was totally wrong.

Another question concerned the objects of infrastructure, which are missing in the town of Zakopane. Respondents could select multiple answers. This is a very important issue, because it is associated with attractiveness of the city, and it affects its level of competitiveness in relation to other areas. The existence of such facilities is a response to the demands of society in a variety of areas. 72.1% of all persons participating in the survey felt that the biggest deficit concerns the infrastructure of communication and transport. Examples given included the lack of public transportation, which implies underdeveloped transportation links/connections and excessive prices. In addition, respondents believed that the bus stops within the Zakopane town were not well marked, while the bus and train stations required a major overhaul.

54.1% of the respondents felt that there was a lack of sports facilities in the area of Zakopane; and the following were listed as lacking: sports/football grounds for youths, cross-country trails, bike paths, ski trails, an outdoor gym, an indoor skate park or a climbing wall.

The lack of cultural facilities was indicated by 49.2% of the respondents (as the kind of places that are missing in the city); but when it comes to green areas, healthcare facilities and educational infrastructure, the lack was felt by 23.0%, 21.3% and 18.0% respondents respectively.

As already mentioned, the questionnaire focuses on issues related to spatial planning. This includes the question, where respondents had to assess whether in the town of Zakopane there are objects that do not fit the character of the city and/or disrupt the spatial order. Over 80% of respondents felt that Zakopane was a place where there are many such objects, among which they listed the following:

- shopping malls (Figure 1),
- bus and train stations (Figure 2),
- the building commonly called the “Gargamel’s House” (Figure 3),
- shops at Krupówki street,
- apartment buildings.
**Fig. 1.** Shopping mall at Krupówki street, and services and retail centre at Szkolna street in Zakopane

**Fig. 2.** Railway and bus station in Zakopane

**Fig. 3.** The villa nicknamed 'Gargamel's House' located in Zakopane
In addition, respondents pointed out that outdoor advertising is ubiquitous in the city, bringing chaos to the urban space.

Over the last five years, the town of Zakopane has seen numerous investment projects, which have largely shaped the city space. These include the construction of a shopping mall on the Krupówek street, as well as a services and retail centre in Szkolna street (near Rondo Romana Dmowskiego, below the Gubałówka mount), as well as the creation of the pedestrian promenade under the Gubałówka. They represent projects that affect the spatial order, primarily because of their size and location, as they are all located in the centre of Zakopane town. Therefore, the respondents were asked to assess these investment projects, and to decide whether they were appropriate and necessary in the town of Zakopane.

Those participating in the study were of a very similar opinion regarding both commercial and service facilities under assessment. Approximately 70% of the respondents considered that these projects were inappropriate and unnecessary for the city. The share of supporters and people who did not have an opinion on this issue was slightly different in each case, as in relation to the construction of the shopping mall in Krupówek 16.4% believed that this was a much needed investment, while people who had no opinion on the subject amounted to 13.1% (out of 61 respondents). 22.9% respondents validated the creation of the service and retail centre in Szkolna street, while 8.2% had no opinion on the subject.

Another project that has been subjected to the assessment by the respondents was the creation of a pedestrian viewing promenade under the Gubałówka mount, resulting in a changed organization of traffic on the section of the road where it had been located, as the dual carriageway (two lanes one-way each) was changed to a single two-way carriageway. 59.0% of respondents believe that the creation of the pedestrian promenade was the right decision, while 34.3% disagreed with it, and only 6.6% had no opinion on this subject. Diversity of opinion may arise from different approaches to the implementation of this investment project. Before renovation, the viaduct, on which the said promenade was placed, had been in a very bad condition. After all the repair works had been completed, the organization of traffic was changed, which significantly influenced the traffic around the city – causing traffic problems especially during the tourist season. According to another approach, this was a successful investment project, the implementation of which has improved the attractiveness of the city.

Spatial order is shaped by the built environment created in the past, and that, which is being created today. In its formation, we should take into account the impact of the investment activities on the vertical and horizontal spatial infrastructure within the area. It should be emphasized that even the smallest investment project involving land use in a certain way, within a particular portion of the space, affects its overall image. Therefore, it is very important that the newly established buildings are designed and constructed in harmony with the existing built environment. 36.1% of the persons participating in the survey said that in Zakopane, in recent years, a number of objects had been built that adversely affected the spatial order, but that you could find single cases of investment projects that blended in well with the existing buildings. 24.6% of
respondents assessed the newly established buildings in Zakopane very negatively; they agreed that new buildings were completely different in the nature from the existing built environment, that they disrupted the spatial order, and that there was a very large number of objects built in a style that diverged from the character of the city. A similar part – that is, 27.9% of respondents – were of an opinion that the buildings created in Zakopane in recent years appropriately complemented the earlier built environment, but that there were individual cases of elements, which slightly disturbed the spatial order. Those who believed that there are no buildings in Zakopane that would differ in architectural style from the older buildings, constituted a minority – merely 1.6% (1 person) among all respondents, while 9.8% of respondents had no opinion on this subject.

The last question in the questionnaire was related to the formation of the “unauthorised construction projects” (land use violations). Respondents were asked whether this phenomenon frequently occurred in the town of Zakopane. As many as 63.9% of the persons responding to the questionnaire thought so (they answered “yes”), while 36.1% had no opinion on the subject. It should be emphasized that among the 22 responses indicating that the respondent did not have an opinion, as many as 15 were tourists visiting the city, while only 5 were the inhabitants of Zakopane and 2 people were living in its neighbourhood. Everyone else agreed that land use violations occurred in Zakopane very often. Such a breakdown of responses stems from the fact that in most cases tourists are not interested in such issues and do not have adequate knowledge in this field, while the inhabitants of Zakopane and the neighbouring villages have more information on the situation in question.

A similar opinion about Zakopane, and about the actions taken on its territory, is also shared by scientists and architects. In the literature, we find voices saying that the Highlanders (inhabitants of the area), whom we tend to identify with the love of their own tradition, are adverse to the adoption of new solutions, and instead they choose their own path, which has led to the formulation of a specific style, not necessarily perceived in a positive way. Traces of the historical Zakopane style, promoted in particular by Stanislaw Witkiewicz, can today be found only in individual investment projects; and taking into account the development of the whole city we can conclude that in Zakopane “everyone builds wherever they want” [Böhm 2008].

Currently, the use of the cultural heritage of Zakopane comes down to perceiving it only in the economic aspects, resulting from the focus on profit, without considering other factors. Such actions have led to the loss of the specific atmosphere and the local “familiarity” of the place. Today the objects that are valuable because of their architectural and historic character are replaced with other buildings, of larger dimensions, that can generate greater financial benefits, which unfortunately is usually the most important concern of their owners. Creating pseudo-mountain-style buildings, locating large hotels, apartment buildings and commercial centres in various parts of the city, completely unsuited to the mountain landscape, and the use of sophisticated forms, has led to considerable spatial chaos in the Zakopane area [Murzyn 2015].
4. Conclusions

The proper forecasting of the directions and the degree of transformation should be preceded by a thorough analysis of the processes taking place in the development of the given spatial unit in the earlier period, and the diagnosis of the current state of affairs. Phenomena occurring in the past continue to have an impact on what happens today, but they also affect the future arrangements, and they influence the development of spatial units – therefore it is of utmost importance to predict the effects of the actions taken [Harańczyk 1999]. This is the main principle of spatial planning, which could lead to the development of territorial units at various levels, provided that it is conducted in a rational way.

The landscape of Zakopane has been changed gradually by the uncontrolled development, and following many wrong zoning and planning decisions. For areas that were not covered by the local spatial development plans, a lot of zoning decisions were issued, which indirectly led to the disturbance of harmony and order in the urban space. Buildings that differ stylistically from the character of the city, “unauthorised construction projects” (land use violations), or chaos of outdoor advertising are just some of the problems faced by the spatial unit in question.

City authorities have undertaken measures aimed at the organization of space, and they have attempted to restore the attractiveness and atmosphere of the city – such as the introduction of the Cultural Part in the area of Krupówki street – but it is a very difficult process that requires the involvement of citizens and decision-making bodies. The transformations in the cultural landscape of Zakopane are so advanced that the restoration of spatial order within its area will be a highly time and effort consuming process.

The authorities attempted to improve the situation of public transportation – two bus lines as have been introduced in Zakopane that deal with the transport of passengers along the routes connecting the city centre with Olcza, and Cyrhla with Krzeptówki. The transportation is provided by modern buses, and current prices are very favourable [www3]. Properly functioning municipal transport is essential to tourist resorts, among which Zakopane belongs. Therefore the authorities should seek to ensure that the local transportation should cover the whole town with its scope as well as the area around the city, including the neighbouring villages.

On the basis of the conducted survey, recommendations were formulated for the analysed spatial unit, including: the creation of a development strategy, which shall formulate specific guidelines; increased use of landscape assets of Zakopane; the removal of the current city-wide advertising; reorganisation and ordering of the area around Krupówki street; unification of the style of construction; and increasing the number of parking spaces, which can be achieved through the use of zoning. In addition, the recommendations include the development of public transport; upgrading of the railway station and bus station; the construction of a multifunctional hall; reducing the construction within green spaces; a return to tradition; cultural development; improving the city’s promotion; and the preservation of historic buildings; the develop-
ment of hiking, cycling and skiing routes; the development of tourism; the joint actions by residents and public authorities; increasing public awareness with regard to the cooperation and the opportunities to achieve greater benefits by acting together.

In conclusion, on the basis of conducted survey, it can be stated that the investment activities conducted within Zakopane town have had a huge impact on that city’s image (perception) and on its spatial order. The changes, which were introduced in the city, are already very advanced – therefore restoring the order to the area requires integrated actions and specific solutions, the implementation of which will be a very difficult and challenging task. Zakopane is a popular place, but the improperly conducted spatial policy has led to the destruction of the landscape, which lost a lot of its attractiveness. The potential, that has not yet been exhausted, should be used; and we must strive to restore the spatial order to the area.

References


Ustawa z dnia 27 marca 2003 r. o planowaniu i zagospodarowaniu przestrzennym (tekst jednolity: Dz. U. 2016, poz. 778).

Ustawa z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (Dz. U. 2014, poz. 1446 z późn. zm.).

Dr Julia Gorzelany
Uniwersytet Rolniczy w Krakowie
Katedra Gospodarki Przestrzennej i Architektury Krajobrazu
30-149 Kraków, ul. Balicka 253c
email: j.gorzelany@ur.krakow.pl

Mgr inż. Justyna Janiczak
Uniwersytet Rolniczy w Krakowie
Katedra Gospodarki Przestrzennej i Architektury Krajobrazu
30-149 Kraków, ul. Balicka 253c
email: justyna.janiczak12@gmail.com

Dr inż. arch. kraj. Magdalena Wilkosz-Mamcarczyk
Uniwersytet Rolniczy w Krakowie
Katedra Gospodarki Przestrzennej i Architektury Krajobrazu
30-149 Kraków, ul. Balicka 253c
email: mwilkoszmamcarczyk@gmail.com
COOPERATION OF AGRICULTURAL PRODUCERS IN POLAND

Sylwia Guzdek, Agnieszka Petryk

Summary

Agrarian fragmentation remains a key problem of Polish agriculture. An individual farm, regardless of its size, has no market power. Its market position among other producers and its bargaining power among consumers of agricultural products is negligible. One way to improve this situation is to support the formation of groups of agricultural producers. Horizontal integration of farmers leads to strengthening their bargaining power and thus to increasing their income. The article is descriptive and based on an analysis derived from scientific literature devoted to the topic. It presents the essential idea of cooperation between farmers in the form of producers’ groups and attempts to characterise activity of these groups in Poland in years 2001–2015. GAPs (groups of agricultural producers) undoubtedly have their advantages and disadvantages, but large number of small producers, increasing demands of the market, strong European competition and financial aid will undoubtedly stimulate further the process of forming producers’ groups in Poland.

Keywords

producer groups in Poland • horizontal integration • the effects of economies of scale

1. Introduction

The European agriculture farms are in various stages of development. The more they are related with the market and the higher the competition is, the more they should cooperate with each other in various areas of activity, both in terms of selling their produce and the supply of productive factors [Boguta and Martynowski 2010]. An individual small farm, regardless of its size, does not have market power. Its market position among other manufacturers and its bargaining power among recipients of produce is negligible. The recipients of the produce are mainly large processing plants, trading companies, supermarkets dictating the terms of the transaction. Farmers’ cooperation in terms of joint sale of their produce increases significantly their market power. The article is descriptive, while using a method of analysis derived from scientific literature devoted to the studied topic. It presents the essential idea of cooperation between farmers that consists in creating
producers’ groups and it attempts to characterise activity of these groups in Poland in years 2001–2015.

2. Justification of integration of farms in theoretical interpretation

In neoclassical economics the absolute prerequisite for integration activities of enterprises is imperfect market structure characterized by a high degree of market power of entities. There are numerous companies on the agricultural market which produce homogeneous products and there are no barriers to enter the market and consequently its structure is similar to a perfect competition model in which individual producers have no market power. The structure of the market of means of production used in the agricultural product market is mainly oligopoly where, due to high barriers to entry and exit the market, a small number of companies provide varied products and consequently business entities are able to influence their sales price [Chlebicka et al. 2008].

According to the neoclassical economics the way to reduce imbalances in the system of market forces between the agricultural producer and other actors in the distribution chain is to increase the economic strength of farms through horizontal integration, which allows them to benefit from economies of scale by, for example, enlarging the surface area of farms or by specialization of production or by the concentration of supply and its adaptation to the market demand by the joint inventory management. Horizontal integration is a tool used to optimize the costs of production, management and marketing [Chlebicka et al. 2008].

The aforementioned considerations base the evaluation of the effectiveness of economic entities on the costs of production and productivity of production factors, without taking note of how the transaction (coordination mechanism) is carried out. According to this approach, regardless of the organizational form, the entities have the same opportunities to achieve economies of scale and the same unlimited access to information [Chlebicka et al. 2008]. From this point of view, new institutional economics seems to be worthwhile and, in particular, transaction cost theory which distinguishes four types of costs dependent on the phase of the transaction, namely: preparation costs, arrangements costs, the costs of control and the costs of adaptation (adjustment), in which the costs of the search for information, negotiation with buyers or sellers, preparation of contracts, monitoring the other party of the contract, contract enforcement and compensations, protection of property rights are included. Bearing in mind the appropriate assessment of the economic effectiveness of business entities which should, apart from their capability of reducing production costs, also consider their ability to reduce transaction costs, new institutional economics consents to consider that the formation of producers’ groups can be seen as an expression of aspiration to optimize transaction costs [Chlebicka et al. 2008].

E. Grochle [Miedziński 1987], a German scientist, divided mergers of enterprises into the ones which deprive entities of their legal personality and the ones which allow for its preservation. Among the latter ones a capital group (holding) can be distinguished. As Bogusławski and Wiąkowskii [1996] noted, the classification was currently
not fully valid and, in the part of the union, supplemented it with cartels, pools as well as rings and, in the part concerning groupings, with conglomerates. Taking social, sociological, legal and economic aspects into consideration Grudzewski and Hejduk [2001] identified three levels of economic potential concentration being in the hands of a single entity. On the first level, entities form fairly loose legal and economic associations, consolidations and alliances of enterprises, banks, companies, cooperatives and foundations. On the second level, holding structures are formed, which perceive the concentration of economic potentials as a key factor. On the third level, there are the entities with the highest degree of concentration, for example, consortia.

Two main forms of enterprise integration can be distinguished, namely cooperative and concentration forms [Kortan 1986]. A concentration which merges manufacturing plants into one multi-plant company is a concentration called in the broad sense as an external concentration or as proposed by Haus [1983] an organizational concentration. This particular type of entities integration and their cooperation is based on the external integration of the existing business entity with another, dependent entity (entities) leading to the formation of a multi-stakeholder partnership [Kreft 1999]. As part of the cooperative integration, only fragmentary segments of the economic process of enterprises, or some one-time tasks are the subject of merger. This association is based on voluntary cooperation and sustainable partnership without a loss of legal personality of entities. However, concentrative integration is subordinated to the single management which leads to the loss of some or all of the existing autonomy of the entities involved [Kreft 1999].

The cohesiveness of the organization is defined as a degree of uniformity of action of entities selected in the integration process which grows as far as the freedom of action of entities participating in integration decreases and the scope and power of influence on the participants of integration of a medium having management powers over them increases [Koziński 1996].

Both forms of integration are linked with divisionalisation which involves the creation of integrated multi-stakeholder groupings, also called sectoral or alliance groupings. The type of cooperation with other companies depends on the intended purpose; however, the following rule can be observed: the more interference into the structure of the plant and the higher the expected intensity of the objective realisation, the stronger and closer the cooperative relationship must be. The intensity of cooperation is higher in concentrative relationships than in cooperative ones [Guzdek 2010].

In the modern economics the growing popularity of alliances enhancing a chance of increasing the development possibilities of enterprises is observed, because greater benefits are achieved through an alliance than as a result of individual actions, mergers and acquisitions [Guzdek 2011, Grabiec 2009]. This is primarily due to the objectives pursued: collaborative acquisition of the increased market share, economization of activities resulting from achieving the desired effect of scale, the effect of horizontal or vertical integration, elimination of unnecessary functions, sharing the risks and costs of undertaken projects [Nogalski and Ronkowski 2000].
3. Farmer producers’ group as a form of integration in agriculture

Horizontal integration of agricultural producers takes the form of capital or functional integration. Capital integration involves the increase of the size of the agricultural area as well as production specialization which leads to the strengthening of the economic power of an individual farmer due to economies of scale. Functional integration occurs when agricultural entities form a group in order to realise common policy of supply, production and product sale [Małysz 1996]. In agriculture, a group of producers is an example of horizontal integration [Małysz 1996]. The unfavourable income situation of many Polish farms makes the process of capital integration limited, therefore, the improvement of the market position of farmers can be accomplished primarily through the functional integration [Bulas 2010].

With time, horizontal integration can initiate vertical integration [Hasiński 2009], which links the successive phases of production and distribution of food and which may arise through the conclusion of contract (integration contract), the acquisition of the ownership entity being in another phase of food production (integration of capital), establishing strategic partnerships (strategic network) and the drafting of appropriate legal standards by the State (institutional integration) [Bulas 2010]. Depending on who initiates vertical integration it can be distinguished as facing forward (bottom-up) and backwards (top-down). A common feature of both of the above mentioned forms of integration is the fact that economic decisions are taken by a partner whose knowledge of the market is broader [Bulas 2010].

Ample opportunities of integration occur in agribusiness [Kujaczyński 2006] due to the multiplicity of the stages of production and distribution between producing raw food and delivering food to a consumer [Kujaczyński 2006].

A joint activity of farmers allows for many benefits enabling them to build competitive advantage by:

- strengthening competitiveness,
- improving the efficiency of management,
- obtaining higher prices for products,
- paying lower prices for purchased inputs,
- greater opportunity to invest,
- easier access to sources of finance¹, market and scientific information [Hasiński 2009].

¹ Rural Development Programme (RDP) 2014–2020 introduces a number of changes to the conditions for granting aid to the groups of agricultural producers (GAPs). The most favourable one concerns the amount of funding under the measure ‘Forming groups and producer organizations in agriculture and forestry’. Identically, in measure ‘Groups of Agricultural producers covered by the RDP 2007–2013’, support can be obtained for the maximum period of 5 years since the date of registration of the group and the amount of the lump sum is the percentage of the net value of sales of products or groups of products produced on farms of members and sold to customers who are not members of GAPs [Żydek and Otrębowska 2016].
4. The essence of producers’ groups

In the scientific literature there are various proposals for a definition of producers’ groups. Most often they are recognized as a group of agricultural producers, created from the bottom up, willingly and spontaneously, in order to sell the production and to obtain higher prices [Kutkowska and Antosz-Kołacz 2005]. According to E. Pudelkiewicz, a producers’ group is a voluntary union of people, organized in a formal way in order to conduct joint production, preparation and standardization of batches and selling them at competitive prices. Cooperation within the group includes four areas of agricultural business: supply of means of production, production, joint use of machinery as well as marketing [Pudelkiewicz 1999]. According to Vorley [2001] a producers’ group is a form of organization of farmers giving them an opportunity to defend themselves against being marginalized in the economic and social life resulting from liberalization and globalization.

Considering the concept of producers’ groups, attention should be paid to two, often misused, terms of collaborative activities of farmers: ‘producers’ group’, which is essentially a cooperation of farmers at the level of production and which sales to a food-processing company, and ‘marketing group’, in which the cooperation of farmers involves the distribution and marketing [Bulas 2010]. Penrose-Buckley [2007] believes, however, that a group of agricultural producers owned and controlled by the producers conducts joint marketing operations.

For the purposes of this study a legal definition of a group has been adopted, which is regulated by the Act of 15 September 2000 on agricultural producers’ groups and their relationships and about the amendment to other acts (Dz. U. [Journal of Laws] 2000, no 88, item 983, as amended). The legislator perceives a producers’ group as any legal entity established on the initiative of farmers, with the primary aim of improving the economic viability of farms, mainly by adjusting production and sales to market requirements. As indicated by M. Bulas [2010], the definition included in the Act shall be construed as the functional name denoting a joint organized activity of farmers, and not a specific legal form.

The purposes for which farmers organize themselves and cooperate with each other are as follows:

- economic: that is the joint buying, sale of agricultural products and the provision of means of production, as well as providing various types of services, which in turn are also an incentive for non-affiliated farmers to join; economic goals are focused on profits and benefits of the group member, not of the organization, for example: strengthening the bargaining power, increasing the competitiveness of products,
access to new markets, increasing revenues, reducing the manufacturing costs of products and transaction costs, minimizing business risk,

- social: representing the interests (lobbying purposes); conducting and organizing support activities, e.g. organization of trainings, social activities for the local community [Chlebicka et al. 2008].

Support provided to members of groups of agricultural producers relates to:

- defence of the interests of farmers (e.g. representative or lobbying functions),
- services of technical and economic value (e.g. production planning, the purchase of the means of production, joint sale),
- local development (e.g. trainings) [Chlebicka et al. 2008].

The basic elements of producers’ groups3 include:

- selection of members of producers’ group,
- definition of objectives and tasks of the group and forms of their implementation,
- definition of the principles of cooperation,
- choice of legal form4.

5. Development of groups of agricultural producers in Poland

According to the current List of groups of agricultural producers in Poland, drawn up by the Ministry of Agriculture and Rural Development5 and indicating the state

---

3 "This has been the harshest penalty imposed on Poland so far and the implications for the state budget are huge" said Jacek Bogucki, the Deputy Minister of Agriculture in the Parliamentary Committee of Agriculture and Rural Development while reporting the situation with the producers’ groups. In 2013 as a result of inspections of the European Court of Auditors in the years 2010 to 2013 in the field of support to preliminarily recognized producers’ groups of fruits and vegetables and detected irregularities, the European Commission urged Poland to implement corrective actions within the operating mechanism of financial support to initially recognized groups of manufacturers – informed the Deputy Minister. (...) Let us recall that currently the supervision over the foundation and functioning of these groups is held by Agricultural Market Agency (...). The control outcomes reveal that not all groups initially approved by the marshals should have such a status (...) in one in four, after analysis of the documents and evidence collected from the marshals, there was no validation observed in awarding these entities the status of preliminary recognition, said the Deputy Minister (...). For the 43 remaining applications which were negatively verified, Agricultural Market Agency, which took over the task of marshals, initiated administrative proceedings leading to annulling the decision on extraordinary rendition. It was found in four cases that the decisions of the Marshals of Voivodeships were issued in violation of the law (...). This situation is financially disastrous for Poland (...). As the deputy minister said, among them [meaning ‘the cause’] is the unpreparedness of marshal offices as well as the ambiguity and lack of precision in the Polish and the EU regulations – especially the latter ones (...). Witold Boguta, the President of the National Association of Manufacturers’ group of Fruit and Vegetables assessed, in this regard, the situation of groups as less unstable” , more at http://www.farmer.pl/finanse/grupy-produencckie-to-byl-niewypal,64057.html (accessed: 17.05.2016).


5 With effect of 18 December 2015 granting the status of competence of GAPs based on the submitted business plan (all the requirements are regulated by the Regulation of MARD of 25 February 2016 (Dz. U. 2016, item 237) [Żydek and Otrębowska 2016]) and their supervision have been taken over
of groups of agricultural producers (GAPs) as of 1 March 2016, 1308 of such entities operate currently in Poland.

The first groups of agricultural producers were established in Poland in 2001. These were ‘AGRO-Zagrodnia’ – a group of Grain Producers’ – Association of Agricultural Producers in the Dolnośląskie voivodeship and ‘AGRO-PRO’ – the Association of Swine Producers in the Wielkopolskie voivodeship. In the period of 2001–2015 the greatest number of GAPs were established in 2013. The number of newly founded groups amounted then to 462 subjects (Table 1).

Table 1. The number of GAPs established in individual years by voivodeship in the years 2001–2015

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dolnośląskie</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>16</td>
<td>13</td>
<td>22</td>
<td>14</td>
<td>41</td>
<td>–</td>
<td>3</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kujawsko-Pomorskie</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>13</td>
<td>8</td>
<td>13</td>
<td>29</td>
<td>14</td>
<td>25</td>
<td>2</td>
<td>–</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>Lubelskie</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Lubuskie</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>11</td>
<td>16</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Łódzkie</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>17</td>
<td>2</td>
<td>–</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Małopolskie</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>–</td>
<td>19</td>
<td>–</td>
<td>–</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Mazowieckie</td>
<td>–</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opolskie</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>12</td>
<td>14</td>
<td>10</td>
<td>32</td>
<td>2</td>
<td>3</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Podkarpackie</td>
<td>–</td>
<td>1</td>
<td>2</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>10</td>
<td>8</td>
<td>16</td>
<td>–</td>
<td>–</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Podlaskie</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>7</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>11</td>
<td>10</td>
<td>–</td>
<td>–</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pomorskie</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>12</td>
<td>6</td>
<td>29</td>
<td>–</td>
<td>–</td>
<td>68</td>
</tr>
</tbody>
</table>

by Local Branches of the Agricultural Market Agency (in accordance with the Act of 11 September 2015 amending the Law on groups of agricultural producers and their relationships – Dz. U. 2015, item. 1888) [Żydek and Otrębowska 2016].

According to the RDP 2014–2020 support aims at groups of a minimum of 5 producers being private individuals, which means that legal persons and partnerships will be excluded. Members of the newly established groups cannot have historical value, but must prove a minimum annual agricultural activity before founding a group of agricultural producers [Żydek and Otrębowska 2016], except for the farmers who took over the whole farm in the year preceding the creation of GAP and beneficiaries, also these potential ones (ie. those who have applied for aid), of the measure ‘Young farmers start-up fund’. The aforementioned criteria lead to the lack of financing when a farming producer used to be a member of GAP organized around ‘cereal grain or oilseeds” category and within the new group would deal with production and sales of grains and oilseeds [Otrębowska, 2016].

GAPs established after 1 January 2014 can apply for funding under the RDP 2014–2020, if they are a micro, small or medium-sized enterprise (according to Annex I to Commission Regulation (EU) No 651/2014 [Otrębowska 2016].
Table 1. cont.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Śląskie</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>1</td>
<td>–</td>
<td>24</td>
</tr>
<tr>
<td>Świętokrzyskie</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>15</td>
</tr>
<tr>
<td>Warmińsko-mazurskie</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>13</td>
<td>12</td>
<td>17</td>
<td>22</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>Wielkopolskie</td>
<td>1</td>
<td>2</td>
<td>–</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>14</td>
<td>23</td>
<td>24</td>
<td>60</td>
<td>75</td>
<td>177</td>
<td>4</td>
<td>8</td>
<td>402</td>
</tr>
<tr>
<td>Zachodniopomorskie</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>16</td>
<td>–</td>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>Altogether</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>13</td>
<td>21</td>
<td>37</td>
<td>87</td>
<td>80</td>
<td>128</td>
<td>195</td>
<td>216</td>
<td>462</td>
<td>15</td>
<td>28</td>
<td>1308</td>
</tr>
</tbody>
</table>

Source: authors' study based on Wykaz grup… [2016]

According to the data presented in Table 1 showing the number of GAPs established in individual years by voivodeship, attention should be paid to the period of 2008–2013. During this period, a systematic increase in the number of entities in almost all voivodeships can be observed. Unquestionably, this is associated with the EU funding of GAPs activities in the period of 2007–2013. The largest number of GAPs can be seen in the Wielkopolskie voivodeship (402 entities), and the fewest – in the Świętokrzyskie voivodeship (15).

Table 2. Number of GAPs according to legal form in individual voivodeships (as of 1 March 2016)

<table>
<thead>
<tr>
<th>Voivodeship</th>
<th>Legal form</th>
<th>Dolnośląskie</th>
<th>Kujawsko-Pomorskie</th>
<th>Lubelskie</th>
<th>Lubuskie</th>
<th>Łódzkie</th>
<th>Małopolskie</th>
<th>Mazowieckie</th>
<th>Opolskie</th>
<th>Podkarpackie</th>
<th>Podlaskie</th>
<th>Pomorskie</th>
<th>Śląskie</th>
<th>Świętokrzyskie</th>
<th>Warmińsko-Mazurskie</th>
<th>Wielkopolskie</th>
<th>Zachodniopomorskie</th>
<th>Altogether</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Association</td>
<td>–</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Cooperative</td>
<td>9</td>
<td>34</td>
<td>15</td>
<td>16</td>
<td>10</td>
<td>17</td>
<td>18</td>
<td>18</td>
<td>27</td>
<td>5</td>
<td>14</td>
<td>3</td>
<td>1</td>
<td>29</td>
<td>209</td>
<td>5</td>
<td>420</td>
</tr>
<tr>
<td></td>
<td>Union</td>
<td>5</td>
<td>–</td>
<td>5</td>
<td>1</td>
<td>–</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>1</td>
<td>15</td>
<td>–</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Ltd.</td>
<td>118</td>
<td>81</td>
<td>13</td>
<td>48</td>
<td>27</td>
<td>9</td>
<td>52</td>
<td>70</td>
<td>13</td>
<td>37</td>
<td>51</td>
<td>21</td>
<td>11</td>
<td>53</td>
<td>177</td>
<td>55</td>
<td>836</td>
</tr>
</tbody>
</table>

Source: authors' study based on Wykaz grup… [2016]

Analyzing the legal form of the GAP it can clearly be stated that the most often chosen one is a limited liability company (836), and the cooperative in a further
In the analysed period diversion from legal forms such as a society or an association focusing rather on typically social tasks can be observed. At the moment there are only 7 associations and 45 unions of GAPs in Poland. In the considered period the largest number of GAPs in the form of a cooperative were established in the Wielkopolskie voivodeship – 209 entities (Table 2), the fewest in the Świętokrzyskie voivodeship – only one. The largest number of Ltd companies were established in the Wielkopolskie voivodeship (177) and in the Dolnośląskie voivodeship (118). GAPs in the form of associations were founded in the Kujawsko-Pomorskie, Świętokrzyskie, Wielkopolskie and Małopolskie voivodeships, in turn, in the form of union none GAP was established in the Kujawsko-Pomorskie, Łódzkie, Śląskie, Warmińsko-Mazurskie and Zachodniopomorskie voivodeships. All of these legal forms are the subject of legal and organizational solutions of GAPs solely in the Małopolskie and Świętokrzyskie voivodeships.

In view of the criterion of the product or group of products, the largest percentage of entities uniting producers in the whole country applies to the following categories:

- Cereal grain or oil seeds: 24.46%
- Live swine: 22.02%
- Chickens: 11.93%
- Turkey: 4.20%
- Live cattle: 4.05%
- Cow milk: 7.34%
- Others: 15.45%

Source: authors’ study based on Wykaz grup… [2016]

Fig. 1. Structure of GAPs in Poland by products (as of 1 March 2016)

8 In the RDP 2014–2020 cooperative GAPs as well as associations of producers assuring the production with voluntary insurance coverage while qualifying for aid are preferred [Żydek and Otrębowska 2016]. The procedure for granting aid has changed. Recruitment to the measure ‘Founding groups and producers’ organizations’ RDP 2014–2020 at a given time as well as measure ‘Modernisation of farms or Support in starting a business by young farmers’ [Otrębowska 2016]. The order of the processing of applications by the ARMA is important here [Żydek and Otrębowska 2016].
‘Cereal grains or oilseeds’ – 24.46% (320 GAPs) and ‘Live swine: piglets, weaners, fresh, chilled, frozen pork’ – 22.02% (288 GAPs). The other product groups with significant share include the following categories: ‘Poultry (regardless of age), meat and edible offal of poultry: fresh, chilled, frozen chickens’ – 11.93% (156 GAPs), ‘Cow milk’ – 7.34% (96 GAPs), ‘Grains’ – 6.35% (83 GAPs), ‘Poultry (regardless of age), meat and edible offal of poultry: fresh, chilled, frozen turkeys’ – 4.20% (55 GAPs), ‘Live cattle: slaughter or farm animals, fresh, chilled, frozen beef’ – 4.05% (53 GAPs).

Clarification: for example, to simplify the ‘Live swine: piglets, weaners, fresh, chilled, frozen pork’ category has been marked as ‘Live swine’. Clarification: for example, to simplify the ‘Live swine: piglets, weaners, fresh, chilled, frozen pork’ category has been marked as ‘Live swine’.

Currently in Poland, GAPs are organized around 43 categories of products or groups of products9, 7 of which aforementioned amounts to 84.55%, and the others, less frequent, but extremely varied represent 15.45%. Unique GAPs in the country are, for example, ‘Fur’ Cooperative Producers of Fur Animals organized around the category of ‘Common and polar foxes, minks, polecats, raccoon dogs, dry hides (raw)’ as well as ‘MIŚ’ Ltd Apiary in Przemyśl (category of ‘Natural honey and other bee products’) in the Podkarpackie voivodeship along with a Producers’ Group called ‘Ziolofarm’ Dobrzyca Ltd. (category of ‘Plants for herbal or pharmaceutical production’) in the Wielkopolskie voivodeship and ‘Vitroflora Horti’ Agricultural Producers’ Group Ltd. organized around the ‘Fresh cut flowers and plants’ category in the Kujawsko-Pomorskie voivodeship.

Analysing the current ‘List of groups of agricultural producers in Poland’ [Wykaz grup… 2016] from the point of view of a product or a group of products it can be concluded that each voivodeship has its own specialization which fits into the categories listed in Figure 1.

6. Conclusions

Specialist literature and the experience of many countries show that the competitive advantage of a farm can be achieved through producers’ groups where the dynamic development in Poland falls into the period after the integration with the European Union mainly thanks to financial aid under the Rural Development Plan 2004–2006, the Rural Development Programme 2007–2013 and Rural Development Programme 2014–2020. It is worth noting that the tightened conditions for the establishment and operation of GAPs in the current Rural Development Programme (RDP) are compensated by much higher financial support. GAPs undoubtedly have their advantages and...

---

9 GAPs producing high quality products covered by Article 16 of the EAFRD Regulation in particular the products of organic farming, as well as uniting producers of pigs, cattle, sheep, goats, honey, hops and plants in the main crop grown to be used for energy purposes or for technical use are preferred. The RDP 2014–2020 does not provide support for groups organized around categories of live poultry (regardless of age), meat and edible offal of poultry: fresh, chilled, frozen [Żydek and Otrębowska 2016].
disadvantages, but the fragmentation of producers, increasing demands on the market, a strong European competition and financial aid will unquestionably stimulate further the process of creation of producers’ groups in Poland.

References


Kujaczyński T. 2006. Powiązania sieciowe w gospodarce żywnościowej. [In:] A. Marcysiak (ed.). Przedsiębiorstwa agrobiznesu w rozwoju obszarów wiejskich. Wydawnictwo AP, Siedlce.


Małysz J. 1996. Wpływ procesów integracyjnych w agrobiznesie na modernizację i rekonstrukcję rolnictwa oraz obszarów wiejskich [In:] S. Urban (ed.). Agrobiznes szansą rozwoju wsi
i rolnictwa. Materiały konferencyjne. Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław.


---

**Mgr Sylwia Guzdek**  
Uniwersytet Ekonomiczny w Krakowie  
31-510 Kraków, ul. Rakowicka 27  
e-mail: sylwia.guzdek@uek.krakow.pl

**Dr inż. Agnieszka Petryk**  
Uniwersytet Ekonomiczny w Krakowie  
31-510 Kraków, ul. Rakowicka 27  
e-mail: agnieszka.petryk@uek.krakow.pl
THE ISSUE OF ZONING FEES – CASE STUDY IN KRAKÓW

Jarosław Janus, Ewa John

Summary

When a municipal council enacts local spatial development plan or its changes, the result may be an increase in real property value. And if such property is sold by an owner or its perpetual usufructuary in five years since the zoning plan or its changes are in force, a head of the commune or a city mayor are obliged to levy the so-called zoning fees. It is a one-time payment related to increase in real estate value due to resolution or change of local development plan, determined by the provisions of the Spatial Planning and Development Act of 27 March 2003. This study aims at presenting theoretical and practical aspects concerning zoning fees. The proceedings carried out in Kraków with regard to real properties under two local development plans: Opatkowice West and Opatkowice East have been analysed. Moreover, the article examines the impact of the amendment to the Spatial Planning and Development Act adopted on 10 August 2011, to embrace the judgement of the Constitutional Tribunal of 9 February 2010, file no. P 58/08. The analyses are based on data acquired from The Geodesy Department of the Kraków City Office.

Keywords

zoning fee • local spatial development plan • spatial planning

1. Introduction

In accordance with the provisions of Spatial Planning and Development Act of 27 March 2003 shaping and pursuing the spatial policy within a commune (gmina) is the own task of its authorities [Act of 2003]. Establishing local development plan, as specified in the Act, is one of these duties [Szwajdler 2013]. To draw up the plan geo-mapping data, especially the land and building register, are necessary [Bujakowski et al. 2008, Bieda et al. 2012]. The local plan is an act of local law aimed at determining the intended land use and the way land is developed and managed [Kwaśniak 2011]. The plan is adopted by municipal council pursuant to the laws, it encompasses specifically the area of a commune and it applies to all entities undertaking any activity related to spatial development within the area covered by the plan [Cymerman 2011]. The procedure of drawing up and adopting the local plan is complex, laborious and is entirely financed from the commune budget. The costs of devising the plan are partly compensated by the so-called zoning fee [Gawroński and Prus 2015].
The idea of zoning fee, derived from the theory of land rents [Wójtowicz 2016] is a colloquial name of a one-time payment for gain in real property value due to resolution or change of local development plan [Heldak 2009 and Hajduk 2014]. In accordance with the article 36, paragraph 4 of the Spatial Planning and Development Act, ‘if, in connection with adoption of a local development plan or its change the value of real properties increases, and an owner or a perpetual usufructuary sells this property, a head of the commune or a city mayor charges one-time payment defined in the plan as a percentage of the property value increase’. The use of this legal regulation is possible when all of the following three conditions are met:

1) gain in real property is the result of enacting a new local development plan or a change of the existing one,
2) percentage rate equal to the increase of a real property value is determined in a plan, as a basis for charging zoning fee,
3) real property is sold by its owner or a perpetual usufructuary before the expiry of 5 years period from the date the local development plan or its change is in force.

Moreover, before selling the real property an owner or a perpetual usufructuary may demand a head of community or a city mayor to give him or her an official decision on what the amount of the fee will be.

The zoning fee is an own revenue of the commune and its amount is determined as a ratio (percentage) not as a limit sum [Niewiadomski 2015], and it cannot exceed 30% of the property value increase. The rate must be determined as an obligatory element of the plan’s text. The issues related to its determination, including controversies over 0% rate, have been extensively described in literature [Wolanin 2011b and Bielecki 2011]. This article presents the theoretical and practical aspects of zoning fee, with special emphasis on the impact of content change in the above mentioned Act on the course of administrative procedures.

2. Characteristics of the research area

The analysis focused on the proceedings carried out in Kraków with regard to real properties covered by two local development plans for estates: Opatkowice West and Opatkowice East. The chosen area is characterized by high proportion of completed proceedings to determine the rate of the zoning fee and thus all the information necessary to carry out the analysis could be obtained. The research applies to the period between 2006 (when the plans became legally binding) and 2015. The analyses have been based on data acquired from The Geodesy Department of the Kraków City Office.

Council of the City Kraków adopted local development plans for areas of Opatkowice-West and Opatkowice East to regulate the principles of the growth of the estate Opatkowice, located in the southern part of Kraków. The plans cover in total 306.02 ha, which is about 0.9% of the whole city. They came into force after 30 days from their publication in the Official Journal of the Małopolskie voivodeship, that is on 6 February 2006 (Opatkowice West) and 14 August (Opatkowice East). The dates mark
Table 1. Characteristic of local development plans of the estate Opatkowice

<table>
<thead>
<tr>
<th>Name of the local plan</th>
<th>Local development plan for Opatkowice West in Kraków</th>
<th>Local development plan for Opatkowice East in Kraków</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register unit</td>
<td>Podgórze</td>
<td>Podgórze</td>
</tr>
<tr>
<td>Premises</td>
<td>84, 85, 87</td>
<td>88, 89</td>
</tr>
<tr>
<td>Districts</td>
<td>VII, X</td>
<td>X</td>
</tr>
<tr>
<td>Surface</td>
<td>223.17 ha</td>
<td>82.85 ha</td>
</tr>
<tr>
<td>Description</td>
<td>The plans cover the areas of housing estate Opatkowice, located in the southern part of Kraków, on the border with the Mogilany commune. It is an example of traditionally agricultural suburban estate, situated within the agglomeration of Kraków, and it successively changes into housing estate. The goal of plans was to sort out the existing situation caused by division of the estate's area by the route 'Zakopianka' (S-7) into two isolated western and eastern parts, with the hope that their development reaches commercial goals and simultaneously is aligned with the city development policy of maintaining and protection of areas of significant natural and landscape values.</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>No XCIII/932/05 of the City Council of Kraków of 9 November 2005</td>
<td>No CIII/1040/06 of the City Council of Kraków of 1 March 2006</td>
</tr>
<tr>
<td>Date of entering into force</td>
<td>6.02.2006</td>
<td>14.08.2006</td>
</tr>
<tr>
<td>Percentage rate</td>
<td>30 % for areas belonging to the Commune of Kraków</td>
<td>30 % for all areas, with the exception of areas 17MN(w) and 23MW(n)</td>
</tr>
<tr>
<td></td>
<td>0 % for areas 17MN(w) and 23MW(n)</td>
<td>0 % for areas 17MN(w) and 23MW(n)</td>
</tr>
<tr>
<td>Remarks</td>
<td>Supervisory adjudication PN.II.0911-329-05 of 13 December 2005 of voivode of the Małopolskie declaring as invalid the Resolution as regard to § 3, sec. 1, point 18.</td>
<td>Voivodeship Administrative Court in Kraków by its judgement of 26 February 2007, file II SA/Kr 1161/06, acting on the complaint of voivode of the Małopolskie repealed § 23, § 4 point 1, let. C (8), § 5 sec. 2 point 2 let. c (1), § 6 sec. 1 point 1 let. d – in part regarding open areas marked as 47 ZO, 48 ZO, 49 ZO; § 27 sec. 2, § 28 sec. 2 – in part including words „no less than’ and a drawing of a plan of terrains marked as 47 ZO, 48 ZO, 49 ZO of the contested resolution; the judgement is legally binding since 30 April 2007</td>
</tr>
</tbody>
</table>

Source: authors’ study based on data from The Geodesy Department of the Kraków City Office (www.bip.krakow.pl)
the beginning of a 5 year period in which proceedings to determine zoning fees can be effectively initiated. In both plans the percentage rate has been fixed at maximum 30% level, with some exceptions when it is at 0% level. The detailed characteristic of these plans is presented in Table 1.

3. Analysis of proceedings to decide zoning fee

3.1. Proceedings initiation

The proceedings to decide zoning fee are started *ex officio* or following a request. In the former case they can be initiated only when an owner or a perpetual usufructuary sells real property before 5 year period passes since the local plan or its change are in force, or a property or its part is legally disposed of [Wolanin 2012]. The information about a vend of a real property is provided by an excerpt from the notarial deed sent by a notary who prepared the contract, the subject of which is disposal of real property. The proceedings upon request are began before selling a real property, when an owner or a perpetual usufructuary submit an adequate request to determine the amount of zoning fee.
Between 2006 and 2011 the Mayor of the City of Kraków received in total 28071 notarial deeds handed over by notaries on the basis of art. 37, sec. 5 of the Act.

In the studied period 291 deeds (1%) referred to real properties covered by directions of local plans: Opatkowice West (226 deeds) and Opatkowice East (65 deeds). Table 2 shows the number of notarial deeds handed over by notaries to the Mayor of the City of Kraków to meet the obligation provided for in the Act in every year of the studied period.

Table 2. The number of notarial deeds handed over by notaries (in 2006–2011) to the Mayor of the City of Kraków to meet the obligation provided for in the Spatial Planning and Development Act, art. 37, sec. 5.

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kraków</td>
<td>2354</td>
<td>7570</td>
<td>4932</td>
<td>5400</td>
<td>3766</td>
<td>4049</td>
</tr>
<tr>
<td>Register unit Podgórze</td>
<td>967</td>
<td>2397</td>
<td>2204</td>
<td>2237</td>
<td>1700</td>
<td>1782</td>
</tr>
<tr>
<td>Local development plan Opatkowice West</td>
<td>27</td>
<td>46</td>
<td>46</td>
<td>31</td>
<td>33</td>
<td>43</td>
</tr>
<tr>
<td>Local development plan Opatkowice East</td>
<td>7</td>
<td>16</td>
<td>20</td>
<td>11</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: authors’ study based on data from Municipal Office of Kraków

In Kraków during 2006–2011 599 proceedings – together ex officio and upon request – were initiated to establish zoning fees. In the studied period 86 proceedings (14%) were related to real properties covered by directions of local development plans: Opatkowice West (64 proceedings) and Opatkowice East (22 proceedings). All the proceedings to establish zoning fees in the studied area were initiated in connection with enacting local development plans, not with their changes. Table 3 presents the number of initiated proceedings to determine zoning fees in successive years. 93% of these proceedings were initiated ex officio. In the studied period 6 requests were put in to establish the amount of zoning fee before selling a real property.

Table 3. The number of initiated proceedings to determine zoning fees in 2006–2011

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Kraków</td>
<td>35</td>
<td>129</td>
<td>111</td>
<td>69</td>
<td>146</td>
<td>109</td>
</tr>
<tr>
<td>Register unit Podgórze</td>
<td>33</td>
<td>109</td>
<td>90</td>
<td>40</td>
<td>72</td>
<td>38</td>
</tr>
<tr>
<td>Local development plan Opatkowice West</td>
<td>7</td>
<td>27</td>
<td>17</td>
<td>5</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Including:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ex officio</td>
<td>7</td>
<td>25</td>
<td>16</td>
<td>5</td>
<td>7</td>
<td>–</td>
</tr>
<tr>
<td>upon request</td>
<td>–</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>Local development plan Opatkowice East</td>
<td>1</td>
<td>14</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Including:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ex officio</td>
<td>1</td>
<td>14</td>
<td>4</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>upon request</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Source: authors’ study based on data from Municipal Office of Kraków
The analysis leads to a conclusion that the proceedings to establish zoning fee are mainly initiated *ex officio*. Though the legislator allows zoning fee to be determined before a real property is disposed of, owners and perpetual usufructuaries rarely exercise this right. The main reason for this is a relatively low level of awareness of an obligatory zoning fee, and vendors usually learn about it at the stage of singing a notarial deed or when proceedings are initiated *ex officio*. However it is worthy to note that the obligation to pay the zoning fee may in many cases be a considerable financial burden to a vendor, and hence the knowledge about its amount before transaction would be a chance to include the fee in the price of a real property or possibly to withdraw from insufficiently profitable transaction.

3.2. Devising a formula for increase in real property value

Adopting a new local development plan or making a change in an existing one is reflected in a value of real property by means of establishing its intended use in a local plan, or legally admissible way of its development. The information on the ways a real property can be developed is one of the basic price-determining factors, and thus value-determining component in the appraisal process that considers market aspect of investment attractiveness of a real property [Wolanin 2011a]. However, it should be emphasized that the sole fact that a local development plan or its change come into effect does not have to result in the establishment of zoning fee. For the fee to be determined it is necessary to demonstrate that a real property gained in value due exclusively to adoption or change of a local development plan, and thus other factors that could influence the valued increase must be excluded. It is possible only after the commissioned assessment of the property value is carried out as part of the proceedings. Appraisal studies are made by certified property appraisers, chosen in compliance with the rules of the Public Procurement Act of 29 of January 2004. The costs of the appraisal are covered by the office.

The method of determining the increase in value of a real property is specified in the art. 37, 2 sentence of the Act. According to its provisions the value increase is determined differently if the existing development plan was changed and if it a new one was adopted. It the first case, that is when an existing plan had been effective before the change was introduced, the increase in property value is defined as a difference between the value of the property, established on the basis of the land intended use, before and after the change of the local development plan. In the latter case, when immediately before the adoption of a local development plan there was no local plan in force, the increase in value is a difference between the value of the property, established on the basis of land intended use after the plan's adoption, and the property value calculated on the basis of its actual use before the plan's adoption.

A different method of calculating the increase in value of a property was introduced by an amendment to the Act that came into force on 10 August 2011. The amendment was intended to take into consideration the judgement of the Constitutional Tribunal of 9 February, file P 58/08, art. 87, sec. 3a. The amendment was added to the Act, which
states that if a local development plan was adopted after 31 December 2003, that is after the previous act adopted before 1 January 1995 ceased to be legally binding, the art. 37, sec. 1, 2 sentence of the Act, concerning the increase of property value, is not applicable if value of a property (established on the basis of land intended use defined in the local development plan adopted before 1 January 1995) is higher than the value of the property calculated on the basis of its actual use after this plan ceased to be legally binding [Act of 2003]. In practice it means that the gain in value is a difference between the value of the property established on the basis of the land intended use after the local plan’s adoption, and its value calculated on the basis of land intended use defined in the local development plan adopted before 1 January 1995.

In the studied area the way to determine the increase in value of property was related to adopting new local plans and not with their changes. Each appraisal study prepared during the proceedings, before the amendment to the Act, defined two market values of a real property: the first took into account the intended use of land after the adoption of the local plan for Opatkowice West or Opatkowice East, the second that took into consideration the actual use of property before adoption of the local plan. In the studied area the change of rules in the Act in the proceedings had a considerable impact on their course. The amendment necessitated the determination in the appraisal study not two, but three market values of a property. Beside those mentioned above, property appraisers also calculated the third market value of a property that took into account the intended use of the land defined in the local general development plan of Kraków.

In the studied period property appraisers completed altogether 82 appraisal studies defining property values that were then used in the proceedings and led to the adoption of a decision. More than half of them – 44 appraisal studies (54%) were completed before the amendment to the Act of 2011. Out of the remaining appraisal studies finished after the amendment, 16 (19%) were used as evidence to determine the increase in property value (or lack thereof) while applying art. 37, sec. 1, 2 sentence of the Act, 21 appraisal studies (26%) while applying art. 87, sec. 3a of the Act, and 1 study (1%) with application of both regulations.

3.3. Administrative decisions

The proceedings to establish zoning fee is decided by an administrative decision. In the proceedings initiated ex officio a decision should be adopted immediately after receiving notarial deed, but after previous adequate evaluation of the evidence, including obtaining assessment of the value of the property and informing former owner of a real property or its perpetual usufructuary that the whole evidence has been gathered to adopt a decision [Wolanin 2012]. This principle of the course of the proceedings is also applied to proceeding initiated upon request. The length of the proceedings in the studied area is presented in Table 4. The divergence between the number of initiated proceedings and the number of final administrative decisions comes from the fact that real properties owned by a few people can be sold by one notarial deed (than separate decisions are adopted).
Table 4. Juxtaposition of dates of initiation and completion of proceedings in the studied area

<table>
<thead>
<tr>
<th>Year of proceedings initiation</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of initiated proceedings</td>
<td>8</td>
<td>41</td>
<td>22</td>
<td>7</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Year of adopting an administrative decisions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2007</td>
<td>3</td>
<td>6</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2008</td>
<td>–</td>
<td>32</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2009</td>
<td>–</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2010</td>
<td>–</td>
<td>2</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>2011</td>
<td>–</td>
<td>–</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>2012</td>
<td>3</td>
<td>7</td>
<td>10</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2013</td>
<td>2</td>
<td>1</td>
<td>21</td>
<td>5</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>2014</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2015</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>In course</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>4</td>
<td>–</td>
</tr>
</tbody>
</table>

Source: authors's study based on data from Municipal Office of Kraków

Data presented in Table 4 show that the majority of decisions in proceedings to determine the amount of zoning fee were not adopted in the year of their initiation. This is closely related to the time of evidence proceedings, especially with the need to make appraisal studies to assess the value of a property. The analysis shows that the proceedings took about 3 years on average.

When the increase in property value occurred, a decision on establishing zoning fee is adopted, whereas when no increase has been found, a decision on discontinuation of proceedings is taken. Other reasons for discontinuation of proceedings are: annulment of the local development plan or its part, withdrawal of a request by any side or selling the property before the decision on the amount of zoning fee was adopted in a proceedings initiated upon request.

In the studied period 86 initiated proceedings led to 128 decisions, of which 123 (96%) were final and enforceable decisions, and the remaining 5 are still in proceedings due to appeals and complaints. Out of all the adopted decisions 92 (72%) determined the amount of zoning fee, 32 (25%) annulled the proceedings and 4 (3%) were ‘mixed’ decisions (in part establishing zoning fee and in part annulling the proceedings). Table 5 presents the types of decision adopted between 2006 and 2015.

Before the amendment of the Act of 2011 there were in total 66 decisions adopted, while 95% of them were decisions establishing zoning fee. The decisions to annul the proceedings adopted in that period referred to the proceedings initiated upon request and were due to withdrawal of requests by one of the side (3 cases).
The amendment has changed the proportions entirely and it led in practice to considerable limitation of decisions charging zoning fees. In subsequent years in total 62 decisions were adopted, half of which were decisions annulling the proceedings initiated *ex officio*. Undoubtedly it was a result of changes in legislation concerning the estimation of increase in property value, because all decisions to annul the proceedings (28) and decisions partly annulling them (3) adopted in years 2012–2013 were the effect of application of art. 87, sec. 3a of the Act. In case of decisions establishing zoning fees or only establishing it partly, the amendment influenced the determination of the increase in value property in 39% of decisions (12).

### 3.4. Appeals and complaints

The proceedings to determine zoning fee consist of two instances. The decisions adopted by the first instance can be appealed by sides to a Local Government Appeals Board (LGAB) within 14 days of the date of notification of the decision. The appeal is brought by means of a body of first instance. Decisions of a Local Government Appeals Board cannot be appealed. The side may however lodge a complaint to a proper Voivodeship Administrative Court (VAC), which assess on the legality of the adopted decision. The number of appeals and complaints and their settlement with regard to proceedings carried out in the studied area are presented in Table 6.

![Table 5. Decisions adopted in proceedings to establish zoning fee in the studied area](image-url)
Table 6. Number of appeals and complaints and their settlements in proceedings to determine zoning fee in the studied area

<table>
<thead>
<tr>
<th>Year of the initiation of proceedings</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>In total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of initiated proceedings</td>
<td>8</td>
<td>41</td>
<td>22</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>86</td>
</tr>
<tr>
<td>No. of completed proceedings</td>
<td>8</td>
<td>41</td>
<td>22</td>
<td>6</td>
<td>4</td>
<td>–</td>
<td>81</td>
</tr>
<tr>
<td>No. of final decisions</td>
<td>9</td>
<td>57</td>
<td>45</td>
<td>8</td>
<td>4</td>
<td>–</td>
<td>123</td>
</tr>
</tbody>
</table>

Including:
- Decisions determining zoning fee: 5, 53, 23, 4, 2, –, 87
- Decision repealing the proceedings: 3, 3, 21, 3, 2, –, 32
- Mixed decisions: 1, 1, 1, 1, –, –, 4

No. of appeals brought to do LGAB in Kraków: 4, 19, 3, 3, 5, –, 34
No. of decisions upheld by LGAB in Kraków: 2, 12, 2, 1, 4, –, 21
No. of decisions overruled by LGAB in Kraków: 2, 5, –, 1, –, –, 8
Other/In course: –, 2, 1, 1, 1, –, 5

No. of complaints lodged to VAC in Kraków: 1, 1, –, –, 4, –, 6
No. of decisions upheld by VAC in Kraków: –, 1, –, –, –, –, 1
No. of decisions overruled by VAC in Kraków: 1, –, –, –, –, –, 1
Other/In course: –, –, –, –, 4, –, 4

Source: authors’ study based on data from Municipal Office of Kraków

In the course of proceedings 34 decisions determining zoning fee have been appealed to the Local Government Appeals Board in Kraków, but 3 appeals were out of time. The analysis shows that most of the objections raised in complaints were related to length of the proceedings, validity of charging of the zoning fee and correctness of the appraisal study. Local Government Appeals Board in Kraków upheld 21 (62%) decisions adopted by the Mayor of the City of Kraków and overruled 8 of them and referred the case for re-examination. The overruling of decisions was justified mainly by the inadvertences in appraisal studies determining the value of a property. In one case the decision of the Mayor of the City of Kraków was overruled entirely, and the proceedings were discontinued. One case is still to be examined. Moreover in 6 cases sides exercised their right to lodge a complaint to the Voivodeship Administrative Court in Kraków. 4 cases are still to be examined.

4. Conclusions

The main proceedings to settle zoning fee consists in gathering evidence material to confirm the occurrence of all three reasons for charging a zoning fee and then adopting a proper administrative decision. The effective initiation of proceedings should occur within the statutory deadline of 5 years from the day a local development plan or its change entered into force. However it is not a deadline for cessation of adjudication on
The analysis showed that the proceedings took around 3 years on average in the studied area. Firstly, the main factor influencing their length was a necessity to confirm the increase in property value due to adoption of a local development plan on the basis of an opinion passed by a property appraiser. He is always selected in accordance with the rules set out in the Public Procurement Act, and therefore the remarks to the procurement procedure, large number of initiated proceedings for establishing zoning fee in Kraków and limited annual financial resources for appraisal studies, in many cases it was impossible to make an appraisal study the same year when the proceedings were initiated. It should be emphasised however that a later date of completing studies has in no way influenced the evidence, because the method of assessment for the purposes of zoning fee is determined by the legislation and it eliminates time-related factor affecting the value of the property. Secondly, the length of the proceedings was undoubtedly affected by appeals brought to the Local Government Appeals Board in Kraków and complaints lodged to the Voivodeship Administrative Court in Kraków. It is noteworthy that the reasons to overrule the decisions of the Mayor of the City of Kraków, which led to re-examination of a case, were mainly objections to appraisal studies, including inadvertences in assessment of the value of the property according to its actual use before the local development plans were adopted. For the above reasons, due to numerous questions concerning interpretation, it would be advisable to make the law more specific in this respect, which would make easier to collect zoning fee in the future. On a side note, the length of proceedings is undoubtedly related to the number of staff responsible for carrying them – Department of Zoning Fee, being the part of the organizational structure of the Geodesy Department of the Kraków City Office. Since in Kraków the area covered by valid local plans is constantly growing larger, and thus the number of proceedings to determine zoning fee grows larger, hiring more people should be considered as a means to shorten the length of the proceedings.

Taking into consideration the content of the verdict of the Constitutional Tribunal of 9 February 2010, by adding art. 87, sec. 3a to the Spatial Planning and Development Act, effectively eliminated the admissibility of charging zoning fee when the use intended in a local plan adopted before 1 January 1995 did not differ from its use after adoption of the local development plan. The amendment to the Act in the studied area influenced 24% of proceedings, which led to decisions to annul the proceedings in their entirety or in part.

References


Legal acts and regulations

Ustawa z dnia 7 lipca 1994 r. o zagospodarowaniu przestrzennym (Dz. U. z 1999 r. Nr 15, poz. 139, z późn. zm.).

Ustawa z dnia 27 marca 2003 r. o planowaniu i zagospodarowaniu przestrzennym tekst jednolity Dz. U. z 2016, poz. 778 z późn. zm.).

Ustawa z dnia 29 stycznia 2004 r. Prawo zamówień publicznych (tekst jednolity Dz. U. z 2015 r., poz. 2164, z późn. zm.).

Ustawa z dnia 26 maja 2011 r. o zmianie ustawy o planowaniu i zagospodarowaniu przestrzennym (Dz. U. z 2011 r. Nr 153, poz. 901).


Wyrok Trybunału Konstytucyjnego z dnia 9 lutego 2010 r., sygn. akt P 58/08 (Dz. U. z 2010 r. Nr 24, poz. 124).

Dr hab. inż. Jarosław Janus
Uniwersytet Rolniczy w Krakowie
Katedra Geodezji Rolnej, Katastru i Fotogrametrii
30-198 Kraków, ul. Balicka 253a
e-mail: j.janus@ur.krakow.pl

Mgr inż. Ewa John
Uniwersytet Rolniczy w Krakowie
Katedra Geodezji Rolnej, Katastru i Fotogrametrii
30-198 Kraków, ul. Balicka 253a
e-mail: john.ewa@wp.pl
Jarosław Janus, Magdalena Łopacka

Summary
Currently in Poland, the problems associated with changes in the functioning of the institutions of the cadastre are becoming very topical. These include the problem of cadastre's location within the structures of the State, the definition of its role and significance in the context of the functions and tasks that it should perform. When introducing the legal concept of real estate cadastre into circulation, the legislator stipulated that until the transformation of the existing land and buildings register is completed, the term cadastre is to signify precisely these land and buildings register. Therefore, a problem arises, concerning the consequences of the parallel use, and the interchangeability of the two terms: 'land and buildings register', and 'cadastre', each of which have their historical, legal and technical references and implications. In this publication, we carry out an analysis of historical and current conditions for the functioning of the land and buildings register, and the real estate cadastre, in terms of the current legislation.

Keywords
real estate cadastre • land and buildings register • geodesic and cartographic law

1. Introduction
In Poland, the issues associated with defining the real estate cadastre, the location thereof within the State structures, determining its role, importance and functions that it should play, remain very much topical and current [Hycner 2004, Wilkowski et al. 2013]. The subject of the real estate cadastre is constantly present in the professional discourse and in the public space, where it is commonly associated with plans to introduce the cadastral tax in the future [Polny 2014]. In the European Union, the concept of real estate cadastre is widely used; and the real estate cadastre itself is the foundation of spatial information [Zevenbergen 2004], and the means to verify ownership.

In Polish legislation and geodetic practice, the concept of cadastre is identified generally (though often incorrectly) with the concept of land and buildings register. Both of these concepts are anchored in the existing legislation and are closely related.
The legislator stipulated that until the transformation of the existing land and buildings register is completed, the term cadastre is to be understood precisely as the land and buildings register (according to the Law of 1989). Thus, the legislator indicates that both of these concepts at the moment are identical (synonymous with each other), while at the same time announcing an unspecified, but necessary transformation of the land and buildings register into the real estate cadastre. Therefore, a problem emerges, pertaining to the consequences of the parallel usage of two terms, which are often used interchangeably, although that is not always correct. It is an indisputable fact that both these concepts have their different and separate origins, as well as different historical, legal and technical references and implications [Felcenloben 2009].

When discussing the issues related to these very significant and important institutions, we need to raise the question of the expediency of replacing the term ‘land and buildings register’ with the term ‘cadastre’ as well as the scope and seriousness of the aforementioned modifications to the law and their indefinite timeline. It is necessary to take efficient legislative action, in order to correct any conceptual discrepancies and adjust the current, unfavourable legal situation in this area [Pietrzak et al. 2012].

2. Real estate cadastre from the ancient times to this day

The beginning of the real estate cadastre dates back to ancient times. Listing and description of land for the protection of property rights was already drawn up in the oldest civilizations. It has evolved over time into the register of lands and their owners, as a basis for calculating land tax. The very word ‘cadastre’ is derived from the Latin. *Caput iugum*, or unit tax, and *capitum registrum* or tax inventory, were introduced in ancient Rome by the Emperor Augustus. In later years, those terms were merged into one – *capitastrum* [Fedorowski 1974], which later gained the form of *catastrum*, closer to the contemporary ‘cadastre’, meaning in practice the type of inventory or register.

The first ordered arrangement of the subject content of cadastral systems in Europe was made in 1853 at the International Statistical Congress in Brussels. At the time, the requirements on the principles of measurement, maps’ scales, rules of drafting borders, records of property and land use, and the general principles of the organization and conduct of cadastral systems have been defined [Brinker and Minnick 1995].

Today, the International Federation of Surveyors (FIG) broadly deals with the subject of real estate cadastre in international context. The Federation defines the cadastre as the current land information system, based on the plots of land, containing a register of property rights to the land, typically including the geometric description of the plots of land in conjunction with other records describing the nature of these rights, as well as, often, the value of the land and the changes thereof [FIG 1995, Kaufmann and Steudler 2000, Parzych and Radzio 2010]. It can be established for fiscal purposes (e.g. the valuation and objective taxation), for legal purposes (transfer of ownership), as an aid in spatial management (e.g. for planning and other administrative purposes), or for enabling the continuity of the development and protection of the environment.
In Europe, the modern real estate cadastre has been defined by the United Nations European Economic Convention in 1996, as an information system consisting of two parts:

1. Graphic – constitutes the counterpart of analogue or digital maps, depicting the size and location of all plots (that is, their geometry).
2. Descriptive – storing the attributes of geometric objects.

In Poland, the history of land cadastre was as stormy as the fate of the entire country. It had the greatest historical significance at the time of the partitions of Poland. That was the time of three different cadastral systems – Austrian, Prussian, and Russian land tax cadastre [Hycner 2004 Felcenloben 2009]. The influences of these systems continue to the present day, because the source materials derived from them are still used today.

The latest normative definition of cadastre was included in the 1947 Decree on land and buildings cadastre, where it was defined as a map-based list and description of land and buildings, which may be separate subjects of property/ownership [Dz. U. 1947, Nr 61, poz. 344].

According to the aforementioned decree, the cadastre of land and buildings served:

a) as the basis for descriptions and plans to designate the property when setting and conducting land registers,

b) to establish and keep mining, water and other registers,

c) to calculate levies, taxes and other public benefits,

d) to provide data on the various fields of technology as well as different areas of social and economic life.

Rural district or municipality was the basic territorial unit of the cadastre. For each cadastral unit, the cadastral operate was prepared, which consisted of maps, registers and files. Cadastral operate included the following data:

a) for the land – location, borders, area, usage, and class,

b) for the buildings – location, purpose, the material from which the given building was made, date of issue and a detailed description,

c) as to the person of the owner – name, parents’ names, and place of residence.

Cadastral operates, official extracts from those operates, and copies or extracts of the maps were treated as public documents and therefore, they were openly accessed. Anyone could view them, as well as receive copies, extracts and maps for a fee. The surveying authorities had the task of maintaining the cadastre operates in compliance with the actual state of the land, and they would conduct constant, periodic revisions for that purpose. The cadastral operate was kept in constant compliance with the entries in the land registers, and the contents of the mining, water and others registries. Judicial authorities, mining, water and other administrative bodies on the one hand, and the surveying authorities on the other hand, were obliged ex officio to communicate, one to the other, within 30 days, any changes that occurred in the files and documents relating to the data. By law, these changes needed to be entered into the books and operates.
The owners (or users) of real estate or their representatives were under obligation to notify the district surveying authorities, within 6 weeks, of making or creating such changes in their properties, which were not disclosed in the land registers, but they were still subject to the inclusion in the cadastral operates. Who did not fulfil the said obligation, was subject to the payment of a fine. General county administration was appointed to rule in these cases. The same principle would also apply to government offices, local government authorities, and public institutions, in so far as a result of their actions, changes resulted in real estate other than their own.

Measurements on the ground were performed by specially appointed individuals, with relevant State-issued certificates, called the ‘expert (or sworn) surveyors’. Cadastre of land and buildings was a public record. Not long after the release of the said decree of land and building cadastre, the concept of property, and private property in particular, has been reassessed. With the development of socialist thought, there emerged the concept of social (common) property, especially with regard to the means of production, as well as the concept of personal property, as the form of private property, however, honoured in limited scope. Due to lack of time, the authorities failed to realize the objectives of the decree, and it was repealed in 1955, giving way to the decree of the land and buildings register. Thus the term of ‘real estate cadastre’ returned to Polish legislation only through the geodesy and cartography Law, thereby co-existing with the term of ‘land and buildings register’.

3. Land and buildings register from the era of socialism until present times

Land and buildings register were created for the needs of the Polish political system at the time, which was then a ‘socialist’ system; and it substituted the land and buildings cadastre, by adapting it for the implementation of the current political agenda. Cadastre could not exist in socialist reality, because it was an institution aimed at securing property rights. Land and buildings register were created by decree in 1955 on the land and buildings register.

The information contained in the register often differed from the actual legal status. This was caused by such practices as field measurements done by surveyors working for government entities, implementing official state policy – rather than by the independent ‘sworn’ experts, as had been done before. An indication of this was, among others, that the course of borders was determined on the basis of measurement of current use as indicated by the interested parties; and there was no need to present the relevant documents. Limits could also be established on the basis of photomaps, while the accuracy and usefulness of such maps for the purpose has been the subject of numerous studies [Kwoczyńska and Noga 2001] and was often questioned because it failed to provide accurate boundaries – in this case, directly in the field. A large part of the borders disclosed in the Land and buildings register operate has no legal nature, also in the cases where the boundaries disclosed in the inventory operate results from a mere redrawing of the contents of the existing cadastral maps [Bieda et al. 2011]. Another phenomenon, which did not favour the protection of property
rights, consisted in restrictions as to the notification about the entries in the register to those persons, whose legitimate interests were involved. This procedure resulted in the formation of discrepancies between the actual situation and the condition as entered in the register. As a result, register of land and buildings did not constitute, and still do not constitute today a reliable source of information. From the very beginning of the register’s existence, the term ‘administering’ received special significance. This term often caused difficulties of interpretation, because ‘administering’ was not defined clearly and precisely enough by any legal provision. This led to infringement on property rights, and opened the way for the appropriation of property.

In 1989, as a result of political changes that began to take place in Poland, the Geodesy and Cartography Law was passed, which abolished the decree on land and buildings register. The Law defined the register, as a uniform, countrywide, regularly updated collection of information on land, buildings, their owners and other natural or legal persons who administered the said land and buildings. Over the twenty-six years of the Law remaining operational, numerous amendments have been passed, and new regulations were issued for the implementation. Noticeable are many changes in the organization and principles of keeping the entries of the register. Work was undertaken on the modernization of the register. This institution has been subjected to digitization and unification. Record keeping was subjected to the competence of district governors.

Dynamic changes in Polish legislation also affected the definition of land and buildings’ register. It changed into a system, which was uniform for the whole country – a regularly updated collection of information on land, buildings and premises, their owners and other administering persons. It began to be conducted using ICT systems, which were different in technical terms, but all implementing the same data model.

The latest amendment to the Geodesic and Cartographic Law introduced another definition of land and buildings register. Today, it is an information system that ensures the collection of information on land, buildings, premises, their owners and other entities administering or managing the land, buildings or premises. At the moment, the inventory operate consists of a number of databases and collections of documents, which provide the basis for the entries to these databases and their changes. The scope of recorded data was amended to include the information on the value of property. The newly introduced regulations provide the basis for carrying out modernization work. The thematic range of databases pertaining to the register of land and buildings is constantly expanding – although it might seem that maintaining a smaller number of attributes, that would be kept up to date, could be a better solution.


The analysis concerns the changes that have occurred in the regulations implementing the Geodesic and Cartographic Law in the years 1969–2015. It pertains to the inventory entries or records, which are the basis for the functioning and organization of the
land and buildings register. The comparison of the content of the executive regulations (Table 1) shows that these changes are very substantial and significant. The amendments and modifications concern almost every item in the register. The analysis shows clearly that the laws on the land and buildings register have evolved significantly over the years, and their current status differs significantly from the original state.

Table 1. An analysis of the changes introduced in entries definitions, in the executive registry between 1969–2015

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject of the registry</td>
<td>– changed</td>
<td>changed</td>
<td>no change</td>
<td>no change</td>
</tr>
<tr>
<td>Object of the registry</td>
<td>– changed</td>
<td>changed</td>
<td>changed</td>
<td>no change</td>
</tr>
<tr>
<td>Plot of land</td>
<td>– changed</td>
<td>changed</td>
<td>no change</td>
<td>no change</td>
</tr>
<tr>
<td>Exceptions from the definition of the plot of land</td>
<td>– changed</td>
<td>changed</td>
<td>no change</td>
<td>no change</td>
</tr>
<tr>
<td>Registry unit</td>
<td>– changed</td>
<td>changed</td>
<td>changed</td>
<td>no change</td>
</tr>
<tr>
<td>Attributes of the plot</td>
<td>– changed</td>
<td>changed</td>
<td>changed</td>
<td>no change</td>
</tr>
<tr>
<td>Attributes of the building</td>
<td>not present</td>
<td>introduced</td>
<td>changed</td>
<td>changed</td>
</tr>
<tr>
<td>Attributes of the property</td>
<td>not present</td>
<td>not present</td>
<td>introduced</td>
<td>changed</td>
</tr>
<tr>
<td>Land properties</td>
<td>– changed</td>
<td>changed</td>
<td>changed</td>
<td>no change</td>
</tr>
<tr>
<td>Contents of the operate</td>
<td>– changed</td>
<td>changed</td>
<td>revoked</td>
<td>not present</td>
</tr>
<tr>
<td>Land Registry</td>
<td>– changed</td>
<td>changed</td>
<td>changed</td>
<td>no change</td>
</tr>
<tr>
<td>Registry groups</td>
<td>– changed</td>
<td>changed</td>
<td>changed</td>
<td>no change</td>
</tr>
<tr>
<td>Exchange of data</td>
<td>not present</td>
<td>introduced</td>
<td>changed</td>
<td>changed</td>
</tr>
</tbody>
</table>

5. Land and buildings register versus real estate cadastre in the current legal regulations

Quoting verbatim from the Article 2 point 8, Geodetic and Cartographic Law [Dz. U. 2015, poz. 520], the land and buildings register were connected inseparably with the term ‘real estate cadastre’, namely – ‘whenever the Law refers to the register of land and buildings register (real estate cadastre) – this means the information system that ensures the collection, updating and sharing, in a uniform manner for the whole country, of the information on land, buildings and premises as well as their owners and other entities administering or managing the land, buildings or premises.’

The term ‘cadastre’ also appears in Article 53a, which reads: ‘Until the transformation of the land and buildings register into the real estate cadastre; the term ‘cadastre’ used in the present Law refers to these register.’ In no implementing act, however, is there a mention of any legal regulations concerning the mode, policies and procedures related to the transformation of the land and buildings register into the real estate
cadastre. In addition, no other Article of the Law in question, not even once, does the concept of cadastre appear.

In the Law on Real Estate Management [Dz. U. 2015, poz. 1774], the issues related to the register of land and buildings appear several times, in the context of land use information for different purposes of real estate management. It should be noted that that the law in question uses the term ‘real estate cadastre’. Nowhere within it there appears the term of ‘land and buildings register. The Law in question refers to the administrative body that keeps the real estate cadastre register, to cadastral value, and to the entries in the real estate cadastre. This is most particularly apparent in Article 170.1. – ‘The body conducting the cadastre shall, by the force of its decision, establish the cadastral value of the property and its entry into the real estate cadastre.’ The Law also contains an Article, which reiterates the provision of Article 53a of the Geodetic and Cartographic Law. Namely, Article 224 states as follows: ‘Until the transformation of the land and buildings register into the real estate cadastre; the term ‘cadastre’ used in the present Law refers to these records.’ One of the objectives of the quoted Article was to establish the uniformity of terms within this scope, between the Geodetic and Cartographic Law (and its pertinent regulations) and other legal acts. Its content is also one of the reasons for the lack of action aimed at transforming the register into a fully-fledged real estate cadastre; as no timeline has been indicated for this process.

Also, the Law on Land and Mortgage Register [Dz. U. 2013, poz. 707], which is one of the most important normative acts related to the protection of property rights, is closely connected with the issue of land and buildings register. The current wording of Article 26.1 states that ‘the basis for the determination and entry of real estate in the land registers is the data from the real estate cadastre,’ although in the form originally adopted, it was the data from land and buildings register that were indicated as the aforementioned basis. Further, in the Article 27.1, it is stated as follows: ‘in the event of inconsistencies between the data of real estate cadastre and the designation of real estate in the land register, the district court shall – at the request of the property owner or perpetual user – rectify the designation of properties based on the real estate cadastre.’ Both cited regulations indicate the great importance of the data contained in the land and buildings register for the content of entries in land registers. Land registers are conducted in order to determine the legal status of the property, and they constitute a guarantee of public faith, which testifies to the weight and significance of the data contained in the land and buildings register.

When analysing the provisions of the law in question, we immediately notice that the term of ‘land and buildings register’ does not appear herein; but that the term ‘real estate cadastre’ is used instead. Furthermore, a footnote in the contents of the Law refers us to the Law of 14 February 2003 On the transfer of land and mortgage register contents to the structure of the land and mortgage register kept in a digitized (computer) system [Dz. U. Nr 42, poz. 363], the Article 25 of which Law states that ‘Until the transformation of the land and buildings register into the real estate cadastre; the term ‘cadastre’ used in Articles 23 and 24 of the present Law, and the amended Laws, refers to these register.’ The said Article 24 refers to the Law, already quoted in this paper, on
Land and Mortgage Register, while Article 23 is contained in the Law of 17 November 1964 of the Civil Code [Dz. U. 2014, poz. 101]. In the latter Law, the concept of ‘real estate cadastre’ also appears, rather than the ‘land and buildings register, as in Article 6288 § 4. ‘When considering the application to change the designation of the property in the land register kept in a computer system, the court shall ex officio verify the data indicated in the application, and the designation of the property as disclosed in the land register, against the data of real estate cadastre, unless there are obstacles preventing the actual carrying out of such check.’

6. Conclusions

It seems reasonable to ask the question whether the ‘land and buildings register’ is a term synonymous with the concept of ‘real estate cadastre’? Is there a real estate cadastre in Poland, currently? Is it feasible, and is it justified to rename the land and buildings register into the real estate cadastre?

The concept and the institution of real estate cadastre had been shaped over centuries, and it accompanied people from the beginnings of civilization. Furthermore, the term has international significance. The word cadastre had its legal significance in Poland after World War II. The cadastre identified the owner, the property holder, and the user of the property. The boundaries of the property were determined by measurements on the ground, carried out by ‘sworn’ measurement experts, and the information contained in the cadastre could be considered reliable and holding the guarantee of public faith.

The qualities of cadastre as listed above meet the general requirements of modern cadastre institutions internationally. We might add at this point that the cadastre, being the register and the map, is the foundation of spatial information, upon which basis any public registers may be created – namely such registers, which are used for the implementation of public tasks.

The land and buildings register were a creation of the state socialist system at the time, and they have been subordinated to its purposes, which also means, that the records then kept were not credible. The information contained in the records differed from the actual facts. The boundaries of the plots were identified in a way that does not meet modern standards of precision, while the owner(s) and the person(s) administering the property were often reported without any legal verification.

The data contained in the land and buildings register are constantly updated on the basis of documents admitted to the national geodetic and cartographic resources. Unfortunately, the modern land and buildings register still contain a lot of defects. The data is characterized by poor quality; there are still discrepancies between the data contained in the records and in the system of land registers. A lot of relevant data on buildings, premises and property values remain missing.

Actions undertaken in Poland since the entry into force of the Geodetic and Cartographic Law, the regulations of 1996 and 2001, and the amendments to the aforementioned regulations, adopted in 2013 and 2015, indeed strive to actually implement the
REAL ESTATE CADASTRE VERSUS LAND AND BUILDINGS REGISTER...

uniformity of concepts: of ‘land and buildings register’ and ‘real estate cadastre’. Currently, the status of existing land and buildings register in Poland does not differ radically from the technical and legal state of the cadastre carried out in the countries of the European Union. However, in order to achieve a true uniformity of the concepts within the principles of recording real estate in the European Union, it would be advisable to change the denomination of ‘land and buildings register’ into that of the ‘real estate cadastre’; which two concepts, in the current Geodetic and Cartographic Law, are treated as synonymous. This should be combined with a fundamental change in the data model, in which property would become the basic unit, rather than, as it is in the present situation, where the register includes plots of land, buildings and premises, summarized in the appropriate category of record units. Unfortunately, in the existing legislation, there is no proposed scope of transformations leading to that conversion of ‘land and buildings register’ into the ‘real estate cadastre’, nor is there a timeline given for instituting such conversion.

References

FIG. 1995. The FIG Statement on the Cadastre. Published by The International Federation of Surveyors (FIG).
Parzyński Z., Radzio W. 2010. Analiza porównawcza modelu danych ewidencji gruntów i budynków z modelu katastru Fig. Rocz. Geomat., T. 8, 1(37).
Legal acts and regulations

Dz. U. 1955 Nr 6, poz. 32. Dekret z dnia 2 lutego 1955 roku o ewidencji gruntów i budynków.

Internet sources

http://www.fig.net/commission7/reports/cad2014/download.htm
IMPLEMENTATION OF THE INSPIRE DIRECTIVE IN POLAND IN THE SCOPE OF SPATIAL DATA ‘LAND USE’ THEME

Joanna Jaroszewicz, Lidia Piotrowska

Summary
The article presents the issues linked to the implementation of the INSPIRE Directive in Poland, within the scope of the spatial data ‘land use’ theme. We present legal regulations in the field of Spatial Information Infrastructure, the tasks of the lead authority in this topic, the participation of other bodies and agencies in the implementation of the tasks of the lead authority, the manner of implementation of these tasks, as well as reflections of the authors upon the changes in competencies and responsibilities, related in particular to the placement of the Chief State Surveyor under the supervision of the minister responsible for construction, planning, zoning, and housing.

Keywords
infrastructure for Spatial Information • INSPIRE • meta-data • ‘land use’ theme of spatial data • zoning and planning standards • list of spatial codes

1. Introduction
‘INSPIRE’ is the Infrastructure for Spatial Information in Europe. The infrastructure is a set of legal, organizational, administrative and technical instruments, along with related services – operations that can be performed using computer software on the data contained in spatial data sets or the related metadata [Litwin, Rossa 2010].

The legal basis of the aforementioned infrastructure is the Directive 2007/2/EC of the European Parliament and of the Council, dated 14 March 2007, establishing an Infrastructure for Spatial Information in the European Community (INSPIRE). In accordance with the above Directive, the Infrastructure for Spatial Information in the European Community should support the development of Community policy in relation to policies and activities that may have a direct or indirect impact on the environment. This infrastructure should be based on Infrastructures for Spatial Information created by the Member States, and the common implementing rules customized thereto, supplemented with measures at Community level. These measures should
ensure the cohesion of Infrastructures for Spatial Information created by the Member States, and the possibility of their use in the Community and trans-border context. Infrastructures for Spatial Information in the Member States should be designed in such a manner as to:

- ensure storing, sharing and maintaining spatial data at the appropriate level;
- make it possible to combine, in a uniform manner, the spatial data from various sources throughout the Community, to facilitate a joint use by multiple users and multiple applications;
- make it possible to share spatial data collected at one level of public authorities, by other public authorities;
- make spatial data available under conditions which do not unduly restrict their extensive use;
- make it easy to search the available spatial data, to evaluate their suitability for a determined purpose, and to know the conditions applicable to their use.

The aforementioned Directive introduces general regulations, aimed at the establishment of INSPIRE for the purposes of Community environmental policies and any policies or activities which may have an impact on the environment.

INSPIRE is based on the Infrastructures for Spatial Information established and operated by Member States [Dyrektywa... 2007]. All Member States were required to transpose the directive into their respective national legal systems. In Poland, the INSPIRE Directive was transposed by the Law of 4 March 2010 on the Spatial information infrastructure [Dz. U. Nr 76, poz. 489 z późn. zm.], hereinafter referred to as the ‘ISI Act.’

The purpose of the construction of the Infrastructure for Spatial Information is the removal of barriers for public access to spatial information and implementing the idea of reusing once acquired spatial information [Bialousz, Bielecka 2011].

Implementation of the INSPIRE Directive should be based on the schedule, which is shown below, broken down into three annexes (Table 1).

In accordance with the INSPIRE directive, spatial data are divided into thematic groups, which were included in the Annexes to the said Directive.

This article examines one of the topics of spatial data, which concerns ‘land use.’ This subject has been included in the third thematic group, as theme 4 (Annex to the ISI Act).

2. Legal regulations concerning the Infrastructure for Spatial Information in Poland

The source of law, containing the rules for the creation and the use of spatial information infrastructure, which include:
Table 1. Implementation schedule for the INSPIRE Directive

<table>
<thead>
<tr>
<th>Deadline</th>
<th>Annex I</th>
<th>Annex II</th>
<th>Annex III</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 December 2010</td>
<td>Search metadata available for sets of spatial data (SD) and services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 November 2011</td>
<td>SD sets available within services of browsing and searching in the INSPIRE geoportal (data do not yet have to be compliant with the secondary legislation (implementation regulations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 November 2012</td>
<td>Recently collected, and fundamentally rearranged SD compliant with the secondary legislation, and available via online services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 December 2012</td>
<td>SD set available within the downloading and editing services (where necessary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 December 2013</td>
<td>Search metadata available for sets of spatial data (SD) and services</td>
<td>SD sets available within services of browsing and searching in the INSPIRE geoportal (data do not yet have to be compliant with the secondary legislation (implementation regulations)</td>
<td>SD set available within the downloading and editing services (where necessary)</td>
</tr>
</tbody>
</table>
Table 1. cont.

<table>
<thead>
<tr>
<th>Deadline</th>
<th>Annex I</th>
<th>Annex II</th>
<th>Annex III</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 October 2015</td>
<td>Recently collected, and fundamentally rearranged SD compliant with the</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>secondary legislation, and available via online services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 December 2015</td>
<td>All executable spatial data services should be equipped with additional</td>
<td>All executable spatial data services linked to recently collected, and</td>
<td>All executable spatial data services linked to recently collected, and</td>
</tr>
<tr>
<td></td>
<td>metadata elements, according to Annex V of the Directive 1312/2014</td>
<td>fundamentally rearranged databases, should be equipped with additional</td>
<td>fundamentally rearranged databases, should be equipped with additional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>metadata elements, according to Annex VI and (where feasible) to Annex</td>
<td>metadata elements, according to Annex VI and (where feasible) to Annex</td>
</tr>
<tr>
<td>23 November 2017</td>
<td>All SD databases compliant with the secondary legislation, and available</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>via online services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 October 2020</td>
<td>All SD databases compliant with the secondary legislation, and available</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>via online services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 October 2021</td>
<td>All executable spatial data services should be equipped with additional</td>
<td>All executable spatial data services should be equipped with additional</td>
<td>All executable spatial data services should be equipped with additional</td>
</tr>
<tr>
<td></td>
<td>metadata elements, according to Annex VI and (where feasible) to Annex</td>
<td>metadata elements, according to Annex VI and (where feasible) to Annex</td>
<td>metadata elements, according to Annex VI and (where feasible) to Annex</td>
</tr>
</tbody>
</table>

Source: authors’ study based on the data from the Main Geodesic and Cartographic Authority [Główny Urząd Geodezji i Kartografii]
1) spatial data and metadata\(^1\) of the infrastructure for spatial information,
2) spatial data services,
3) interoperability of spatial data sets and spatial data services,
4) sharing of spatial data,
5) cooperation and coordination in the field of infrastructure for spatial information,

is the ISI Act [Ustawa o IIP, Dz. U. Nr 76, poz. 489 z późn. zm]. In addition to the rules listed above, the aforementioned Act determines the appropriate authorities for the above range of responsibilities. It defines ‘administrative authorities’ and ‘lead authorities.’ The administrative authority is understood as: government authority or body, or unit of local self-government; another entity, when it is established by law or authorized under agreements to perform public tasks related to the environment.

The concept of ‘lead authority’ is extremely important, because it determines which unit or agency of public authorities is responsible for preparing the data for specific spatial data themes in accordance with the secondary legislation implementing the ISI Act and the INSPIRE directive [Białousz, Bielecka 2011].

The ISI Act lists 12 bodies, being lead authorities in 34 themes of spatial data.

In accordance with the ISI Act, the lead authority in the ‘land use’ spatial data theme is the Minister responsible for construction, local planning, zoning, land use and housing.

In addition to the above mentioned ‘lead authorities,’ the ISI Act also mentions the ‘third parties,’ that is to say, individuals, legal persons or entities without legal personality, other than administrative authorities or their agencies.

The Act stipulates that the infrastructure for spatial information includes spatial data sets, which:

- pertain to Polish territory, or are associated with it,
- occur in electronic format,
- are maintained by:
  a) the authority (government body/agency) or on its behalf – and which are created, updated and made available according to its public tasks and responsibilities; OR
  b) a third party, certified to be included in the infrastructure;
- refer to at least one of the data themes listed in the Annex to this Act [Ustawa o IIP, Dz. U. Nr 76, poz. 489 z późn. zm].

---

\(^1\) Metadata are defined descriptively, as data about data (or information about information). Therefore, these are the ‘data” with the prefix ‘meta’, which comes from the Greek and means: among, between, after, at the back; or change, while in science it is used in the sense of: above, beyond, of something in a different context. In computer systems of document management, metadata are the descriptions of (imprints within) the documents, containing information describing the given document. Whereas, in the case of databases, metadata are definitions of: tables, views, keys, etc. [Litwin, Rossa 2010].
The Act stipulates that wherever a large number of identical spatial data is in posses-
sion of or is stored on behalf of various administrations, the provisions of the Act shall
apply only to the reference version, from which the various copies are derived.

Each lead authority specified above is assigned spatial data theme or themes, indicated
and defined in the Annex to the ISI Act. The annex is divided into 34 themes of spatial data,
into three thematic groups. The first (I) thematic group includes 9 spatial data themes, the
second (II) consists of 4 themes and the third (III), of 21 data themes – see Table 2.

**Table 2. Spatial data themes**

<table>
<thead>
<tr>
<th>First (I) thematic group</th>
<th>Second (II) thematic group</th>
<th>Third (III) thematic group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Coordinate reference systems</td>
<td>1 Elevation</td>
<td>1 Statistical units</td>
</tr>
<tr>
<td>2 Geographical grid systems</td>
<td>2 Land cover</td>
<td>2 Buildings</td>
</tr>
<tr>
<td>3 Geographical names</td>
<td>3 Orthoimagery</td>
<td>3 Soil</td>
</tr>
<tr>
<td>4 Administrative units</td>
<td>4 Geology</td>
<td>4 Land use</td>
</tr>
<tr>
<td>5 Addresses</td>
<td></td>
<td>5 Human health and safety</td>
</tr>
<tr>
<td>6 Cadastral parcels</td>
<td></td>
<td>6 Utility and governmental services</td>
</tr>
<tr>
<td>7 Transport networks</td>
<td></td>
<td>7 Environmental monitoring facilities</td>
</tr>
<tr>
<td>8 Hydrography</td>
<td></td>
<td>8 Production and industrial facilities</td>
</tr>
<tr>
<td>9 Protected sites</td>
<td></td>
<td>9 Agricultural and aquaculture facilities</td>
</tr>
<tr>
<td>10 Population distribution — demography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Area management/ restriction/ regulation zones and reporting units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Natural risk zones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Atmospheric conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Meteorological geographical features</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Oceanographic geographical features</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Sea regions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Bio-geographical regions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Habitats and biotopes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Species distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Energy resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Mineral resources²</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: author’s study based on the ISI Act

² Appendix to the ISI Act.
Spatial data theme ‘land use,’ which is the subject of our analysis in the present article, was included in the third (III) thematic group, as the fourth theme. ‘Land use,’ according to the literature, is the current state of land development, resulting from the conduct of spatial, or land, management [Śleszyński 2013].

According to the definition provided in the annex to the ISI Act, ‘land use’ is understood as land development, in its current and future functional dimension, or as socio-economic purpose of the land, including residential, industrial, commercial, agricultural, forestry, and recreational functions, resulting the planning (zoning) documents.3

In interpreting the above definition, we should pay particular attention to the plural used in relation to the ‘planning documents’. In Poland, there are three levels of planning (local/municipal, provincial, and national) accompanied by three layers of planning documents: the local zoning plan, the municipal study of conditions and directions of spatial management, and the spatial development plan of the province. However, it should be noted, that in this definition of ‘land use’ spatial data theme, reference is made to the designation (the functional dimension) of land. It should be noted that the use of the land is defined only by one of the three planning documents listed above, that is, the local zoning plan. The study of conditions and directions of spatial management determines the spatial policy of the community, rather than the use of the land. The spatial development plan is the document most general of all three mentioned above, which – just like the aforementioned study – does not determine the land use in the area. Considering the above, the question arises, what are the planning documents pertinent to the spatial data sets in the discussed theme?

In addition to the ISI Act, the laws that apply in the field of Spatial Information Infrastructure, include, among others:

- Regulation by the Minister of Internal Affairs and Administration dated 20 October 2010 On keeping the records of spatial data sets and services covered by the Infrastructures for Spatial Information [Dz. U. Nr 201, poz. 1333];

3 Ibidem.
• Regulation by the Minister of Internal Affairs and Administration of 13 September 2010 On the Council for Spatial Data Infrastructure [Dz. U. Nr 183, poz. 1233];

The above regulations may give rise to problems of interpretation and application. Therefore, a number of studies on INSPIRE may be very helpful for the administration bodies, lead authorities and third parties. For instance, on the Head Office of Geodesy and Cartography website4, one can get acquainted with such studies and reports, divided according to the extent of information they cover:

• quality of data in INSPIRE,
• publication of metadata for external entities,
• a conceptual model for developing specification for interoperability of spatial data infrastructures,
• results of monitoring the implementation of INSPIRE,
• data specification,
• web services within INSPIRE,
• guidance on the monitoring and reporting under the INSPIRE Directive,
• identification of spatial data sets and services for INSPIRE thematic groups I and II,
• Polish national metadata profile in the field of geo-information,
• the status of the implementation of INSPIRE in Poland,
• definitions and scopes of data themes within INSPIRE.

Additional support for the above listed bodies and persons is provided in the form of textbooks – materials for experts in the course of training (on basic and expert levels), developed as a part of the project titled ‘Educational support the implementation of the INSPIRE Directive in local government administration, in the context of raising the quality of service and operational efficiency’.5

Another interesting project is Geo-information in practice - INSPIRE ACADEMY, which facilitated the publication titled ‘Get inspired! Geo-information in local municipal self-government’ (UNEP GRID Warszawa, Warsaw 2011). The subject of the project

in question, as well as the publication, coincides with the objectives pursued by the Chief State Surveyor, related to the implementation of the INSPIRE Directive in Poland [Andrzejewska et al. 2011].

Lead authorities, on their own, also issue statements, commission expert studies and publish reports, and they conduct research and analyses for their own needs related to the execution of their assigned tasks and responsibilities associated with INSPIRE. For example, the Minister responsible for the spatial data theme of ‘land use’ has so far commissioned, among others:

- developing a handbook dedicated to planners and employees of local governments titled ‘Infrastructure for Spatial Information,’ in e-book format [Litwin, Borsa 2013];
- conducting the analysis of the harmonization of spatial data contained in the study ‘Developing a strategy for the harmonization of the subject land use planning (land use) on a pilot project in municipalities, in the harmonization of the collection, metadata and spatial data services’ (UNEP GRID Warsaw);
- drafting the document on ‘CATALOGUE OF LAND USE ITEMS in the field of spatial data, land use theme, in reference to Chapter III of the Annex to the Law of 4 March 2010 on the Infrastructure of Spatial Information’ [Jaroszewicz et al. 2013];
- conducting the analysis of planning documents in terms of their inclusion in the resources of a national infrastructure for spatial information (UNEP GRID Warsaw);
- drawing up a report on the analysis of applicable law in the area of technical requirements for electronic documents, taking into account the Infrastructure for Spatial Information created in Poland [Litwin 2012].

3. Legally appointed asks and responsibilities of the lead authority for the ‘land use’ theme of spatial data

Tasks and responsibilities of lead authorities bodies have been defined explicitly in the ISI Act. These tasks and responsibilities can be described as follows:

- creation and implementation of training programmes covering in particular issues pertaining to the creation, updating and sharing of metadata and agreeing training plans;
- making available, to the authorities and third parties included in the Infrastructure for Spatial Information, any information necessary to perform tasks of implementing technical solutions to ensure interoperability of spatial data collections and services;
- approval (or taking the initiative) on the inclusion of the spatial data sets and services belonging to third parties in the Infrastructure for Spatial Information;
- creating, maintaining and developing the Infrastructure for Spatial Information in cooperation with other authorities and third parties;

6 Resources of the Minister responsible for construction, spatial planning, land use and management, and housing.
• creating and maintaining the common elements of the Infrastructure for Spatial Information (in coordination with other bodies, by agreement);
• monitoring and reporting on the development works pertaining to the creation and operation of the Infrastructure for Spatial Information.

Originally, that is, from the date of entry into force of the ISI Act (7 June 2010), until the date of entry into force of the Act of 19 November 2015 Amending the Law on Public Government Administration and other acts, in connection thereto the Regulation was issued by the President of the Council of Ministers of 9 December 2015 Amending the regulation on the detailed scope of activities of the Minister of Infrastructure and Construction, the Minister responsible for matters of planning, zoning and land use (presently, the Minister for Infrastructure and Construction, and earlier the Minister of Infrastructure; Minister of Transport, Construction and Maritime Economy; and the Minister of Infrastructure and Development) only administered the spatial data theme of ‘land use.’ Currently, according of the above Law and Regulation, the said Minister also supervises the Chief State Surveyor, who, according to the ISI Act, carried out the tasks specified in that Act on behalf of the Minister responsible for public administration.

Law amending the Law on Government Administration and other Acts reworded Article 9a of the Law on Government Administration, as well as changing the name of the pertinent department of government (formerly the department was called: construction and local planning; land use planning and housing). The current department of construction, land planning, land use and housing also includes matters related to geodesy and cartography.

Prior to the abovementioned changes, it was the Minister in charge of Public Administration who implemented (with the aid of the Chief State Surveyor), the coordination tasks, relating to:
• the coordination of creating, maintaining and developing infrastructure,
• the cooperation with the European Commission, and transfer of information and reports thereto, concerning the establishment and operation of infrastructure,
• the monitoring of the course of works on the creation and operation of infrastructure and its development,
• the organization of projects and activities supporting the development of infrastructure,
• the cooperation with the governors and local government units in their actions relating to the creation and operation of infrastructure.

In addition to the above tasks, the Chief State Surveyor also performed the task of lead authority, consisting in organizing, coordinating and monitoring the activities related to the creation, maintenance and development of the Infrastructure for Spatial Information in the scope of the assigned spatial data themes, ensuring the compatibility of these activities, including the technical solutions introduced, with the regulations for Spatial Information Infrastructure.
In addition, the Chief State Surveyor:

- was responsible for the contacts with the European Commission in matters related to the ISI Act; and for operating the Contact Point in charge of providing information on the implementation of the INSPIRE Directive in Poland, and for Polish reports to the European Commission (including documents for monitoring and reporting INSPIRE),
- created and maintained the national Geoportal, as the central point of access to the National Spatial Data Infrastructure,
- conducted publicly available records of spatial data sets and services, covered by the Infrastructure for Spatial Information, and equipped them with uniform identification tags.

Source: author’s study based on the ISI Act

**Fig. 1.** Co-ordinating body and lead authorities in ISI (before the change in legislation)
Figure 1 shows the coordinating body for the implementation of the INSPIRE Directive in Poland, before the entry into force of the Law amending the Law on Government Administration and other acts – this coordinating function was performed by the Chief State Surveyor (shown in red), supervised by the Minister responsible for Public Administration; as well as 12 lead authorities (the yellow colour indicates the Minister responsible, prior to the entry into force of the aforementioned laws and regulations, for one spatial data theme of ‘land use’).

Considering the above changes made by the force of the aforementioned Law and Regulation, it should be noted that the Minister of Infrastructure and Construction, who heads the government administration divisions of: construction, local planning
spatial management, land use and housing; as well as communication; and transport, is now responsible for all the INSPIRE theme in Poland. Therefore, the scope of the Minister's competence has been extended to include the competence of the minister responsible for public administration, performing tasks with the help of the Chief State Surveyor [Ustawa... 2015].

Figure 2 shows the coordinating body for the implementation of the INSPIRE Directive in Poland, after the entry into force of the Law amending the Law on Government Administration and other acts – this coordinating function was performed by the Chief State Surveyor (shown in red), currently supervised by the minister responsible for construction, local planning spatial management, land use and housing; as well as 12 lead authorities (the colour blue represents the Minister, who after the entry into force of the above Law and regulation, not only has the power over one spatial data theme, i.e. 'land use', but also the supervision of the Chief State Surveyor and responsibility for the entire Infrastructure for Spatial Information in Poland).

4. Participation of other bodies, units and agencies in the implementation of the tasks of lead authority within the spatial data 'land use' theme

Lead authorities in the given theme (or themes) of spatial data may cooperate with other administrative bodies, institutions or entities.

And so, the minister responsible for matters of construction, local planning, spatial management, land use and housing, in the performance of duties (duties) in the spatial data theme of 'land use', has undertaken co-operation with such bodies and institutions as the Institute of Spatial Planning and Housing in Warsaw, Institute of Urban Development in Kraków, Polish Academy of Sciences, UNEP / GRID Centre in Warsaw, Society of Polish Town Planners, Institute of Spatial and Cadastral Systems SA, Warsaw University of Technology, as well as independent experts. This co-operation is mainly based on the above entities conducting various types of studies, reports, analyses, and research projects for the purposes of the Infrastructure for Spatial Information, in the spatial data theme of 'land use'. It also involves participation of these organisations (as members) in the team set up with particular purpose to support the aforementioned Minister in the implementation of statutory obligations resulting from the INSPIRE Directive. The Team for the spatial data 'land use' theme was established by the Regulation No. 8 of the Minister of Transport, Construction and Maritime Economy on 12 April 2013 (and amended by Regulation No. 35 of 5 November 2013), and it was subdivided into three thematic groups:

- The first group dealt with issues of local planning and zoning,
- The second group dealt with issues of infrastructure for spatial information,
- The third group dealt with issues of metadata.

---

Within the framework of the above three working groups, work was conducted mainly related to the analysis of changes in the legislation on spatial planning and development, in order to align them with the provisions of the spatial information infrastructure (in particular, the work related to the development of standards for planning and digitization of the planning documents prepared at the local/municipal level), as well as the technical work related to, among others, the metadata profiles.

After the merger on 27 November 2013 of two ministries, i.e. The Ministry of Transport, Construction and Maritime Economy and the Ministry of Regional Development [Rozporządzenie… 2013], the abovementioned Team ceased their work. The official information of the Ministry indicates that the Team, after the aforementioned merger of the ministries, had no legal grounds to continue its operations, as on 27 November 2013 the Ministry of Transport, Construction and Maritime Economy was effectively abolished, while the Ministry of Regional Development was transformed into the Ministry of Infrastructure Development. In the new Ministry, works were carried out on another Regulation, which involved the reactivation of the work of the Team, however, staffed with new and different team members. Regulation No. 20 of the Minister of Infrastructure and Development of 2 July 2015 On the appointment of the Team for spatial data ‘land use’ theme again re-established the aforementioned Team, as a subsidiary body of the minister responsible for construction, local planning, land use, zoning, and housing.

According to § 2.1 of the Regulation cited above, the tasks of the Team were to include the analysis of legal, technical, organizational and financial considerations, and making the recommendations to the lead authority as pertains to the spatial data ‘land use’ theme, as well as policies and solutions regarding:

1) legislative changes in terms of regulations on infrastructure for spatial information;
2) the standard model⁸ of spatial data sets for spatial planning;
3) field-specific metadata profile;
4) reference resources for planning documents, their sources and conditions for their sharing;
5) The national classification of land use and development of mapping rules for the HILUCS classification⁹;
6) The minimum requirements for base maps (map backgrounds) for the purpose of spatial planning, including a list of eligible geodetic and mapping materials;
7) The standardization and visualization of spatial data sets for planning purposes;
8) The integration of spatial data in spatial planning;

---

⁸ Data model is an ordered, digital description facilitating the representation of selected features of reality. General data models (raster, or vector based) used in spatial information systems, like data recording models in databases (relational, object-oriented, and relational-object oriented) are largely independent of the IT tools used – other than the format of the records [Olszewski, Gotlib 2013].

⁹ Hierarchical INSPIRE Land Use Classification System.
9) Other issues related to the creation, development and maintenance of the Infrastructure for Spatial Information in the field of land use and land planning, including those relating to recommending draft plans, and the participation of the Minister, as the lead authority, in the creation and operation of the said infrastructure for the following years [Zarządzenie… 2015].

In relation to the Team’s task referred to in point (6) above, we should note that the Team should not be concerned with ‘the minimum requirements for base maps (map backgrounds),’ as specified in the Regulations which re-activated it; but instead, it should be concerned with a set of reference data for spatial planning, and with developing the standard cartographic visualization, which should provide the base map for the presentation of data in the ‘land use’ theme.

It must be emphasized that the competent authorities in the spatial data ‘land use’ theme should bear in mind that is crucial in the planning process to integrate different kinds of data, and carry out the efficient and multi-criteria analysis of that data [Białousz 2013].

In relation to the tasks set out in the abovementioned Regulation No. 20, past tense was used (“were to include’), because despite the fact that the above Team was reactivated, did not perform any work (it remained inactive), and considering the creation of a new ministry, i.e. The Ministry of Infrastructure and Construction, it must be presumed from the date of the creation thereof, the Team had no legal basis for the operation (as was the case in the situation of merging the Ministry of Transport, Construction and Maritime Economy with the Ministry of Regional Development).

When analysing the period of the actual operation of the Team (i.e. from the entry into force of the Regulation of 12 April 2013, until the merger of the aforementioned ministries), it should be noted that the Team provided very substantial support in the performance of tasks and responsibilities of the minister at the time. The findings and arguments, developed during the meetings of the Team, were the basis for initiating the work on adapting the legislation on planning and spatial development to the regulations in the field of infrastructure for spatial information.

The question then arises whether, in connection with the legal changes, consisting in adding the ministerial responsibilities for geodesy and cartography to the areas of ‘construction, spatial planning, land use, and housing,’ as well as extending the supervision over the Chief State Surveyor by the minister responsible for construction, spatial planning, land use, and housing, the Team will be appointed for the third time, as its advisory body, or, whether the issues within the scope of the Team will be taken over, for instance, by the Chief Commission for Urban Planning and Architecture.

It is worth noting the organizational chart, included in point 1.2 of the ‘Programme for the Development of Infrastructure for Spatial Information at the Ministry of Infrastructure and Development for the years 2014–2015’ [Program Budowy... 2014], prepared by the said Ministry, according to which chart, the then Minister of Infrastructure and Development, as the competent authority in the spatial data ‘land use’ theme, should conduct on-going co-operation not only with the mayors, municipal, town and village authorities, with the Council of Spatial Information Infrastructure, or
with the Point of Contact in this theme, but also with the Team for spatial data 'land use' theme. Practice shows, however, that the scheme unfortunately did not reflect reality, as the said Team (after the formation of the aforementioned Ministry) did not operate.

The provisions of the ISI Act do not exclude cooperation of lead authorities with external actors and experts who are not administrative bodies, for instance by commissioning research and other studies and expert opinions.

At this point, it is worth mentioning that according to Article 21 paragraph 1 of the ISI Act, the Council of Spatial Data Infrastructure is affiliated with the minister responsible for public administration. The Council is to issue opinions on draft legislation, standards, organizational, scientific and educational measures, plans and reports on the Spatial Information Infrastructure, as well as take initiative on improving the Spatial Data Infrastructure.

The composition of the above Council is explicitly defined in the ISI Act. The minister responsible for construction, spatial planning, land use, and housing, before the changes in the law described above, worked with the Council of Spatial Data Infrastructure as the lead authority in the spatial data 'land use' theme, and the member of that Council. The said Minister, as a member of the Council, proposed to the Council of Infrastructure for Spatial Information that special sections for spatial data 'land use' theme be created on the www.radaip.gov.pl and www.gugik.gov.pl websites.

Now that the above-described changes in the law have been introduced, the question arises whether the Council of Spatial Information Infrastructure, appointed by the minister responsible for public administration, which, in accordance with Article 19 of the ISI Act performs tasks (with the assistance of the Chief State Surveyor) involving the creation, maintenance and development of Spatial Data Infrastructure and which keeps the European Commission informed and provides it with reports concerning the creation and operation of this infrastructure will continue to function, but now affiliated with a different Minister? Or, instead, should the provisions of the ISI Act be amended and adapted to the changes introduced by the Law Amending the Law on Government Administration and other laws, as well as the Regulation Amending the Regulation on the detailed scope of activities of the Minister of Infrastructure and Construction?

5. Manner of implementation of tasks by the Minister competent in the ‘land use’ theme of spatial data

The minister competent in the field of construction, spatial planning, land use, as the lead authority in the spatial data 'land use' theme, after the entry into force of the ISI Act, commissioned a series of studies, expert opinions and reports, and ordered a number of analyses and studies on the implementation of the INSPIRE Directive in the scope of the said theme. Some of these were designed to identify areas, in which legislation changes should be introduced. Notwithstanding the above, the Law on Spatial Planning and Development still has not been changed or adapted to the INSPIRE Directive, the ISI Act, or the pertinent regulations.
It should be noted that already in the Draft for the Spatial Data Infrastructure (SDI) Development Programme, stage covering the years 2012–2013, in the section relating to legal foundations, it was indicated that ‘It seems proper to consider the need to amend the Act of 27 March 2003 on spatial planning and development, aimed at addressing the conditions resulting from the Law on the Infrastructure for Spatial Information’ [Ustawa… 2003].

The main legal sphere, which should be regulated in terms of the provisions for spatial planning and development, should be solving problems in the field of digitization of planning documents, i.e. the studies of conditions and directions of spatial development at municipalities, and local development (zoning) plans. It can be argued that the current legal status does not regulate this issue at all. The consequence of this legal status can be seen in discrepancies between the findings, that is, among other things, the incompatibility between the local development plans, and the records of land and buildings [Izdebski, Malinowski 2014].

The present legal problem can be solved by development the so-called planning standards that would ensure the quality of planning data, and the harmonization thereof with reference data sets – for local development plans, with records of land and buildings (EGiB), Geodetic Records of Public Utilities (GESUT), etc.; for municipal studies of conditions and directions of spatial development, with BDOT10k, etc. The planning standards would also define a standard data model (the conceptual model, the UML\textsuperscript{10} and GML\textsuperscript{11} application models, dictionaries, HILUCS mapping rules to the national code list of land use, which should also be developed, and standards for data visualization, that is, the development of standard cartographic presentations and methods of making them available through geo-portals).

In reference to sharing spatial data sets via the geo-portals mentioned above, which include local zoning plans, we can point, for example, to the Geoportal Kielce, which was designed based on the INSPIRE concept (Figure 3). This geo-portal provides, among other things, access to layers of local development plans, including plans in course of preparation, as well as the layer of urban planning studies (municipal studies of conditions and directions of spatial development).

It is worth noting at this point that the current local plans are drawn up based on the Regulation of the Minister of Infrastructure of 26 August 2003 On the required scope of the projected local zoning plan [Rozporządzenie… 2003]. An annex to the above Regulation sets out the basic colour, visual and letter symbols for the designation of areas, to be used while drawing the local plan. Therefore, the competent authorities responsible for drawing up local plans, introduce additional markings of the designation (purpose or function) of the areas, which are not contained in the above Annex, and which are present in the locality for which the plan is drawn up (Table 3).

\textsuperscript{10} Unified Modeling Language

\textsuperscript{11} Geography Markup Language
Fig. 3. Local land use (zoning) plans for the city of Kielce

Table 3. Basic colour and visual symbols used while drafting spatial development (land use) plans in Poland

<table>
<thead>
<tr>
<th>No.</th>
<th>Designation</th>
<th>Letter symbols</th>
<th>Colour of the designation in the drawing/plan/design</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2. Business and commercial (service) use areas</td>
<td>U</td>
<td>red</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Residential areas with single-family houses</td>
<td>MN</td>
<td>light brown</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Residential areas with multi-family houses and high rise</td>
<td>MW</td>
<td>dark brown</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Retail and commercial use areas</td>
<td>U</td>
<td>red</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Sports and recreational areas</td>
<td>US</td>
<td>green-red hatching</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------</td>
<td>----</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Areas with retail and commercial venues with sales area over 2000 m²</td>
<td>UC</td>
<td>red-dark grey hatching</td>
<td></td>
</tr>
</tbody>
</table>

### 3. Agriculture areas

<table>
<thead>
<tr>
<th>3.1</th>
<th>Agricultural and livestock land</th>
<th>R</th>
<th>yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2</td>
<td>Areas with production services for agriculture, and livestock farms, horticulture, forest and fisheries</td>
<td>RU</td>
<td>yellow-red hatching</td>
</tr>
<tr>
<td>3.3</td>
<td>Built-up areas in agriculture, horticulture, and livestock farms</td>
<td>RM</td>
<td>yellow-light brown hatching</td>
</tr>
</tbody>
</table>

### 4. Industrial areas (technical and production)

<table>
<thead>
<tr>
<th>4.1</th>
<th>Areas with manufacturing, warehouse and utility buildings</th>
<th>P</th>
<th>purple</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2</td>
<td>Mining and extraction areas</td>
<td>PG</td>
<td></td>
</tr>
</tbody>
</table>

### 5. Greenery and water areas

<table>
<thead>
<tr>
<th>5.1</th>
<th>Green spaces under legal environmental protection</th>
<th>ZN</th>
<th>dark green</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>Unimproved forest land</td>
<td>ZL</td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>Regulated green spaces such as parks, gardens, greenery accompanying building developments, lawns, arboretums, alpine gardens, hillforts, burial mounds, historic fortifications and earthworks</td>
<td>ZP</td>
<td>green</td>
</tr>
<tr>
<td>5.4</td>
<td>Allotment gardens</td>
<td>ZD</td>
<td></td>
</tr>
<tr>
<td>5.5</td>
<td>Cemeteries</td>
<td>ZC</td>
<td></td>
</tr>
<tr>
<td>5.6</td>
<td>Flood risk areas</td>
<td>ZZ</td>
<td>light green hatching against the background in the colour applicable to the given designation</td>
</tr>
<tr>
<td>5.7</td>
<td>Surface water areas / seas and oceans</td>
<td>WM</td>
<td>light blue</td>
</tr>
<tr>
<td>5.8</td>
<td>Inland surface water areas (rivers, lakes, ponds, streams, canals)</td>
<td>WS</td>
<td></td>
</tr>
</tbody>
</table>

### 6. Transportation areas

| 6.1 | Public roads | KD | white |
Table 3. cont.

<table>
<thead>
<tr>
<th>No.</th>
<th>Designation</th>
<th>Letter symbols</th>
<th>Colour of the designation in the drawing/plan/design</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6.2</td>
<td>Internal roads</td>
<td>KDW</td>
<td></td>
<td>light grey</td>
</tr>
<tr>
<td>6.3</td>
<td>Water transportation, water routes</td>
<td>KW</td>
<td></td>
<td>dark blue</td>
</tr>
</tbody>
</table>

7. Areas of technical infrastructure and utilities

<table>
<thead>
<tr>
<th>No.</th>
<th>Designation</th>
<th>Letter symbols</th>
<th>Colour of the designation in the drawing/plan/design</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Electricity</td>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Gasworks</td>
<td>G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3</td>
<td>Waterworks</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4</td>
<td>Sewage</td>
<td>K</td>
<td>dark grey</td>
<td></td>
</tr>
<tr>
<td>7.5</td>
<td>Telecommunications</td>
<td>T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.6</td>
<td>Waste management</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.7</td>
<td>Power plants</td>
<td>C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Annex to the Regulation by the Minister of Infrastructure of 26 August 2003 on the required scope of the projected local zoning plan [Rozporządzenie… 2003]

Source: author’s based on the decision no. LVII/1710/2009 by the Warsaw Metropolitan Council of 18 June 2009 revoking of the local zoning plan for Rakowiec area [Uchwała… 2009]

Fig. 4. Areas in the visual Annex to the local zoning plan in two versions according to the Regulation on the required scope of the projected local zoning plan, and complying with the symbols according to the INSPIRE specification
Figure 4 presents a fragment of the zoning layer of the sample visual Annex to the local plan in two versions: the symbols complying with the Regulation, and the symbols according to the specifications of INSPIRE. The difference is not just in the visual layer (use of other colour symbols), but – mainly – in the conceptual model. For example, green recreational areas and cemeteries belonging to the category of green areas (according to the Regulation) and presented in green, according to the HILUCS code list belong to the category of municipal services, and in accordance with the specifications of INSPIRE Directive, are presented in grey. In this case, only the economic function is depicted, without any predictive information on other aspects of the functional areas in the draft plan, including landscape aspects.

It is important, not only from the point of view of the INSPIRE Directive, that planning standards are developed for the planning document drawn up at the regional level, i.e. the spatial development plan for a voivodship (province). Repeatedly amended Law on Spatial Planning and Development has been in force since July 2003, but no Regulation governing the scope, symbols, nomenclature and graphical layer of the aforementioned plan has been developed by the minister to date. Referring to the standards of planning, which were mentioned above, it should be remembered that the previous minister, i.e. the minister responsible for construction, spatial planning, land use, and housing (Minister of Transport, Construction and Maritime Economy), together with the Team for the spatial data ‘land use’ theme, started working on these standards. The idea of their endeavours was that the planning standards should be introduced by the Regulation of the Minister and used widely, so that every planning document, drawn up at the local or municipal level was developed in accordance with those standards. For this purpose, a study was prepared, titled the ‘Catalogue of Land Use Items in the field of spatial data, land use theme, in reference to Chapter III of the Annex to the Law of 4 March 2010 on the Infrastructure of Spatial Information’ [Jaroszewicz et al. 2013] developed in 2013 by the Department of Geodesy and Cartography at the Warsaw University of Technology, as commissioned by the Ministry of Transport, Construction and Maritime Economy. It included the discussion of thematic items of spatial data, associated with:

• the visual annex to the resolution of the municipal council on the adoption of the local development plan (Polish abbreviation: MPZP);

• the visual annex to the resolution of the municipal council, containing the drawing of directions for spatial development of the city or municipality – Study of Conditions and Directions for Municipal Development (Polish abbreviation: SUiKZP) [Jaroszewicz et al. 2013].

The developed ‘Catalogue of land use items...’ can still serve as a basis for standardization, leading to the established structure of database for the storage and sharing of information on the spatial planning and development. Such a solution would allow future analysis of the changes in the above field; would make it possible to evaluate the effectiveness of the regulations related to spatial planning and spatial development, and
it would facilitate the development of new planning documents. The link to reference datasets would improve the quality and reduce the time of preparing draft planning documents’ [Jaroszewicz et al. 2013].

The development of such a catalogue of items is one of the basic elements in creating standards for spatial data. The introduction of uniform standards in terms of spatial data structures, data sharing, and data presentation would improve all stages of work on local plans, both for persons developing such plans and for decision-makers. Furthermore, it can contribute to the development of public participation in the planning process. The main assumptions for the concept of this publication were as follows:

- developing extensible and hierarchically organized code lists, that would provide the flexibility of solutions and facilitate the search for information through the ontological approach,
- ensuring harmonization with the reference data, included in the visual Annex to the draft local development plan (e.g. GESUT, EGiB, PRG databases,¹² central records of environmental protection, etc.),
- facilitating the mapping to the INSPIRE data model, while simultaneously taking into account the requirements and experiences of spatial planning in Poland,
- developing a flexible solution, in which it is possible to record both the general and very specific, detailed regulations of the local zoning plan (plans, archives, as well as plans created today); a solution that is relatively easy to update when changing laws, which does not limit the creative planning process.

The developed ‘Catalogue of land use items…’ was supposed to be the starting point for extensive public consultation, including consulting with local governments and the milieu of spatial planners. The catalogue form, as it is prepared, is understandable also for people who are unfamiliar with the formats of UML applications.

Classes of items, introduced in the ‘Catalogue of land use items…’ can be mapped to the PLU INSPIRE data model. The developed code lists, specifying the destination of areas, have been created on the basis of a large (more than 300), representative sample of existing, adopted local development plans, from different regions of Poland, with varying characteristics.

Based on the analysis of these plans, as well as applicable laws regulations and existing reference databases, other items were also defined, included in the plans, affecting land use (classes of items, mapping to the Supplementary Regulation class in the PLU INSPIRE model).

This paper is therefore an attempt to standardize the nomenclature of the items included in Polish local land use plans with their simultaneous harmonization of legal definitions and reference databases. At the same time, in our study we reject the concept of basing code lists, specifying the use of the land, directly on HILUCS. The creators of the ‘Catalogue of land use items…’ took the stand standards need to be

---

¹² Polish abbreviation of: Państwowy Rejestr Granic (State Inventory of Borders)
created that would be tailored to the local spatial development plans, to the legal acts and regulations developed and applied in Poland; and based on that, Polish lists of land designations (or regional lists) should be developed for mapping, HICULS being their highest level of the hierarchy. At present, the prevailing opinion is that the highest level of the hierarchy of the state-wide nomenclature should be a non-extension, finite list, compatible with HILUCS, while the extension should be possible only on the lowest level of a three-level hierarchy (this is reflected, for instance, in the terms of reference for the drafting of standards for planning databases, included in the website of the Ministry of Infrastructure and Construction).

The prepared ‘Catalogue of land use items…’ lists a number of demands for further actions, including:

- to carry out extensive inter-departmental consultations in order to standardize the proposed code lists associated with the types of items belonging to the so-called external themes (reference projects included in the local development plan), in particular those relating to the protection of cultural heritage and monuments, nature conservation, environmental protection, water management, geology, mining, agriculture, forestry, technical infrastructure and communication etc.,
- to develop agreed, harmonized code list: zoning (area designation) codes and HILUCS codes,
- to define acceptable relationship between the attribute values: the zoning (area designation) and the study of conditions (SUIKZP), as selected from the code list ‘List land use study,’ and attribute values: basic purpose (MPZP, local development plan), selectable from the code list: ‘List land use plan,’
- in view of the changes in the geodetic and cartographic law, to verify and to develop acceptable cartographic materials, which will provide map base for the development of planning documents,
- to develop UML and GML application schemes,
- to carry out pilot studies in selected municipalities,
- to develop a methodology for the transformation of existing spatial data sets and new data sets in order to adapt them to the relevant standards,
- to develop a training program in numerical standards for planning studies, and to conduct the training itself.

One of the recommendations contained in the ‘Catalogue of land use items…’ has been defined as: the reconciliation and standardization of letter symbols used for areas covered by local development plans (MPZP) – Table 4.

It is worth noting that in the ‘Catalogue of land use items…’ the proposed code lists have a hierarchical structure, and is acceptable to extend the lists on their respective levels. For residential built-up areas, included in Table 4, the hierarchy is as illustrated in Figure 5.
Table 4. Sample descriptions of residential and services areas in local development plans

<table>
<thead>
<tr>
<th>Symbol according to the Regulation by the Minister of Infrastructure</th>
<th>Symbol according to the BGWM PLANY report</th>
<th>Description resulting from the analysed planning documents (analysed local development plans presented in Annex 3 ‘Catalogue of land use items…’)</th>
<th>Proposed symbols (full list in included in Table no. 49 in the ‘Catalogue of land use items…’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN – residential areas with single-family houses</td>
<td>MN – residential areas with single-family houses</td>
<td>M – built-up residential areas MN – residential areas with single-family houses of low intensity MIZ – residential areas with single-family houses within the area of organised business activity SMU – inner-city built-up areas of mixed services and residential functions MWN – residential built-up areas MNL – residential areas in forest land</td>
<td>MN – residential areas with single-family houses Mne – residential areas with single-family houses /extensive development Mni – residential areas with single-family houses /intensive development</td>
</tr>
<tr>
<td>MW – residential areas with multi-family houses</td>
<td>MW – residential areas with multi-family houses</td>
<td>MW – residential areas with multi-family houses MWu – residential areas with multi-family houses with services MW – residential areas with multi-family houses, with possibility of services</td>
<td>MW – residential areas with multi-family houses</td>
</tr>
<tr>
<td>Undetermined</td>
<td>ML – residential areas of holiday resort/leisure</td>
<td>ML – residential areas of individual holiday resort-type housing</td>
<td>ML – residential areas of individual holiday resort-type housing</td>
</tr>
<tr>
<td>U – service built-up areas</td>
<td>Undetermined</td>
<td>U – service built-up areas</td>
<td>U – service built-up areas</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U – multifunctional service built-up areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>U – service areas</td>
<td></td>
</tr>
<tr>
<td>Undetermined</td>
<td>UA – administrative services areas</td>
<td>UA – administrative services built-up areas</td>
<td>UA – administrative services areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UA – administrative services and offices built-up areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ua – administrative services built-up areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>U-A administrative services areas, business premises</td>
<td></td>
</tr>
<tr>
<td>Undetermined</td>
<td>UP – public services areas</td>
<td>UU – built-up areas with public utility services</td>
<td>UP – public services areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UP – built-up public services areas</td>
<td></td>
</tr>
<tr>
<td>Undetermined</td>
<td>UO – educational services areas</td>
<td>UO - educational services areas – schools</td>
<td>UO – educational services areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UO – built-up areas with educational services</td>
<td>UOp – educational services areas – kindergartens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UO – educational services areas</td>
<td>UO – educational services areas – primary schools</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UO – built-up areas with educational services</td>
<td>UOs – educational services areas – Junior High schools</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UO – built-up areas with educational and cultural services</td>
<td>UOs – educational services areas – secondary schools</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UO – built-up areas with utilities for educational services</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UO – built-up areas with education and science services</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>U.O – educational services areas – kindergartens</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>U.Og – educational services areas – Junior High schools</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>U.Oś – educational services areas – secondary schools</td>
<td></td>
</tr>
<tr>
<td>Undetermined</td>
<td>UK – cultural services areas</td>
<td>UK – built-up areas with cultural services</td>
<td>UK – cultural services areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UK – built-up service areas – culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UK – built-up areas with religious cult services</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UKK – areas with religious cult services</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UUK – built-up areas with utilities for cultural services</td>
<td></td>
</tr>
<tr>
<td>US – sports and recreation areas</td>
<td>US – sports and recreation service areas</td>
<td>US – built-up areas with utilities for sports and recreation services</td>
<td>US – areas of sports and recreation services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US – sports and recreation areas</td>
<td></td>
</tr>
<tr>
<td>UC – areas with retail and commercial venues with sales area over 400 m²</td>
<td>UC – areas of large-scale retail services</td>
<td>UC – areas with retail and commercial venues with sales area over 2000 m²</td>
<td>UC – areas of large-scale retail services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UC – commercial services areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UCH – areas with non-basic services including large-scale retail services</td>
<td></td>
</tr>
<tr>
<td>Undetermined</td>
<td>UH – areas of commercial services</td>
<td>UH – built-up areas of commercial services</td>
<td>UH – areas of commercial services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U–HB – areas of commercial services and offices</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>U–HA – areas of commercial services, offices and administration</td>
<td></td>
</tr>
</tbody>
</table>

Source: [Jaroszewicz et al. 2013, pkt 3.4.1]
It is urban planners who decide the level of detail, according to which they wants to determine the designation of the area. In proposing a new designation, the urban planners must determine its position in a particular level of the hierarchy. This ontological approach makes it easier to search for information and, importantly, it makes it possible to develop, in the future, mapping rules for the national standards for the classification of land use (if such standards are created) for the HILUCS classification.

The 'Catalogue of land use items...' is a comprehensive document, which can be used in the future, in order to further work on the development of the planning standards. What is disturbing, however, is a noticeable trend of starting all the work from scratch every time, without the use of the results achieved and contained in the earlier studies.

Also noteworthy is a project titled ‘The acceleration of the growth of competitiveness of the Mazovia Region, by building the information society and knowledge-based economy, through the creation of integrated knowledge bases for Mazovia,’ also called ‘The BW Project.’ This is a key project, entered in the Indicative Investment Plan in the framework of the Mazovia Regional Operational Programme for the years 2007–2013, Priority I: ‘Creating conditions for the development of innovation potential and entrepreneurship in Mazovia.’

Source: author's study based on the 'Catalogue of land use items...' [Jaroszewicz et al. 2013]

Fig. 5. Hierarchy of the classification of residential built-up areas according to the 'Catalogue of land use items...'

It is urban planners who decide the level of detail, according to which they want to determine the designation of the area. In proposing a new designation, the urban planners must determine its position in a particular level of the hierarchy. This ontological approach makes it easier to search for information and, importantly, it makes it possible to develop, in the future, mapping rules for the national standards for the classification of land use (if such standards are created) for the HILUCS classification.

The 'Catalogue of land use items...' is a comprehensive document, which can be used in the future, in order to further work on the development of the planning standards. What is disturbing, however, is a noticeable trend of starting all the work from scratch every time, without the use of the results achieved and contained in the earlier studies.

Also noteworthy is a project titled ‘The acceleration of the growth of competitiveness of the Mazovia Region, by building the information society and knowledge-based economy, through the creation of integrated knowledge bases for Mazovia,’ also called ‘The BW Project.’ This is a key project, entered in the Indicative Investment Plan in the framework of the Mazovia Regional Operational Programme for the years 2007–2013, Priority I: ‘Creating conditions for the development of innovation potential and entrepreneurship in Mazovia.’

Source: author's study based on the 'Catalogue of land use items...' [Jaroszewicz et al. 2013]

Fig. 5. Hierarchy of the classification of residential built-up areas according to the 'Catalogue of land use items...'

It is urban planners who decide the level of detail, according to which they want to determine the designation of the area. In proposing a new designation, the urban planners must determine its position in a particular level of the hierarchy. This ontological approach makes it easier to search for information and, importantly, it makes it possible to develop, in the future, mapping rules for the national standards for the classification of land use (if such standards are created) for the HILUCS classification.

The 'Catalogue of land use items...' is a comprehensive document, which can be used in the future, in order to further work on the development of the planning standards. What is disturbing, however, is a noticeable trend of starting all the work from scratch every time, without the use of the results achieved and contained in the earlier studies.

Also noteworthy is a project titled ‘The acceleration of the growth of competitiveness of the Mazovia Region, by building the information society and knowledge-based economy, through the creation of integrated knowledge bases for Mazovia,’ also called ‘The BW Project.’ This is a key project, entered in the Indicative Investment Plan in the framework of the Mazovia Regional Operational Programme for the years 2007–2013, Priority I: ‘Creating conditions for the development of innovation potential and entrepreneurship in Mazovia.’

Source: author's study based on the 'Catalogue of land use items...' [Jaroszewicz et al. 2013]

Fig. 5. Hierarchy of the classification of residential built-up areas according to the 'Catalogue of land use items...'

It is urban planners who decide the level of detail, according to which they want to determine the designation of the area. In proposing a new designation, the urban planners must determine its position in a particular level of the hierarchy. This ontological approach makes it easier to search for information and, importantly, it makes it possible to develop, in the future, mapping rules for the national standards for the classification of land use (if such standards are created) for the HILUCS classification.

The 'Catalogue of land use items...' is a comprehensive document, which can be used in the future, in order to further work on the development of the planning standards. What is disturbing, however, is a noticeable trend of starting all the work from scratch every time, without the use of the results achieved and contained in the earlier studies.

Also noteworthy is a project titled ‘The acceleration of the growth of competitiveness of the Mazovia Region, by building the information society and knowledge-based economy, through the creation of integrated knowledge bases for Mazovia,’ also called ‘The BW Project.’ This is a key project, entered in the Indicative Investment Plan in the framework of the Mazovia Regional Operational Programme for the years 2007–2013, Priority I: ‘Creating conditions for the development of innovation potential and entrepreneurship in Mazovia.’

Source: author's study based on the 'Catalogue of land use items...' [Jaroszewicz et al. 2013]

Fig. 5. Hierarchy of the classification of residential built-up areas according to the 'Catalogue of land use items...'

It is urban planners who decide the level of detail, according to which they want to determine the designation of the area. In proposing a new designation, the urban planners must determine its position in a particular level of the hierarchy. This ontological approach makes it easier to search for information and, importantly, it makes it possible to develop, in the future, mapping rules for the national standards for the classification of land use (if such standards are created) for the HILUCS classification.

The 'Catalogue of land use items...' is a comprehensive document, which can be used in the future, in order to further work on the development of the planning standards. What is disturbing, however, is a noticeable trend of starting all the work from scratch every time, without the use of the results achieved and contained in the earlier studies.

Also noteworthy is a project titled ‘The acceleration of the growth of competitiveness of the Mazovia Region, by building the information society and knowledge-based economy, through the creation of integrated knowledge bases for Mazovia,’ also called ‘The BW Project.’ This is a key project, entered in the Indicative Investment Plan in the framework of the Mazovia Regional Operational Programme for the years 2007–2013, Priority I: ‘Creating conditions for the development of innovation potential and entrepreneurship in Mazovia.’

Source: author's study based on the 'Catalogue of land use items...' [Jaroszewicz et al. 2013]

Fig. 5. Hierarchy of the classification of residential built-up areas according to the 'Catalogue of land use items...'

It is urban planners who decide the level of detail, according to which they want to determine the designation of the area. In proposing a new designation, the urban planners must determine its position in a particular level of the hierarchy. This ontological approach makes it easier to search for information and, importantly, it makes it possible to develop, in the future, mapping rules for the national standards for the classification of land use (if such standards are created) for the HILUCS classification.

The 'Catalogue of land use items...' is a comprehensive document, which can be used in the future, in order to further work on the development of the planning standards. What is disturbing, however, is a noticeable trend of starting all the work from scratch every time, without the use of the results achieved and contained in the earlier studies.

Also noteworthy is a project titled ‘The acceleration of the growth of competitiveness of the Mazovia Region, by building the information society and knowledge-based economy, through the creation of integrated knowledge bases for Mazovia,’ also called ‘The BW Project.’ This is a key project, entered in the Indicative Investment Plan in the framework of the Mazovia Regional Operational Programme for the years 2007–2013, Priority I: ‘Creating conditions for the development of innovation potential and entrepreneurship in Mazovia.’

Source: author's study based on the 'Catalogue of land use items...' [Jaroszewicz et al. 2013]

Fig. 5. Hierarchy of the classification of residential built-up areas according to the 'Catalogue of land use items...'

It is urban planners who decide the level of detail, according to which they want to determine the designation of the area. In proposing a new designation, the urban planners must determine its position in a particular level of the hierarchy. This ontological approach makes it easier to search for information and, importantly, it makes it possible to develop, in the future, mapping rules for the national standards for the classification of land use (if such standards are created) for the HILUCS classification.

The 'Catalogue of land use items...' is a comprehensive document, which can be used in the future, in order to further work on the development of the planning standards. What is disturbing, however, is a noticeable trend of starting all the work from scratch every time, without the use of the results achieved and contained in the earlier studies.

Also noteworthy is a project titled ‘The acceleration of the growth of competitiveness of the Mazovia Region, by building the information society and knowledge-based economy, through the creation of integrated knowledge bases for Mazovia,’ also called ‘The BW Project.’ This is a key project, entered in the Indicative Investment Plan in the framework of the Mazovia Regional Operational Programme for the years 2007–2013, Priority I: ‘Creating conditions for the development of innovation potential and entrepreneurship in Mazovia.’

Source: author's study based on the 'Catalogue of land use items...' [Jaroszewicz et al. 2013]
The main tasks within the BW Project included:

1. To gather and organize the appropriate data structure for Topographic Database (TBD) of Mazovia Region, according to the ‘Technical guidelines for TBD’ by the Chief State Surveyor.

2. To support work related to the transformation of the land and buildings records (EGiB) into digital form, to supplement the data on buildings and to effect the modernization of the records; to transform the base map (primer) into numerical format; to carry out works related to the transformation to digital format of other spatial data, to scan documents which justify entries into the EGiB.

3. To develop the concept for the standardization of municipal studies of conditions and directions of spatial development, local development plans and regional spatial development plan.

4. To convert the existing municipal studies of conditions and directions of spatial development, local development plans, and regional spatial development plan to digital formats, and to include these studies in the MSIP.\(^{15}\)

5. To create digital data sets for the records of towns and villages, streets and addresses, and the inclusion of these collections in the MSIP.

6. To deliver and implement the components of MSIP at the county and municipal level.

7. To implement the system for managing the county geo-reference database (database of detailed data of geodetic matrixes, the EGiB database, the GESUT database, databases of topographic objects covered by the content of the basic map and database of land prices and property values), and to integrate this system with the MSIP.

The materials and documents, developed in the framework of the aforementioned project, were among others, the foundation work for the ‘original’ Team for spatial data ‘land use’ theme.

6. Will the changes in the Law on Government Administration, regulating the supervision over the Chief State Surveyor, help streamline and facilitate the harmonisation of Spatial Planning and Development Law to the INSPIRE Directive?

Considering the changes introduced to the law on government administration, involving the transfer of geodesy and cartography matters to the new field of ‘construction, spatial planning, land use and housing,’ including the introduction of the supervision over the Chief State Surveyor by the minister responsible for construction, spatial planning, land use and housing, it may be presumed that the intention of the legisla-

\(^{15}\) Polish abbreviation of: Mazowiecki System Informacji Przestrzennej (Mazovia Region System of Planning Information)
tor was to achieve systemic changes in the sphere of spatial planning and land use, in conjunction with construction regulations and the geodetic and cartographic law. So far, amendments to the: Law on Spatial Planning Development; Construction Law; and Geodetic and Cartographic were implemented, effectively, separately from each other. Each law regulates its own scope, and the amendments thereto, in the most part, related precisely to their separate scopes of operation.

Due to the currently existing legal discrepancies in the abovementioned areas, the intention of the legislator should be upheld, as it carries the hopes of a change for the better. Finally, spatial planning and land use would not be separated from the building law and technical conditions, as well as the land and buildings records. The hope lies also in the Report on problematic issues in the field of spatial planning, developed by the Ministry of Infrastructure and Construction, which provided information material to the meeting of the Committee on Local Government and Regional Policy on 11 May 2016. The aforementioned material is a presentation of the most important issues and problems, in the assessment of the Ministry, pertaining to spatial planning in Poland, under the Law for spatial planning and development and its regulatory environment.

In the present Report, the ministry indicates problems in the following areas:16

1) narrow perception of spatial planning as State policy;
2) complex legal environment of the Law on spatial planning and development;
3) broad and unjustified liability for damages by public government bodies
4) private interests versus the public interest – the lack of balance;
5) the study [of conditions] as an insufficiently effective instrument for space management;
6) slowdown of planning work;
7) planning decision [on the conditions of building construction];
8) lack of systemic financing of spatial planning;
9) consolidations and divisions;
10) no institution of derogation within the framework of the planning procedure;
11) public participation in urban planning;
12) public investments;
13) requirements of State defence and security are not sufficiently taken into account in the planning system;
14) weak links between documents at different levels of space management;
15) planning at the national level;
16) planning at the regional level;
17) functional planning;
18) spatial data.

The above listed issues, defined by the Ministry, indicate a full understanding of the problems that occur in the practical application of planning and spatial development regulations, including those related to the Infrastructure for Spatial Information in the spatial data ‘land use’ theme. The present line of action by the Ministry must therefore be upheld.

7. Conclusions

INSPIRE Directive in Poland was implemented by the ISI Act. The ISI Act itself, however, did not introduce changes to the Law on spatial planning and development. Was this, in fact, the legislator’s intention?

It should be noted that still, today, the law on spatial planning and development has not been adapted to the issues of the INSPIRE Directive; and therefore it has been operating ‘as if separately’ from the ISI Act and regulations.

Bearing in mind the problems that occur primarily in the field of digitization of planning documents, i.e. municipal studies for the conditions and directions of spatial development and local zoning plans, as well as with the view to differences that arise between the arrangements set in the visual Annexes (drawings) to the local zoning plans and records of land and buildings, geodetic records of public utilities GESUT, etc., as well as the lack of so-called planning standards, that would ensure the quality of the planning data, their harmonization with reference data sets, and definition of a standard data model, it seems necessary that the minister responsible for construction, spatial planning, zoning, and housing (currently the Minister of Infrastructure and Construction), should take action, aiming to bring the law on spatial planning and development, to the extent that is appropriate, in harmony with the provisions of the spatial information infrastructure (not only the ISI Law, but also the implementing rules). This action would solve problems in the field of digitization of the planning documents, i.e. the municipal studies of conditions and directions of spatial development and local development plans. It seems necessary for the Minister to issue a regulation on the contents of the draft regional spatial development plan.

Legislative changes concerning the acquisition, by the above Minister, of the supervision over the Chief State Surveyor, and the inclusion of matters in the field of geodesy and cartography in the public administration department of ‘construction, planning, land use planning and housing’ can be the basis for the introduction of comprehensive legal changes, not only in terms of planning and zoning and the Infrastructure for Spatial Information, but also in terms of land and buildings records, as well as the construction law, so as to eliminate, among others, the discrepancies described above.

Looking at the ‘Detailed Description of the Contract (Tasks) involving the drafting of standards for planning databases,’ published on the website of the Ministry of Infrastructure and Construction (www.mib.gov.pl), on the one hand, one can congratulate the Ministry on the comprehensive and complete treatment of the problem, but on the other hand, it can be noted that the above work is contracted as a task to be performed ‘from scratch.’ It is a pity that instead, it is not based on the studies that
have already been done, for instance, on the ‘Catalogue of land use items…’ discussed in point 4, which is a development based on solid analytical material, and which can be a starting point for further work, in particular with regard to the establishment of standard nomenclature in addition to the so-called good practices developed in the various provinces considered leaders in the Infrastructure for Spatial Information in Poland, in the spatial data ‘land use’ theme. The ‘Catalogue of land use items…’ is, by far, the most complete document, endeavouring to harmonize the classification of local development plans, in line with practice and legislation, aiming to develop a national classification. Regional studies in given provinces usually rely on generalized classification of land and other facilities. The present catalogue is the only one to provide a fairly complete analysis of possible items. It had been consulted with a number of people associated with conducting reference databases, for instance, on monuments, etc. According to the authors of this article, the ‘Catalogue of land use items…’ should be included in further work by the Ministry. The assumptions of the said catalogue should be submitted by the competent Minister to a wide-ranging discussion in the milieu of planners, local government units, businesses, etc. – such were the demands, assumed within the catalogue itself, and such were the findings of the ‘original’ Team for spatial data ‘land use’ theme. The present course of action is disturbing, because it does not take into account the existing acquis in the subject.

References


Litwin L. 2012. Analiza wymagań technicznych dla dokumentów elektronicznych zawierających akty normatywne i inne akty prawne, określonych Rozporządzeniem Prezesa Rady Ministrów z dnia 27 grudnia 2011 r. w sprawie wymagań technicznych dla dokumentów elektronicznych zawierających akty normatywne i inne akty prawne, dzienników urzędowych wydawanych w postaci elektronicznej oraz środków komunikacji elektronicznej i informatycznych nośników danych (Dz. U. Nr 289, poz. 1699) i ocena skutków regulacji dla procedury miejscowego planu zagospodarowania przestrzennego i jego zmiany w kontek-


Legal acts and regulations

Decyzja Komisji 2009/442/WE z dnia 5 czerwca 2009 r. w sprawie wykonania dyrektywy 2007/2/WE Parlamentu Europejskiego i Rady w zakresie monitorowania i sprawozdawczości.

Dyrektwa 2007/2/WE Parlamentu Europejskiego i Rady z dnia 14 marca 2007 r. ustanawiająca infrastrukturę informacji przestrzennej we Wspólnotie Europejskiej (INSPIRE).

Ustawa z dnia 27 marca 2003 r. o planowaniu i zagospodarowaniu przestrzennym (t.j. Dz. U. z 2016 r., poz. 778).

Ustawa z dnia 4 marca 2010 r. o infrastrukturze informacji przestrzennej (Dz. U. Nr 76, poz. 489 z późn. zm.) [ISI Act, Ustawa IIP].

Ustawa z dnia 19 listopada 2015 r. o zmianie ustawy o działach administracji rządowej oraz niektórych innych ustaw (Dz. U. z 2015 r., poz. 1960).

Geomatics, Landmanagement and Landscape No. 4 • 2016
Rozporządzenie Komisji (WE) Nr 1205/2008 z dnia 3 grudnia 2008 r. w sprawie wykonania dyrektywy 2007/2/WE Parlamentu Europejskiego i Rady w zakresie metadanych.
Rozporządzenie Komisji (WE) Nr 976/2009 z dnia 19 października 2009 r. w sprawie wykonania dyrektywy 2007/2/WE Parlamentu Europejskiego i Rady w zakresie usług sieciowych.
Rozporządzenie Komisji (UE) Nr 1088/2010 z dnia 23 listopada 2010 r. zmieniające rozporządzenie (WE) Nr 976/2009 w zakresie usług pobierania i usług przekształcania.
Rozporządzenie (UE) Nr 1089/2010 w sprawie wykonania dyrektywy 2007/2/WE w zakresie interoperacyjności zbiorów i usług danych przestrzennych.
Rozporządzenie Komisji (UE) Nr 1089/2010 z dnia 23 listopada 2010 r. w sprawie wykonania dyrektywy 2007/2/WE Parlamentu Europejskiego i Rady w zakresie interoperacyjności zbiorów i usług danych przestrzennych.
Rozporządzenie (UE) Nr 1089/2010 w sprawie wykonania dyrektywy 2007/2/WE w zakresie interoperacyjności zbiorów i usług danych przestrzennych.
Rozporządzenie Komisji (UE) Nr 1089/2010 z dnia 23 listopada 2010 r. zmieniające rozporządzenie (UE) Nr 1089/2010 w sprawie wykonania dyrektywy 2007/2/WE w zakresie interoperacyjności zbiorów i usług danych przestrzennych.
Rozporządzenie KE (UE) Nr 1253/2013 z dnia 21 października 2013 r. zmieniające rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 20 października 2010 r. w sprawie ewidencji zbiorów i usług danych przestrzennych objętych infrastrukturą informacji przestrzennej (Dz.U. Nr 201, poz. 1333).
Rozporządzenie Ministra Infrastruktury z dnia 26 sierpnia 2003 r. w sprawie wymaganego zakresu projektu miejscowego planu zagospodarowania przestrzennego (Dz. U. z 2003 r., Nr 164, poz. 1587).
Rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 13 września 2010 r. w sprawie Rady Infrastruktury Informacji Przestrzennej (Dz. U. Nr 183, poz. 1233).
Rozporządzenie Prezesa Rady Ministrów z dnia 9 grudnia 2015 r. zmieniające rozporządzenie w sprawie szczegółowego zakresu działania Ministra Infrastruktury i Budownictwa (Dz. U. z 2015 r., poz. 2095).
Rozporządzenie Rady Ministrów z dnia 27 listopada 2013 r. w sprawie utworzenia Ministerstwa Infrastruktury i Rozwoju oraz zniesienia Ministerstwa Transportu, Budownictwa i Gospodarki Morskiej (Dz. U. z 2013 r., poz. 1390).
Uchwała Nr LVII/1710/2009 Rady M. St. Warszawy z dnia 18 czerwca 2009 r. w sprawie uchwalenia miejscowego planu zagospodarowania przestrzennego obszaru Rakowca.
Zarządzenie Nr 8 Ministra Transportu, Budownictwa i Gospodarki Morskiej z dnia 12 kwietnia 2013 r. w sprawie powołania Zespołu do spraw tematu danych przestrzennych „zagospodarowanie przestrzenne”.
Zarządzenie Nr 35 Ministra Transportu, Budownictwa i Gospodarki Morskiej z dnia 5 listopada 2013 r. zmieniające zarządzenie w sprawie powołania Zespołu do spraw tematu danych przestrzennych „zagospodarowanie przestrzenne”.
Zarządzenie Nr 20 Ministra Infrastruktury i Rozwoju z dnia 2 lipca 2015 r. w sprawie powołania Zespołu do spraw tematu danych przestrzennych „zagospodarowanie przestrzenne”.

Internet sources
www.gugik.gov.pl
www.e-dziennik.transport.gov.pl
www.radaiip.gov.pl
www.mib.gov.pl
www.geodezja.mazovia.pl
www.rpo.mazovia.eu
Dr inż. Joanna Jaroszewicz
Wydział Geodezji i Kartografii
Politechnika Warszawska
00-001 Warszawa, pl. Politechniki 1
e-mail: j.jaroszewicz@gik.pw.edu.pl

Mgr inż. Lidia Piotrowska
Wydział Geodezji i Kartografii
Politechnika Warszawska
00-001 Warszawa, pl. Politechniki 1
e-mail: lidia.piotrowska@onet.com.pl
Spatial planning in Poland in the context of ‘INSPIRE’ rules and amendment to the Spatial Planning and Development Act

Magda Pluta

Summary

Spatial planning is a vital aspect of social and economic development of a country. Spatial planning in Poland is regulated by the Spatial Planning and Development Act of 27 March 2003 and should be implemented in conformity with the EU Directive Establishing an Infrastructure for Spatial Information in the European Community (INSPIRE). In the study an assessment of the spatial planning system in Poland in the light of existing legislation has been carried out, and a SWOT analysis has been performed, showing the planning’ strengths and weaknesses, opportunities and threats, and the most immediate needs to be met – in the context of amendments currently being drafted – have been indicated.

Keywords

spatial planning in Poland • INSPIRE • SWOT analysis

1. Spatial planning in Poland according to existing legislative acts


---

1 The research was completed as part of a theme no. DS 3366/KGRKiF/2016 and was financed by a grant for science given by Ministry of Science and Higher Education. The article is a part of a doctoral thesis ‘Synergia danych trójwymiarowych w planowaniu przestrzennym’ (Synergy of 3D data in spatial planning), that was awarded a distinction by a Council of Faculty of Environmental Engineering and Land Surveying of the Agriculture University in Kraków (resolution no 88/2016).
on a national, voivodeship and communal level. On a national level it is a matter for Council of Ministers, which develops a project of spatial development of the country, being only a set of general guidelines, and having analytical and information function [COMMIN 2007]. Guided by the principle of hierarchy of spatial plans, the act imposes an obligation to harmonize local plans with spatial development plan of a voivodeship [art. 17, p. 6, Dz. U. 2003 Nr 80, poz. 717], and the latter plan with decisions on spatial development plan for the whole country [Dz. U. 2003 Nr 80, poz. 717, art. 39, p. 4], though in practice it does not mean that one is superior to the other. On the level of a commune the act distinguishes: a study of conditions and directions of spatial development (SCDSD), with analytical, coordinative, informational and in a less degree decision-making function, and a local plan of spatial development (LPSD) of a commune with a decision-making function [COMMIN 2007]. According to the Act, SCDSD is a planning document determining spatial policy of a commune [art. 9, p. 1, Dz. U., 2003 Nr 80, poz. 717], but it is not an act of a local law. Moreover, in the plan COMMIN [2007] two remaining functions of SCDSD are referred to: as an act defining policy of economic development and promoting a commune among potential investors, directly influencing its economic activity [art. 4, p. 1, Dz. U. 2003 Nr 80, poz. 717].

The Spatial Planning and Development Act of 27 March 2003 [Dz. U 2003 Nr 80, poz. 717] specifies the procedure of drawing up local development plans and their required scope and content, and introduces a division into text and graphic parts, which are annexes to the resolution of a commune council to adopt the study [art. 12, p. 1, Dz. U. 2003 Nr 80, poz. 717]. The process of drawing up local plans has two significant elements: participation of citizens through making remarks [art 17, p. 11, Dz. U. 2003 Nr 80, poz. 717] to solutions adopted in the plan, and by an exchange of views during public discussions [art. 17, p. 9, ibidem]. Moreover COMMIN [2007] suggests that combining local plans with development strategies embracing economic and social determinants is an increasingly frequent practice. In spite the lack of legal requirement to adopt a strategy, a growing number of communes chooses such solutions due to their positive impact on the process of spatial planning. According to art. 1, point 1 [Dz. U. 2003 Nr 80, poz. 717], all activity related to spatial planning in Poland should respect the principle of spatial order, adherent to the sustainable development principle, understood in view of art. 3, point 50 [Dz. U. 2001, Nr 62, poz. 627] as a social and economic development, in which integrating process of political, economic and social actions takes place, while respecting natural equilibrium and durability of basic natural processes with the aim to satisfy fundamental needs of communities or citizens of current and future generations.

The Spatial Information Structure Act of 4 March 2010 introduces into Polish law the notion of spatial data understood as data referring directly or indirectly to a definite geographical position or area [art. 3, p. 1, Dz. U. 2010 Nr 76, poz. 489]. Spatial data sets described by metadata, services for discovering, browsing, downloading and processing of these set [art. 9, p. 1, Dz. U. 2010 Nr 76, poz. 489], as well as technical tools, processes and procedures used and made available by government administration bodies and third parties, according the Act, form infrastructure for spatial information in Poland [art. 3, p. 2, Dz. U. 2010 Nr 76, poz. 489]. Based on art. 4, p. 1 [Dz. U. 2010 Nr
one of the conditions to categorize spatial data as infrastructure for spatial information is its digital form. The data must also belong to at least one of the spatial data themes defined in the Annex to the Act [art. 4, p. 1, Dz. U. 2010 Nr 76, poz. 489].

In the context of the issue discussed in this section the theme called ‘spatial development’ described in third thematic group is particularly noteworthy.


Affek [2013] tried to analyse the implementation of Directive INSPIRE in a theme ‘spatial development’ for Poland in 2012, using in his research a DSi1.3 index [art. 5.b.iii, Decision 2009/442/WE], which defines the extent to which the country is covered by spatial data sets that correspond to themes listed in the Annex III [Dz. U. L 108 25.4.2007, p. 1]. Affek [2013] notes that to calculate Dsi.1.3 Land Use index, it is necessary to know the relation of the area currently covered with spatial data sets, being part of the theme ‘spatial development’, to the area that should be covered by such sets. In line with the opinion of the Ministry of Transport, Construction and Maritime Economy of 29 May 2013, spatial data sets within the theme ‘spatial development’ are: spatial development plan as a basic set and study of conditions and directions of spatial development of a commune and a local recovery plan as additional sets [BP-ILP-075-5/13 no 2120, 2013]. Affek [2013] states that in a report for 2011 submitted by Poland the current area and the area essential for the theme ‘spatial development’ was not calculated. Based on the study commissioned by the Ministry of Transport, Construction and Maritime Economy and carried out by Centre UNEP/GRID in Warsaw, in cooperation with the Institute of Geography and Spatial Organization of the Polish Academy of Sciences (PAS), the size of the essential and current area in the theme ‘spatial development’ as of 2012 was determined, choosing for the analysis three sets of spatial data: the set of studies of conditions and directions of spatial development (SCDSD) for communes, the set of local spatial development plans (LSDP) indicated in the study SCDSD, and the set of studies (SCDSD) and local plans (LSDP), while simultaneously assuming that the data sets have digital form (GIS or georeferenced CAD) [Affek 2013]. The studies demonstrate that there is 9% probability that from 91.7% to 96.9% of communes do not have spatial data sets SCDSD and that from 94.92% to 98.78% of communes do not have metadata SCDSD that would be compatible with INSPIRE. Moreover, with 95% probability, from 85.1% to 92.1% of communes do not possess spatial data sets LSDP and from 96.63% to 99.62% of commune do not possess metadata LSDP that would be compatible with INSPIRE [Affek 2013]. DSi1.3 index for each theme of Annex III to Directive [Decision 2009/442/WE 2009] is represented as quotient of the current area to the essential area. The essential area for a SCDSD data set is the area of the whole country (variant 1), whereas for a LSDP set the essential areas is the one indicated in SCDSD, for which there is an obligation to
draw up local plans (variant 2). The author acquired data on area indicated in SCDSD for which there is an obligation to draw up local plans from Local Data Bank of the Polish Central Statistical Office (GUS). The studies show that with 95% probability the DISi 1.3 indices for the theme ‘spatial development’ fall in the range 2.31–56% in the variant 1, and in the range 4.14–15.18% in the variant 2 [Affek 2013].

Other guidelines on establishing infrastructure for spatial information (ISI) in Poland are specified by the programme of establishing infrastructure for spatial information (ISI) issued by the Surveyor General of Poland as of 2014–2015 [GUGiK 2014]. Among tasks to be implemented by the end of 2015 are works leading to amendment to the Spatial Planning and Development Act of 27 March 2003 [Dz. U. 2003 Nr 80, poz. 717]. The goal of the amendment is to adjust it to the directions of the Spatial Information Infrastructure Act of 4 March 2010 [Dz. U. 2010 Nr 76, poz. 489] as regards preparing planning documents in a digital form [GUGiK 2014].

2. Spatial planning – SWOT analysis

Spatial planning in Poland during last several dozen years has undergone numerous transformations aimed at adjusting planning processes to existing socioeconomic conditions [Litwin and Pluta 2015]. Some authors, such as Cieślak [2010], Izdebski et al. [2007], Ścibor [2007], Kwartnik-Pruc and Przewięźlikowska [2007], made the appraisal of the effectiveness of spatial planning in Poland, as regards solutions used in the European Union member states, showing strengths and weaknesses, as well as opportunities and threats of the spatial planning in Poland.

2.1. Strengths

Ścibor [2007] suggests that striving for sustainable development while maintaining spatial order and democratic processes can be regarded as strengths of the system. For Kwartnik-Pruc and Przewięźlikowska [2007] it is also advantageous that only one legal act is in force that regulates issues concerning spatial planning in Poland, which is in contrast to systems existing in western countries. The fact that property right is respected as to the possibilities of land development and management can be regarded as positive too.

2.2. Weaknesses

According to art. 47a of Spatial Planning and Development Act of 27 March 2003 [Dz. U. 2003 Nr 80, poz. 717] the competent minister in charge of regional development reviews and analyses the principles, method and conditions of institutions’ functioning, procedures and instruments, and submits to the Council of Ministers the proposition of changes, while taking into account especially the concept of spatial development of the country. The Concept of Spatial Development of the Country [M.P. 2012, poz. 252], adopted by the Council of Ministers, indicates the main problems with regard to spatial
planning, including a scattered housing, high costs of building technical infrastructure, lack of social infrastructure in built-up areas, and conflicts between communities and local authorities, resulting from lack of approval for actions undertaken by the administration. Cieślak [2010] notes that spatial planning system is currently undergoing a crisis, and the amendment to the Act [Dz. U. 2003 Nr 80, poz. 717] is very well grounded. In contrast to solutions adopted in Great Britain or Germany spatial planning in Poland is not effectively connected to socioeconomic planning [Ścibor 2007] and investment planning [Izdebski et al. 2007]. At the level of communes the Act lists the instruments of spatial policy, such as: the study of conditions and directions of spatial development defining the spatial policy of a commune, a local spatial development plan defining the intended use of land and the way of its development, and also decision on zoning and land development conditions (ZLDC) issued when there is no local plan specifying that plots should meet the conditions defined by the Act. Izdebski et al. [2007] claim that over-wide powers to communes as to shaping the spatial policy are a weakness of the spatial planning in Poland. Ścibor [2007] argues that SCDSD is obligatory in each commune, however it is not an act of local law and therefore its directions are not legally binding while taking decision on ZLDC. Moreover the decisions are taken by officials of the administration and are not consulted with councils of communes or local communities, which is practised in the English system with regard to planning permits [Izdebski et al. 2007]. According to the Act [Dz. U. 2003 Nr 80, poz. 717] drawing up LSDP is not obligatory, the number of existing local plans covers small area of the country, which especially applies to investment and tourist areas, suburban zones and areas along the transport corridors [Ścibor 2007]. Furthermore the alternative decision issued on ZLDC contributes negatively to unfavourable process of housing dispersion [Izdebski et al. 2007]. In comparison to spatial planning system functioning in Germany or Great Britain the Polish communes do not calculate the areas that are intended for residential housing in local plans in relation to the costs incurred by making these areas available to indispensable infrastructure [Izdebski et al. 2007]. Some authors, like Ścibor [2007] and Izdebski et al. [2007], also criticise the lack of uniform principles regarding preparation of a drawing to SCDSD or LSDP. Small number of symbols defined in a regulation [Dz. U. 2003 Nr 164, poz. 1587] means that communes need to introduce their own symbols, which are not systematized on the national level. According to Izdebski et al. [2007] the drawings of plans are made for too large areas, which together with the scale of the study imposed by the Act, makes them illegible and they define the intended use of the area only generally, without giving any information on the zoning and land development conditions. Moreover, preparation of a few planning concepts, taking into account the effects of their implementation, is not practiced, and in contrast to German and English systems the Act does not require the addition of rationale for solutions adopted in a local plan, resulting from socioeconomic conditions [Izdebski et al. 2007]. Ścibor [2007] says that plans are not made with the use of available tools, such as GIS (Geographic Information System) and are not published in Internet, which make effective data exchange impossible, and the blocks access to information for local community.
2.3. Opportunities

The amendment to the Spatial Planning and Development Act of 27 March 2003 is a chance for improvement of spatial planning system in Poland. The assumptions of the amendment are similar to solutions – regarded as effective by authors like Ścibor [2007], Izdebski et al. [2007] – adopted in western countries. The bill aims at strengthening connection between spatial planning and economic planning resulting from extensive analysis of needs and capacities of a given commune. Spatial planning process, according to the amendment, should be proceeded by defining relation between revenues and costs related to planning activities. Directing building investments to areas prepared for that purpose through equipping them with adequate technical and social infrastructure is also crucial to the bill. Establishing principles of effective management, such as limiting the number of decisions as to ZLDC will help to achieve the goal of a dense, low-emission city addressing the needs of pedestrians and cyclists. Proposed change in the procedure of adopting SCDS and LSDP, enabling an owner of a real property to build technical infrastructure at his own expense, and then giving it for free to commune to improve the investment process, is also a positive aspect of the amendment. Moreover it strives to increase the involvement of local communities in the process of spatial planning, through introduction of additional public consultations in the initial phase of planning works, so that residents could express their expectations about a given area. Formal framework will also be constructed to enable implementation of INSPIRE directive in a theme ‘spatial development’ [Projekt ustawy... 2015].

2.4. Threats

The threats regarding the improvement of spatial planning system in Poland are related to three main issues: actions of administrative bodies of local government units, legal state of real properties, and the level of digitalization of data stored in geodetic and cartographic administration resources. Bober et al. [2013] mention a few malfunctions of local governments’ operations, but in the context of effective spatial planning at a local level, one can list a bureaucratic malfunction, manifested in administrative inefficiency and dominance of office over citizen, financial malfunction and malfunction in absorbing EU funds. Limiting financial independence of a commune and a lack of uniform strategy of making investments with the use of EU funds will contribute to inappropriate stimulation of a commune development, also as regards land management [Bober et al. 2013]. One of the factors determining proper land management is a fixed legal status, especially with regard to property rights. Taszakowski [2011] says that land registers (LR) contain subjective data concerning a real property, whereas in land and building registers (LBR) amass objective data acquired mainly from consolidation studies, regulative or complementary measurements. It is assumed that legal status revealed in LR is in conformity with the actual state disclosed in LBR, and in case of inconsistency, proceedings need to be initiated to determine and synchronize data in both kinds of documents. Bagnicki and Mika [2013] claim that inconsistency results from the fact that LR and LBR are managed
by two separate institutions, subordinated to different ministries and using different software tools, which contributes to creating local conflicts and obstacles to investments. The level of digitalization of documents collected by centres of geodetic and cartographic documentations, particularly regarding base map, is a threat to the functioning of spatial planning in Poland in the context of directives imposed by The Spatial Information Infrastructure Act of 4 March 2010. According to art. 16, point 1 [Dz. U. 2003 Nr 80, poz. 717], local plan should have a scale of 1 : 1000 and be prepared with help of copies of official base maps or, in case there are no such maps available, with the use of cadastral maps collected in a national geodetic and cartographic resource. As Bielecka and Izdebski [2014] state, in the light of new legal regulations, base map should have a numerical form, based on data from databases run by adequate administration. The report of Head Office of Geodesy and Cartography (GUGiK) issued in 2014 [Jarząbek 2014] demonstrates that Poland is covered by numerical map only in 58%. Karpackie voivodeship has a highest coverage (90.8%), Podlaskie voivodeship – the smallest one (14%). The level of coverage by a base map in a digital and analogue form in Poland is shown in Figure 1.

![Figure 1. Poland's coverage by a base map in its digital and analogue form](image_url)
3. Conclusions

The current spatial planning system in Poland shows more weaknesses than strengths and the existing Spatial Planning and Development Act of 27 March 2003 does not regulate effectively the issues regarding proper land management. The SWOT analysis shows numerous disadvantages of the system, including unfavourable process of housing dispersion, unbalanced public and private interests, no integration of spatial planning with socioeconomic planning, and also a problem of low citizen participation. Works initiated by the Polish government on the amendment to the Act, aimed at assimilating solutions adopted in western countries, are a chance for improvement of the current system. In the process of change of Polish spatial planning system, particular attention should be devoted to threats resulting from external factors related to malfunctioning of local government units, unregulated legal status of real properties, and available documents used in the process of spatial planning.
List of abbreviations

INSPIRE – Infrastructure for Spatial Information in the European Community
SCDSD – Study of conditions and directions of spatial development
LPSD – Local plan of spatial development
GIS – Geographic Information System
CAD – Computer Aided Design
MOGC – Main Office of Geodesy and Cartography
LBR – Land and building register
LR – Land register
ZLDC – Zoning and land development conditions

References


Rozporządzenie Ministra Infrastruktury z dnia 26 sierpnia 2003 r. w sprawie wymaganego zakresu projektu miejscowego planu zagospodarowania przestrzennego (Dz. U. 2003 Nr 164, poz. 1587).

Stanowisko Ministra Transportu, Budownictwa i Gospodarki Morskiej z dnia 29 maja 2013 r. (BP-ILP-075-5/13 Nr 2120).


Uchwała Rady Ministrów dnia 13 grudnia 2011 r. w sprawie przyjęcia koncepcji przestrzennego zagospodarowania kraju 2030 (M.P. 2012, poz. 252).


Ustawa z dnia 27 marca 2003 r. o planowaniu i zagospodarowaniu przestrzennym (Dz. U. 2003 Nr 80, poz. 717).

Ustawa z dnia 4 marca 2010 r. o infrastrukturze informacji przestrzennej (Dz. U. 2010 Nr 76, poz. 489).

---

Dr inż. Magda Pluta
Uniwersytet Rolniczy w Krakowie
Katedra Geodezji Rolnej, Katastru i Fotogrametrii
30-198 Kraków, ul. Balicka 253a
e-mail: magda.belz@outlook.com
EXCLUSION OF LANDS FROM AGRICULTURAL PRODUCTION AND URBAN PRESSURE – CASE STUDY

Barbara Prus

Summary

Though agricultural lands are subject to legal protection limiting their use for non-agricultural purposes, recent research shows that investment areas are becoming larger at the cost of agricultural production areas. The analysis of cases in which lands have been excluded from agricultural production within Ropczyce-Sędziszów district (powiat), covering the period of 15 years, confirms that the change of area of particular lands is taking place. The biggest change affected grasslands and arable lands. The lands excluded from agricultural production are transformed into single-family housing, recreational and communication areas. Moreover the research allowed to show similarities in communes (gminy) with respect to lands excluded from agricultural production. The communes were singled out that were homogeneous as regards exclusion carried out in years 1999–2014. The choice of a research unit – Ropczyce-Sędziszów district – is determined by accessibility of data regarding exclusions and the fact the district is regarded as a unit with an average outlook for socioeconomic development. Simple statistical methods, quantitative analyses and a method of spatial taxonomy were used in the research.

Keywords

historical and local changes in land use • urban pressure • original and target use • objects' classification • spatial taxonomy

1. Introduction

In recent years there is a consistent increase in demand for investment areas [Sokołowski 1999, Prus 2012, Springer 2013]. Unfortunately, the demand is met at the cost of mainly agricultural lands, which on the one hand are an important biosphere factor component, and on the other – create environment of agricultural production. Agricultural lands have specific qualities, such as spatial permanence, the fact that they cannot be enlarged and they are directly affected by human activity [Czechnowski and Janik 1997]. These qualities have a significant impact on setting directions of development of these lands (their use) and on the way of their protection [Pawlak 1983, Czechowski et al. 1994].

---

1 The research was completed a part of a theme no. DS 3371/KGPIAK/2016 and was financed by grant for science given by Ministry of Science and Higher Education.
The environmental protection is based on many premises, among other things on principles of sustainable development [Kauko et al. 2015], and on the economic aspect of space as a good of a specific value, generating income and incurring costs related to its protection [Wańkowicz 2010, Antczak-Steśniak 2015]. The limitation of space intensifies competitions for it and causes investment pressure, especially in case of lands located in near vicinity of developing rural centres [Domański 2013, Jakóbczyk-Gryszkiewicz 1998, Lisowski 2006]. Inhabitants need private as well as cultural, public or social space. For it is a domicile, a recreational site and – in case of agricultural function – a workplace. The lands used for agricultural production are most likely to be excluded from production, and in consequence fall prey to urban sprawl. It can be seen mainly in transformation of their character from rural to urban [Sokołowski 1999, Gonda-Soroczyńska 2009]. The scale of this processes is a cause for concern among researchers and demands are expressed for thrifty management of space [Szluczewska 200, Matysiak 2004, Poniży 2008]. Recent studies shows that suburban areas are growing in an uncontrolled and chaotic way [Poniży 2008, Springer 2013]. It is generally believed that from the economic point of view that urbanization has adverse effects due to, for the most part, inefficient use of lands, shrinkage of agriculturally usable spaces, cost increase of building technical infrastructure, as well as rise in traffic congestion [Kamiński 1995]. The development of suburban areas occurs at the cost of rural and natural surroundings [Czochański 2007]. On the other hand a single-family house in a suburban area is a dream cherished by many people who want to improve their living standards, enjoy environmentally friendly leisure, and have more privacy [Domagalski et al. 2008, Parysek 2008]. Indeed though suburbanization is perceived as having negative effects, areas of lands excluded from agricultural production is still growing [Prus 2012, Mrozik and Wiśniewska 2013].

The change of intended land use is introduced in local development plans. But for lands to be actually excluded from agricultural production – according to the Agricultural and Forest Lands Protection Act of 3 February 1995 – their owners have to obtain a permission, in the form of administrative decision, to start non-agricultural activity [Ustawa 1995]. The protection of agricultural lands is thus implemented in two stages. First, it is the process of adopting or changing local development plan (quantitative protection at a commune level). Second: when a decision is issued that allows the exclusion from agricultural production (district level). As specified by the Act, quantitative protection is aimed at limiting the scope of the procedure, as a result of which lands may be used for non-agricultural purposes. On the other hand, qualitative protection is related to owners’ obligation to prevent soil erosion and degradation and to carry out land reclamation [Oleszko et al. 1997].

Decision excluding lands from agricultural production must be obtained before obtaining building permit. The decision contains an exclusion permit, the purpose of exclusion, and a list of obligations related to it. A person who obtained such a decision is obliged to make all the necessary payments and annual fees, and if forest lands were excluded from agricultural production – to pay one-time compensation in case premature felling was done. Decision consists also of a precise information on soil quality class and types of agricultural land that are subject to exclusion [Ustawa… 1995].
2. Research method

The research was carried out by using a quantitative and descriptive-comparative analyses, as well as a method of spatial taxonomy. The area of research covered Ropczyce-Sędziszów district in the Podkarpackie voivodeship (Figure 1). The field of a basic assessment was a commune. The choice of the research unit was determined by accessibility of data regarding exclusions and by the fact that the district, together with 18 other districts of the voivodeship, is regarded as a unit with an average outlook for socioeconomic development [Gawroński et al. 2014, Bański 2009]. Therefore the study can be considered as reliable (cross-sectional), and the cases of exclusion did not result from specific determinants.

The Ropczyce-Sędziszów district, consisting of 46 village administrations, covers an area of 548.89 km², which is 3.1% of the Podkarpackie voivodeship area. According to data of Central Statistical Office (GUS) in 2014 the districts had 73.5 thousand inhabitants, which is 134 persons per km². It has two towns: Ropczyce and Sędziszów Małopolski, two urban-rural communes: Ropczyce and Sędziszów Małopolski, and three rural communes: Iwierzyce, Ostrów and Wielopole Skrzyńskie (Figure 1).

![Map of the Ropczyce-Sędziszów district](source)

**Fig. 1.** Location of the Ropczyce-Sędziszów district in the Podkarpackie voivodeship, and its administrative division

The goal of the study was to analyse administrative decisions to exclude lands from agricultural production with regard to changes in land use. Only permanent exclusions were taken into account. The study was carried out in four stages. In the
first one changes of land use in the Ropczyce-Sędziszów district have been analysed in years 1999–2014. Thus directions of changes in areas of usable lands were determined. Another analysis was carried out to determine changes in the area size in the group of agricultural lands. In the second stage the area of excluded lands was analysed, and a logarithmic trend line was drawn, which indicates a tendency of exclusion size in consecutive years. The structure of exclusions has been established on the basis of target directions of land use, defined in administrative decisions. In the third stage percentage share related to exclusion of arable lands and grasslands from use was calculated, comparative analysis was carried out and communes of the studied district were classified. On the assumptions of numerical taxonomy, a Euclidean distance matrix was chosen as a similarity measure, and then, on the basis of it, objects were classified by a spatial taxonomy method. Percentage share of excluded lands in the area of arable lands, grasslands and agricultural lands was chosen as a criterion of similarity and then of communes’ division. In the final, fourth stage, summary of studies was made and conclusions were presented.

3. Results and discussion

3.1. Stage one: analysis of changes in land use

The Ropczyce-Sędziszów district is mainly agricultural, what is reflected mainly in the structure of land use, in which agricultural land have the largest share (67% in 1999 and 62 in 2014). In the structure of tillage cereals, sugar beets and potatoes dominate. Decrease in area of agricultural lands during 15 years correspond to 5 percentage points, which is 2.6 thousand ha (Figure 2). In this period developed areas grew larger by about 330 ha and forest lands by about 2340 ha.

![Fig. 2. The change in area of usable lands in the Ropczyce-Sędziszów district in years 1999–2014](source: author's study based on data from land register)
The analysis of agricultural lands (Table 1) in 1999–2014 showed that the greatest change occurred in arable lands – their area shrank by 1723 ha (4.7%). The area of meadows and pastures has also diminished – by 736 ha (2%) in total. And the area of orchards was reduced by 244 ha.

Table 1. Types of areas of agricultural lands in the Ropczyce-Sędziszów district in 1999–2014

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Arable land</td>
<td>25829</td>
<td>70.4</td>
<td>24106</td>
<td>70.8</td>
<td>−1723</td>
<td>−4.7</td>
</tr>
<tr>
<td>Orchard</td>
<td>573</td>
<td>1.6</td>
<td>329</td>
<td>1.0</td>
<td>−244</td>
<td>−0.7</td>
</tr>
<tr>
<td>Permanent meadows</td>
<td>4559</td>
<td>12.4</td>
<td>3909</td>
<td>11.5</td>
<td>−650</td>
<td>−1.8</td>
</tr>
<tr>
<td>Permanent pastures</td>
<td>5548</td>
<td>15.1</td>
<td>5462</td>
<td>16.0</td>
<td>−86</td>
<td>−0.2</td>
</tr>
<tr>
<td>Ditches</td>
<td>179</td>
<td>0.5</td>
<td>245</td>
<td>0.7</td>
<td>−66</td>
<td>0.2</td>
</tr>
<tr>
<td>Agricultural lands in total</td>
<td>36688</td>
<td>100</td>
<td>34051</td>
<td>100</td>
<td>−2769</td>
<td>−7.2</td>
</tr>
</tbody>
</table>

Source: author’s study on data from land register

In the analysis of decisions to exclude lands from agricultural production information on area in hectares of arable lands and grasslands was important, because it is within those areas that exclusions were made.

Fig. 3. Area of arable lands and grasslands in communes of the Ropczyce-Sędziszów district as of 31 December 2014

Source: author’s study
In the Ropczyce-Sędziszów district the area of arable lands is four times as large as the area of grasslands (Figure 3).

3.2. Stage two: analysis of exclusions of lands from production

In 1999–2014 in the Ropczyce-Sędziszów district there were 1598 request made to exclude lands from agricultural production. The area of agricultural lands (including arable lands and grasslands) that were subjected to exclusion, amounted to 82.9677 ha, which translates into 0.0549 ha for one decision. The largest annual area excluded from production was in 2004 (8.5244 ha), 2007 (8.3762 ha) and 2008 (9.3430 ha), with an average annual area excluded from agricultural production during 15 years of 51.855 ha. The smallest area of agricultural lands was excluded in 2014 (2.7698 ha), 2011 (2.8640 ha) and in 2002 (2.9282 ha).

The chart of logarithmic trend shows that size of lands excluded from agricultural production is diminishing (Figure 4). During 15 years the mean annual area of lands excluded from production has decreased from above 6 ha in the initial phase of the study to less than 5 ha in 2014.

![Area of lands excluded from agricultural production](image)

**Fig. 4.** The area of lands excluded from agricultural production [ha] in consecutive years in the Ropczyce-Sędziszów district

Among administrative decisions taken between 1999 and 2014 those excluding land from agricultural production for single-family housing purposes (Bp) are dominating. Areas intended as urbanized non-developed ones amounted to 67.2% of all lands excluded in the Sędziszów Małopolski commune, and as much as 77.9% of land in the Wielopole Skrzyńskie commune (Table 2).
Table 2. The area of lands excluded from production in communes of the Ropczyce-Sędziszów district according to type of target use

<table>
<thead>
<tr>
<th>Target use of excluded lands</th>
<th>Wielopole Skrzyńskie [%]</th>
<th>Sędziszów Małopolski [%]</th>
<th>Ropczyce [%]</th>
<th>Ostrów [%]</th>
<th>Iwierzyce [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial areas Ba</td>
<td>0</td>
<td>0.0</td>
<td>2.8</td>
<td>4.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Other developed areas Bi</td>
<td>0.3469</td>
<td>15.0</td>
<td>4.8956</td>
<td>14.8</td>
<td>0.0400</td>
</tr>
<tr>
<td>Urbanized non-developed areas Bp</td>
<td>1.8070</td>
<td>77.9</td>
<td>23.3458</td>
<td>70.5</td>
<td>3.1310</td>
</tr>
<tr>
<td>Recreational and leisure areas Bz</td>
<td>0</td>
<td>0.0</td>
<td>6.3</td>
<td>0.0</td>
<td>0.5600</td>
</tr>
<tr>
<td>Fossil lands K</td>
<td>0</td>
<td>0.0</td>
<td>0.0828</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Roads dr</td>
<td>0.1659</td>
<td>7.2</td>
<td>3.8427</td>
<td>13.3</td>
<td>0.0200</td>
</tr>
<tr>
<td>Other communication areas Ti</td>
<td>0</td>
<td>0.0</td>
<td>0.0100</td>
<td>0.0</td>
<td>0.0292</td>
</tr>
<tr>
<td>Total</td>
<td>2.3198</td>
<td>100</td>
<td>28.8029</td>
<td>100</td>
<td>3.7510</td>
</tr>
</tbody>
</table>

Source: author’s study
Significant percentage of lands in two communes (Sędziszów Małopolski and Ropczyce) was intended for road investments. In Sędziszów Małopolski and Ostrów communes there were also a few investments related to recreation and leisure facilities (Figure 5).

### 3.3. Stage three: defining similarities between communes, classification

In order to compare the communes of the Ropczyce-Sędziszów district and to indicate communes with similar direction and character of exclusion of lands from agricultural production indices were calculated that show share of excluded areas in the area of usable lands. They were calculated for arable lands, grasslands and altogether for agricultural lands (Table 3). The indices calculated for five communes in case of exclusion of arable lands vary from a minimal value of 0.042 in the Wielopole Skrzyńskie commune to maximal of 0.346 in the Sędziszów Małopolski commune. As to grasslands, a minimal index was calculated in the Wielopole Skrzyńskie commune – 0.026, and maximum one in the Iwierzyce commune – 0.860.

Undoubtedly, grasslands are more often excluded from production than arable lands. This tendency can be found in all communes, with the exception of Wielopole Skrzyńskie (Table 3, Figures 6 and 7). Among communes of the Ropczyce-Sędziszów district, with respect to areas of lands excluded from production, we can observe some regularities. Ostrów and Wielopole Skrzyńskie and Ropczyce and Sędziszów Małopolski communes share some similarities (Figure 7). To define similarities between communes statistically, on the basis of calculated indices of percentage share of areas excluded in the area of total area adequate types of lands, a Euclidean distance matrix was calculated (Table 4).
Table 3. Areas excluded from agricultural production and original use of excluded lands

<table>
<thead>
<tr>
<th>Commune</th>
<th>Area of arable lands [ha]</th>
<th>Area of grasslands [ha]</th>
<th>Area of excluded arable lands [ha]</th>
<th>Area of excluded grasslands [ha]</th>
<th>Area of excluded arable lands/area of arable lands * 100%</th>
<th>Area of excluded grasslands/area of grasslands * 100%</th>
<th>(Area of excluded lands/area of arable lands + area of grasslands) * 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iwierzyce</td>
<td>3661</td>
<td>553</td>
<td>10.1113</td>
<td>4.7551</td>
<td>0.276</td>
<td>0.860</td>
<td>0.353</td>
</tr>
<tr>
<td>Ostrów</td>
<td>2841</td>
<td>926</td>
<td>2.6506</td>
<td>1.1001</td>
<td>0.093</td>
<td>0.119</td>
<td>0.100</td>
</tr>
<tr>
<td>Ropczyce</td>
<td>7090</td>
<td>1362</td>
<td>23.8658</td>
<td>9.2665</td>
<td>0.337</td>
<td>0.680</td>
<td>0.392</td>
</tr>
<tr>
<td>Sędziszów Małopolski</td>
<td>5764</td>
<td>1418</td>
<td>19.9166</td>
<td>10.0568</td>
<td>0.346</td>
<td>0.709</td>
<td>0.417</td>
</tr>
<tr>
<td>Wielopole Skrzyńskie</td>
<td>4748</td>
<td>1204</td>
<td>2.0043</td>
<td>0.3155</td>
<td>0.042</td>
<td>0.026</td>
<td>0.039</td>
</tr>
</tbody>
</table>

Source: author's study
Fig. 6. Percentage share of lands excluded in two categories: arable lands and grasslands in total area of arable lands and grasslands. Graphic interpretation of indices of area of excluded arable lands and area of excluded grasslands.

Fig. 7. Comparison of indices of percentage share of excluded lands in two categories: arable lands and grasslands in total area of arable lands and grasslands. Graphic interpretation of indices of area of excluded arable lands and area of excluded grasslands and of area of excluded lands/area of arable lands + area of grasslands.
Index calculated for arable lands and grasslands shows minimal value in the Wielopole Skrzyńskie commune, and the maximal in the Sędziszów Małopolski commune.

Table 4. Euclidean distance matrix defining taxonomic similarity of communes

<table>
<thead>
<tr>
<th></th>
<th>Iwierzyce</th>
<th>Ostrów</th>
<th>Ropczyce</th>
<th>Sędziszów Małopolski</th>
<th>Wielopole Skrzyńskie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iwierzyce</td>
<td>0</td>
<td>0.804</td>
<td>0.193</td>
<td>0.178</td>
<td>0.921</td>
</tr>
<tr>
<td>Ostrów</td>
<td>0.804</td>
<td>0</td>
<td>0.678</td>
<td>0.716</td>
<td>0.122</td>
</tr>
<tr>
<td>Ropczyce</td>
<td>0.193</td>
<td>0.678</td>
<td>0</td>
<td>0.039</td>
<td>0.800</td>
</tr>
<tr>
<td>Sędziszów Małopolski</td>
<td>0.178</td>
<td>0.716</td>
<td>0.039</td>
<td>0</td>
<td>0.838</td>
</tr>
<tr>
<td>Wielopole Skrzyńskie</td>
<td>0.921</td>
<td>0.122</td>
<td>0.800</td>
<td>0.838</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: author’s study

It results from Euclidean metrics that the shorter distance between units (communes), the more similarities between them [Kolenda 2006]. Using spatial taxonomy – hierarchical method of objects classification – similarities between communes in the studied district have been defined.

Source: author’s study based on the Numerical taxonomy software

Fig. 8. Graphic interpretation of communes’ classification in the Ropczyce-Sędziszów district by spatial taxonomy method
Full structure of objects classification done by a method of spatial taxonomy covered four ranks (Figure 8). In the second rank three types of communes were singled out that were homogeneous as to a direction of exclusion of lands from production. The first group included Sędziszów Małopolski and Ropczyce, the second – Ostrów and Wielopole Skrzyńskie and separately, a third group – the Iwierzyce commune was classified. One degree higher classification rank connected Sędziszów Małopolski, Ropczyce and Iwierzyce communes in one homogeneous group. Measure $D = 0.921$ indicates taxonomic mean for the whole class of objects and maximal distance in a distance matrix. Index $D_m = 0.529$ indicates mean value of distances in a distance matrix. Index $V$ shows mean intragroup variation [Kolenda 2006]. Measure $H = H^{**}$ demonstrates strong heterogeneity of a group. Whereas, according to Rousseeuw [1987], the value of measure silhouette coefficient $SC = 0.838$ on the level of second rank and $SC = 0.845$ on the level of a third rank indicate in both cases a very good division into groups in the classification.

4. Recapitulation and conclusions

Though there are legal limitations imposed on exclusion of lands from agricultural production, the rural areas are subject to ongoing suburbanization and consequently they lose their agricultural function and acquire a non-agricultural one and change their character. This phenomenon is noticeable mainly in high number of administrative decisions on exclusions, and in the form of large area of lands excluded from agricultural production. The Ropczyce-Sędziszów district in the Podkarpackie voivodeship is a good example of such practices. During 15 years almost 1600 such decisions were issued, slightly more than 106.5 per year. Exclusions result especially in structural changes of usable lands. In that period around 55 ha of lands of highest production quality were subject to exclusion (I–III soil quality class). Every year the area of agricultural lands, particularly arable lands, is getting smaller. On a positive note, however, the studies show that in recent years less lands are excluded from production. The maximal value of 9 3430 ha of lands excluded from production was not repeated in the following years. Target functions designated in administrative decisions to exclude lands from productions, taken during 15 years in the Ropczyce-Sędziszów district’s communes, were dominated by housing investments, then by recreational and leisure and road investments.

The calculated coefficients, showing the percentage share of arable lands and grasslands excluded from production, point to some similarities between the studied communes. In order to define this similarity the communes were classified by spatial taxonomy method. It allowed to single out group of objects homogeneous as to a pace of growth of lands excluded from production in both types of usable lands (arable lands and grasslands). Three types of communes can be singled out (in the second rank of classification). These are objects, as to which numerous administrative decisions to exclude lands from production are issued. The phenomenon can be explained by the proximity of towns, well developed communication network (there is a national road
E40 nearby and a ring road of Ropczyce), and good quality of roads, which makes suburb residential plots more attractive. The rural commune of Iwierzycy was the only one to be classified in the second group. It is a very characteristic object, because in spite of its rural status, large number of decisions to exclude lands from production were issued there (262 in 15 years). The reason for this can be a close neighbourhood of Sędziszów Małopolski town, as well as to the location of part of the commune that is good for building development. The southern part of the commune is much less frequently chosen as place of living, as these lands are characterized by considerable height differences and classified as a physiographical region averagely favourable for settlement and transportation [Klimek et al. 1969]. The third group is composed of two communes: Wielopole Skrzyńskie and Ostrów. They are also noted for the smallest change in the areas of particular types of agricultural lands. These communes are located in the northern and southern outskirts of the Ropczyce-Sędziszów district, far from main urban centre of this area. They are also communes with substantial height differences, largely forested, and with unfavourable conditions for housing development (sandy soils with low bearing capacity).

References


Ustawa z dnia 3 lutego 1995 r. o ochronie gruntów rolnych i leśnych (Dz. U. z 2004 r. nr 121, poz. 1266)

REVIEWERS (YEAR 2016)

Dr hab. inż. arch. Andrzej Białkiewicz, prof. PK (Politechnika Krakowska)
Prof. zw. dr hab. inż. Stanisław Bialousz (Politechnika Warszawska)
Prof. dr hab. inż. Henryk Bryś (Politechnika Krakowska)
Prof. dr hab. inż. Khrystyna Burshtynska (Politechnika Lwowska)
Prof. dr hab. inż. arch. Bohdan Cherkes (Politechnika Lwowska)
Prof. dr hab. inż. Ryszard Cymerman (Uniwersytet Warmińsko-Mazurski w Olsztynie)
Prof. dr hab. inż. Józef Czaja (Akademia Górniczo-Hutnicza w Krakowie)
Dr hab. inż. Kazimierz Ćmielewski (Uniwersytet Przyrodniczy we Wrocławiu)
Dr hab. Marek Dąbski (Uniwersytet Przyrodniczy w Lublinie)
Prof. dr hab. inż. Oleksandr Dorozhynskyy (Politechnika Lwowska we Lwowie)
Prof. dr hab. inż. Konrad Eckes (Państwowa Wyższa Szkoła Techniczno-Ekonomiczna w Jarosławiu)
Dr hab. inż. Ireneusz Ewiak (Wojskowa Akademia Techniczna w Warszawie)
Dr hab. inż. Tadeusz Gargula (Uniwersytet Rolniczy w Krakowie)
Prof. dr hab. inż. Krzysztof Gawroński (Uniwersytet Rolniczy w Krakowie)
Dr hab. inż. Dariusz Gotlib (Politechnika Warszawska)
Dr hab. inż. Paweł Hanus (Akademia Górniczo-Hutnicza w Krakowie)
Prof. dr hab. Jerzy Hetman (Uniwersytet Przyrodniczy w Lublinie)
Prof. Dr. Ing. Elena Horská (Slovak University of Agriculture in Nitra)
Dr h.c. Prof. Ing., PhD Húska Dušan (Slovak University of Agriculture in Nitra)
Dr hab. inż. Jarosław Janus (Uniwersytet Rolniczy w Krakowie)
Dr hab. inż. Marcin Karabin (Politechnika Warszawska)
Prof. Dipl.-Ing. Thomas Kersten (Hafen City Universität, Hamburg)
Prof. Dr.-Ing. habil. Theo Kötter (University of Bonn)
Reviewers (year 2016)

Dr hab. inż. Tomasz Kowalik (Uniwersytet Rolniczy w Krakowie)
Prof. dr hab. inż. Waldemar Krupiński (Wyższa Szkoła Inżynieryjno-Ekonomiczna w Rzeszowie)
Dr hab. inż. Zdzisław Kurczyński, prof. PW (Politechnika Warszawska)
Prof. Dr. habil. Dipl.-Ing. Eckart Lange (University of Sheffield, England)
Prof. zw. dr hab. inż. Urszula Litwin (Uniwersytet Rolniczy w Krakowie)
Prof. dr hab. inż. Wiesław Musiał (Uniwersytet Rolniczy w Krakowie)
Prof. zw. dr hab. Tadeusz Niedźwiedź (Uniwersytet Śląski)
Dr hab. inż. Robert Olszewski, prof. PW (Politechnika Warszawska)
Dr hab. inż. Piotr Parzych (Akademia Górniczo-Hutnicza w Krakowie)
Prof. dr hab. inż. dr h.c. Zbigniew Piasek (Politechnika Krakowska)
Dr hab. inż. Jacek Pijanowski (Uniwersytet Rolniczy w Krakowie)
Dr hab. inż. Wojciech Przegon, prof. UR (Uniwersytet Rolniczy w Krakowie)
Prof. dr hab. Krystyna Przybylska (Uniwersytet Ekonomiczny w Krakowie)
Prof. dr hab. inż. Krystian Pyka (Akademia Górniczo-Hutnicza w Krakowie)
Ing. CSc. Jan Ratiborský (Czech Technical University in Prague)
Assoc. Prof. Dr. Dipl.-Ing. Walter Seher (University of Natural Resources and Life Sciences, Vienna)
Dr hab. inż. Katarzyna Sobolewska-Mikulska, prof. PW (Politechnika Warszawska)
Dr hab. Klaudia Stala (Politechnika Krakowska)
Prof. Dr.-Ing. Karl-Fredrich Thöne (Technische Universität, Dresden)
Dr hab. inż. arch. Stanisława Wehle-Strzelecka (Politechnika Świętokrzyska w Kielcach)
Prof. dr hab. inż. Franciszek Woch (Instytut Uprawy Nawożenia i Gleboznawstwa w Puławach)
Dr hab. inż. Dorota Zawieska, prof. nadzw. PW (Politechnika Warszawska)
Dr hab. inż. Tadeusz Zawora, prof. UR (Uniwersytet Rolniczy w Krakowie)
Dr hab. inż. Agnieszka Ziernicka-Wojtaszek (Uniwersytet Rolniczy w Krakowie)
Prof. dr Julian Zlobin (Sumy National Agrarian University)
Dr hab. Mirosław Żelazny (Uniwersytet Jagielloński w Krakowie)
INSTRUCTIONS TO AUTHORS

The journal *Geomatics, Landmanagement and Landscape* features original English language scientific articles related to all aspects of spatial and environmental processes.

Preparation of the manuscript

1. **Length of the text:** manuscripts should not exceed 12 pages (A-4 format), including tables and illustrations. The text must be typed in a 12-point font (Times New Roman), 1.5 spaced with wide margins (2.5 cm).

2. **Tables and illustrations:** these should not be larger than 12.5 × 19.5 cm (B-5 format). Tables must include only essential data with appropriate statistical values. Duplicating the results presented elsewhere in the manuscript (e.g. in graphs) should be avoided. Each table with its heading and each figure identified by its number – must be printed on separate sheets of paper. Tables and illustrations should be numbered in the order in which they appear in the text.

3. **Layout:**
   - Title: concise name of the paper, appropriate to its’ contents.
   - Authors: In the article of several authors the alphabetical order of the names is assumed. At the bottom of the last page should be written: full names, place of work, e-mail and the full postal address of all authors sending the paper.
   - Abstract (in English): a short Summary (100–200 words) of the study, containing basic information on its objective, methods, results and major conclusions.
   - Keywords (in English): up to 6 words or phrases referring to the main topics of the paper.
   - Main body: the text should consist of the following sections: introduction, material and methods, results and discussion, conclusions. The objective of the study should be specified in the introduction.
   - References: citations in the text should be by author and year, e.g. [Kowal 2000, Kowal and Nowak 2000, Baran et al. 2007]. Cited publications will be listed alphabetically at the end of the paper according to the following pattern:

**Ergenzinger P.E., de Jong C., Christaller G.** 1994. Interrelationships between bedload transfer and river-bed adjustment in mountain rivers: an example
from Squaw Creek, Montana. [In:] M.J. Kirkby (ed.), Process models. John Willy, New York, 140–144.


4. Units: the SI system should be used throughout the paper. Compound units should have the form of products, e.g. g · dm⁻³ (instead of g/dm³).

Publishing procedure

1. Authors should submit two copies of their manuscript to the publisher and electronic version to e-mail: gll@ur.krakow.pl.

2. Each article is reviewed by two reviewers – specialists in given field. One of the reviewers is outside of the research unit affiliated by the author of the publication.

3. Information about the authors and reviewers are not available for both parties during the review process.

4. The list of reviewers is published on the website of the publishing house and in the last issue of the year or in the first issue of the next year.

5. Reviews – along with the manuscript containing article adjustments – are sent to the authors to enable them to get acquainted with the comments.

6. The review form that is filled by the reviewer during the article review is available on the journal’s website or in printed form in the editorial office.

7. In cases where a manuscript is returned to its author for revision, it must be corrected and resubmitted to the publishers in electronic version within 5 days; otherwise it will be considered as withdrawn by the author. The author will be notified of the acceptance of the publication.

8. The Authors are obliged to formally declare the agreement concerning the transfer of copyright and that the paper has not been published before; it is not being considered for publication elsewhere – and, if accepted, it will not be published elsewhere in the same form without the written permission of the publisher.

9. The responsibility for obtaining permission from the copyright holder to reproduce any copyright-protected figures rests with the authors.

10. The authors are obliged to provide information about the sources of financing of the research presented in the scientific article, sent for publication in the GLL.
11. Final version of the manuscript will be send to the authors for acceptation as its electronic copy. The publisher reserves the right to make cuts and corrections in the text.

12. Final version of the manuscript should be sent back to the publisher within 48 hours from its receiving. Alterations to the text should be limited to factual or typesetting errors.

13. Each author will receive a free copy of the issue.

14. The journal does not levy any charges.

Publication Ethics and Malpractice Statement. Ethical guidelines

In order to prevent cases of scientific misconduct the Editorial Board has procedures in place to deal with cases of “Ghost-writing”, “Guest Authorship”, “Plagiarism” and “Self-plagiarism”.

Ghost-writing: A situation where someone makes a substantial contribution to a publication without revealing his or her participation as one of the authors or without being mentioned in the acknowledgments attached to the publication.

Guest Authorship or Honorary Authorship: A situation where one or more authors are cited as making a significant contribution to a work were as in reality the contribution is insignificant.

Plagiarism: The act of using someone else's work as one's own without acknowledging the source of that work.

Self-plagiarism: The act of using your own earlier published work without acknowledging the source of that work.