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Series „Administratio Locorum" is concerned with the social, economic, geographic, legal, environmental and planning aspects of land administration. The aim of the journal is to provide an interdisciplinary platform for the exchange of ideas and information among scientists representing various disciplines, whose ideas and discoveries tribute to effective land administration. Thus, journal publishes both reviews and empirical studies presenting the results of surveys and laboratory works. Topics covered by our Authors include, i.e.: land administration, technical and social infrastructure, spatial economics, social-economic geography, land management, real estate management, rural areas, environmental protection, protection of historical buildings, spatial planning, local and regional development, sustainable development, urban studies, real estate market, transport systems, legal regulations for the land administration, and spatial management.
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THE ASSESSMENT OF TOOLS FORMING HOUSING POLICY IN POLAND USING THE EXAMPLE OF THE GOVERNMENT'S MdM PROGRAMME

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ABSTRACT

One of the most important needs in the hierarchy of human needs is the housing need. Virtually all European countries fulfil a pro-family housing policy by using various tools to support investments of this kind. Housing policy is also conducted in Poland. In spite of the huge popularity of the TBS (Social Housing Association) and Rodzina na swoim (A Family's Own Place) programmes, the demand for flats in Poland is still high.

The authors of this paper tried to assess the impact of the implementation of the MdM (Mieszkania dla Młodych – Home for Young People) programme on the housing market in the biggest cities of Polish regions and in peripheral areas. The level of the relationship between the level of subsidies used in this programme and areas of newly built flats for the indicated spatial units was demonstrated with the use of statistical methods.

The result of the completed analyses is the assessment of the effectiveness of the programme with regard to the housing policy being adopted, and the analysis of its effectiveness with regard to spaces with different levels of social and economic development.

Key words: instruments of housing policy, housing policy, social-economic space, development of the building industry, housing market

INTRODUCTION

The primary aims of the housing policy conducted by the majority of European states are to create conditions for the purchase or lease of flats by all citizens while ensuring the availability and appropriate quality of housing resources (Cieślak et al. 2014). The pursuit of these aims may involve difficulties related, among others, to the provision of access to flats of minimum, yet good standard to households with low incomes (Ball 1983, Mallach 1984). The budgets of these households should be relieved at a level that would

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allow them to live at a relatively stable financial level. This requires an extremely balanced compromise between the market economy of developed states and their vision of a welfare state (Bengtsson 1995, 2001, Gent 2010). Problems of the housing policy also involve conditions for the fulfilment of the special housing needs of certain social groups (the elderly, solitary and homeless persons), decapitalisation of housing resources, or regional disproportions in the level of fulfilment of the housing needs of the urban and rural populations (Lis 2008). It must be stressed that the housing situation in European states depends mainly on the effectiveness of the housing policy conducted by these states (Brandsen et al. 2006). Western Europe owes its position in this field to building programmes implemented for the purpose of making up for shortages in housing resources that were necessary because of the consequences of the Second World War. However, it must be added that this did not apply to all states (e.g. Sweden). Financed and managed by the state, these programmes were aimed at creating the possibility of building a large number of cheap flats for low-income and middle-income families (Ulman 2011).

As emphasised in the Regular National Report on Housing Developments in European Countries (Norris and Shiels 2004), regulating the issue of the housing industry is not a part of the competencies of the European Union. However, the creation of housing policy is an important part of the creation of the sustainable economical development of the EU.

The situation of Poland is very unfavourable compared to the relatively stable situation in Western European countries. The shortage of flats in Poland is very high – it is the highest rate among EU countries (327 flats per 1,000 inhabitants in Poland vs. 466 inhabitants on average in the EU) (Herbst 2012). In Poland, the average rate of usable area per inhabitant is 28 sq.m. In countries such as Germany or Denmark, the average rate is 40 sq.m. (Groger 2007). According to the assessment of the Supreme Audit Office, no sufficient actions have recently been taken either at central government level or local government level for the effective performance of tasks in the field of housing management (Nieboer and Gruis 2015). The absence of long-term, prospective and stable policy supporting the housing industry results in a high level of housing deficit, which has lasted for nearly 10 years and currently amounts to 1.5 million flats. This situation is aggravated by the low standard of existing housing resources, which may decrease considerably in the near future (NIK 2011, PZPD 2012).

PRIMARY INSTRUMENTS OF HOUSING POLICY IN POLAND

The recognition of the housing industry as one of the functions of government authorities and local government authorities is reflected in provisions contained in basic legal acts, including the Constitution of the Republic of Poland (Cieślak et al. 2014, Zysk and Wawrowska 2018). According to Article 75 par. 1 of the Constitution, public authorities are obliged to conduct a policy favouring the fulfilment of citizens' housing needs, with particular regard to the prevention of homelessness, the support of the development of the social housing industry, and the support of citizens' activities aimed at obtaining their own flat ('Assumptions of the housing industry support policy till 2020' – draft version).

The form of the main tools in the Polish housing policy changed at the end of the 1990s. As early as in the middle of the 1990s half of new flats were put into use within the social building system, which included housing co-operatives, a resource of establishment-owned flats and council flats (Gwiaździńska-Goraj 2018). In 1995 Social Housing Associations (**Towarzystwa Budownictwa Społecznego – TBS**) were established; their aim was to build tenement flats for middle-income families with the support of municipalities. However, TBS did not become a popular institution that diametrically changed the housing situation of Poles. Conditions imposed by TBSs were not attractive for the social group to which the programme was addressed (mainly because of high rents). In those times the private building industry was a relatively small part of the housing industry, and the development building industry was an even smaller one. However, the structure of the housing industry has changed dramatically during the last two decades.

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In 2010, social entities put only 6.6% of all new flats into use, whereas development flats accounted for 40% of all flats put into use (Urbański 2012). By 2011, over 60% of flats in Poland were ultimately in the possession of private owners (Pittini and Laino 2011).

Examples of tools of the housing policy conducted in Poland are government programmes under which the State Treasury provides financial aid to their beneficiary for a certain extent. In the years 2008–2013, for the purpose of the development of the building industry in Poland, the Rodzina na swoim (A Family's Own Place) programme was introduced to improve the housing situation of young people and have an indirect impact on the improvement of the demographic situation in Poland. It was introduced pursuant to the Law on the financial support of families in the purchase of their own flat (Journal of Laws of 18 December 2008, no. 223, item 1465). The aim of the programme was to provide financial support to families and single parents intending to purchase a flat or house. The beneficiary could apply for supplementary funds from the State Treasury for credit contracted in Polish zlotys under the programme. The form of support proposed by the State Treasury made it possible to decrease the capital & interest instalment by a few dozen per cent within 8 years. The amount of supplementary funds depended primarily on the amount of outstanding debt. The Act also introduced conversion factors for the replacement cost of 1 sq. m. of the usable area of residential buildings for the whole of Poland with division into provinces that differentiated the prices of one square metre of real property. The programme finished on 31 December 2013. Then, the government declared that it would introduce another programme aimed at helping young people to purchase a flat. To sum up, over 192,000 credits were granted under the Rodzina na swoim programme. In 2011, the biggest number of credits were granted for flats or houses from the secondary market (over 27,000) and for the construction of houses (over 9,000). One year later, the number of credits granted on the primary market was 15,000. The programme was used most frequently by beneficiaries aged 30–34 (www.sse.geo.uni.lodz.pl, 1.02.2017).

On 27 September 2013, the Law on financial aid in the purchase of the first flat by young people came into force (Journal of Laws 2013, item 1304], under which the **Home for the Young** (**Mieszkanie dla Młodych – MdM**) project was introduced. It clearly specifies the group of target beneficiaries and the requirements that they must meet in order to receive financial aid. The programme specifies maximum prices and areas of real property. Financial state support is paid out to beneficiaries on a one-off basis. The MdM programme is addressed to persons aged up to 35 who want to buy a flat or a house for the first time (Matel 2018). The legislation also specifies financial aid for persons aged up to 36 who build a house on their own in the form of reimbursement of part of VAT on building materials. As in the case of the **Family on Their Own** (**Rodzina na swoim – RnS**) programme, potential beneficiaries of the programme include married couples, single people, and single parents who want to buy a flat/house on the primary market or build a house on their own. The MdM programme differs from the RnS programme in terms of the analysis of the housing situation of the person applying for financial aid. Such a person must not be the owner of a residential building or premises, or a co-owner of buildings without separated residential premises.

The MdM programme is based on financial aid supplementing the beneficiary's own contribution, which must be proved in the case of applying for credit for the purchase/construction of real property. The programme covers flats from the primary market with a maximum area of 75 sq. m. and houses with an area of up to 100 sq. m. There is an exception to this rule – families with at least three children may purchase a flat with a maximum area of 85 sq. m. or a house with a maximum area of 110 sq. m. However, financial aid covers not more than 50 sq. m. of the area of a flat/house. Moreover, upper price limits for real property prices that can be co-financed through financial aid from the MdM are determined and published in the Public Information Bulletin by Bank Gospodarstwa Krajowego. Real property issued by the beneficiary must be located in Poland and be used for fulfilling the beneficiary's own housing needs (Foryś 2014). The price of the purchase of a flat

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must not exceed the amount being the factor 1.1 multiplied by the usable area of the flat and the average conversion factor of the replacement cost of 1 sq. m. of the usable area of residential buildings valid for the municipality in which the flat is located (Program „Rodzina na swoim"… 2019).

The rules of financing are more complex than in the previous RnS programme. Any person who wants to obtain financial aid must incur credit in Polish currency for a period of at least 15 years in the minimum amount of 50% of the price of purchase of the real property. The programme allows less wealthy persons to join with members of their closest family as additional borrowers of the credit. The amount of financial aid supplementing the beneficiary's own contribution is:

– 10% of the value of the flat for childless married couples or a single person;
– 15% of the value of the flat for married couples or a single person with at least one child;
– an additional 5% if a third or further child (including adopted children) is born to beneficiaries during the period of 5 years from the purchase of the flat.

The MdM programme assumes the repayment of part of the credit paid out in connection with the birth or adoption of a child equal to 5% of the multiplication product of the average conversion factor of the replacement cost of 1 sq. m. of the usable area of residential buildings constituting a basis for the determination of the amount of financial aid supplementing the beneficiary's own contribution and the area calculated adequately to the usable area of the purchased flat. It is granted to the purchaser only once, and concerns the repayment of part of the capital of the credit granted by a crediting institution for the purchase of a flat.

The legislation presents the situations in which the beneficiary under the MdM programme must immediately withdraw from the agreement. These are cases when, during a period of 5 years from the day of acquisition of the right of ownership to real property, the owner sells a flat/house, rents or leases a flat/house to a third party, becomes the owner or a co-owner of another real property (excluding inheritance) – in such cases, the amount of financial aid must be returned in the amount proportional to the number of months remaining till the end of the 5-year period (MdM… 2019, Rodzina na swoim… 2019).

ANALYSIS OF THE FUNCTIONING OF THE MDM PROGRAMME

The primary aim of the research was to assess the conformity of the assumptions of the MdM programme with regard to the housing situation of individual provinces in Poland. For the purpose of obtaining an outline of the situation in this field, a decision was made to analyse available statistical data determining the level of development of the real property market and implementation of the MdM programme. The main factors under analysis refer to the living area put into use in each municipality in 2014. This parameter was considered with division into area units specified in accordance with the act defining the assumptions of the MdM programme (the Act of 27 September 2013 on financial aid in the purchase of the first flat by young people, Journal of Laws from 2013, item 1304). These were:

– administrative units of cities constituting the seats of the head of the province (wojewoda) and provincial councils (sejmiki wojewódzkie);
– municipalities adjacent to the above, in accordance with the act;
– other municipalities of the province.

The analysed data concerned the 1st, 2nd and 3rd quarter of 2014 and were consistent with the data of the Central Statistical Office. The overview of data helped to determine the housing development index (R_{BM}), which is determined as the relationship between the living area put into use (Pm) and the number of inhabitants of the given administrative unit *(M)* as at the specific time *(t)*.

$$R_{BM}(t) = P_m(t)/M(t) \quad (1)$$

where:

R_{BM} – housing development index;
P_m – usable area of flats put into use;
M – number of inhabitants;
t – specific time.

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The analysis of the index clearly divides the space of Poland into areas that can be said to be developing properly, and the living area per inhabitant that was put into use last year is considerably higher than the national average (0.27). These are the economically well-developed regions of Poland: Mazowieckie Voivodeship, Małopolskie Voivodeship, Dolnośląskie Voivodeship and Wielkopolskie Voivodeship (Fig. 1).

It is also possible to separate eastern Poland, which is still a much poorer part of the country, and where the calculated index reaches low values (Łódź, Podkarpackie Voivodeship, Świętokrzyskie Voivodeship, Lublin, Warmińsko-Mazurskie Voivodeship and Lubuskie Voivodeship). Interestingly, this area overlaps almost entirely with the region of eastern Poland specified (on the basis of GNP per inhabitant) as the poorest part of the European Union. This is also confirmed by the distribution of financial support used under the programme in individual provinces in 2014, which is presented in percentage values in Figure 2 (BGK 2014).

It turns out that the biggest amount of funds was used in provinces that are regarded as richer regions (Fig. 2), which is confirmed by GNP statistics per inhabitant (Central Statistical Office). It must be noted that over 50% of funds were granted to three provinces: Mazowieckie, Wielkopolskie and Pomorskie. It must, therefore, be stressed that the system of subsidies used in MdM favours wealthier areas with high development indices. On the one hand, we can say that the programme responds to higher deficits of living space in these areas; on the other hand, however, we must note that it increases the risk of the further marginalization of poorer areas.

The above statements are reinforced by an analysis of data concerning the percentage distribution of amounts of financial aid in provinces, with division into areas consistent with the statutory classification

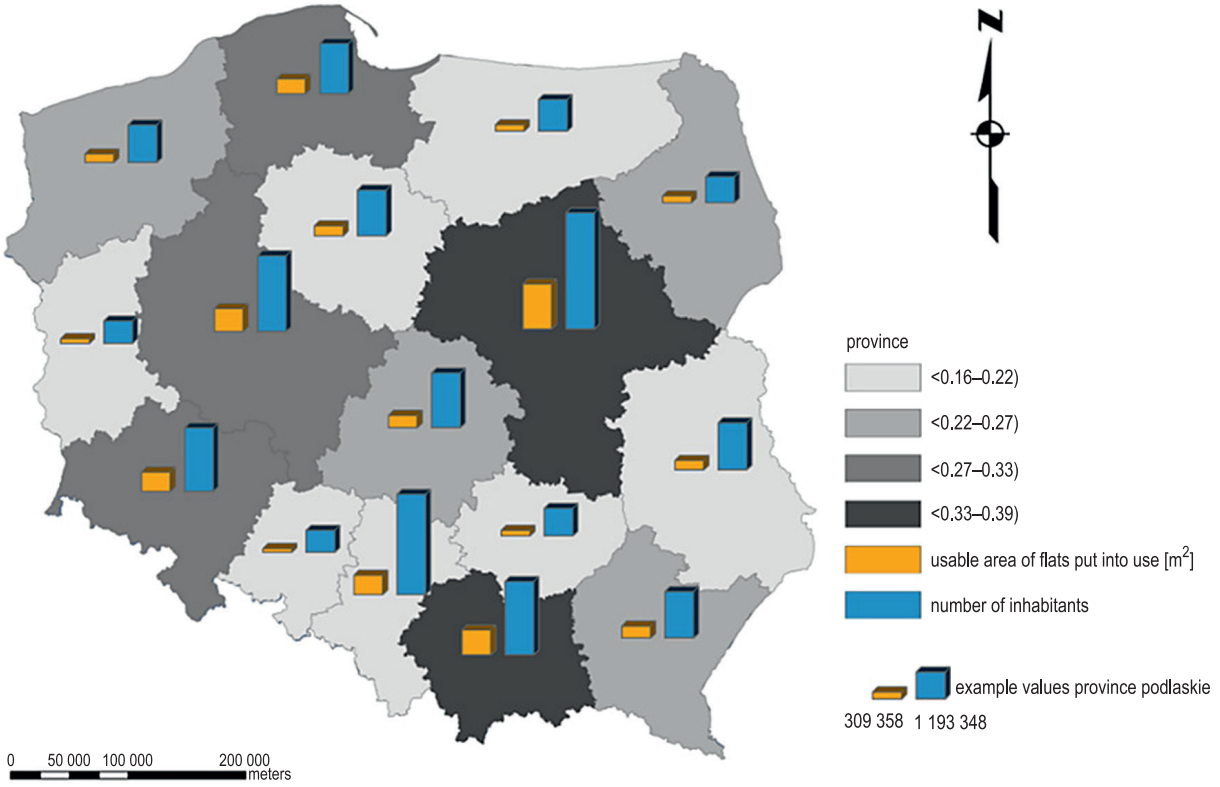

Fig. 1. The R_{BM} index for Poland and individual provinces
Source: authors' own work

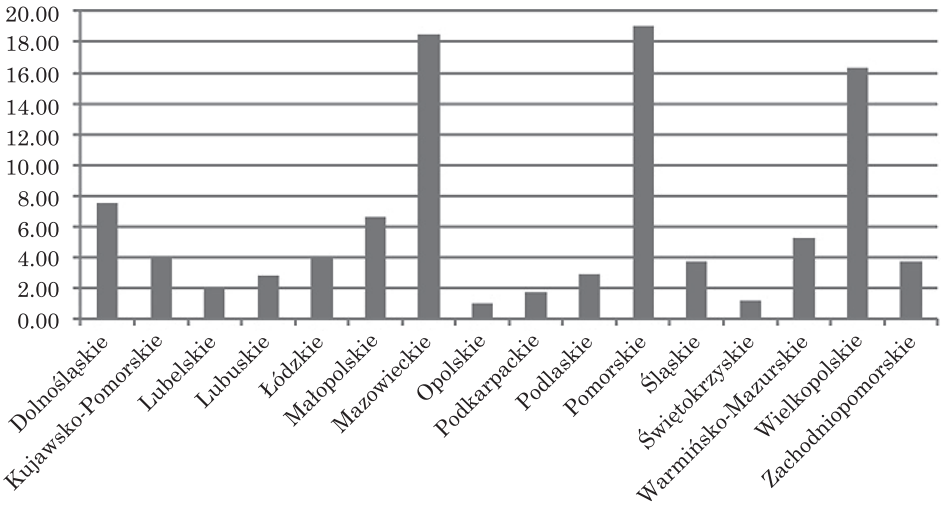

Fig. 2. The amount of financial aid under the MdM programme in individual provinces, expressed as a percentage value
Source: authors' own work

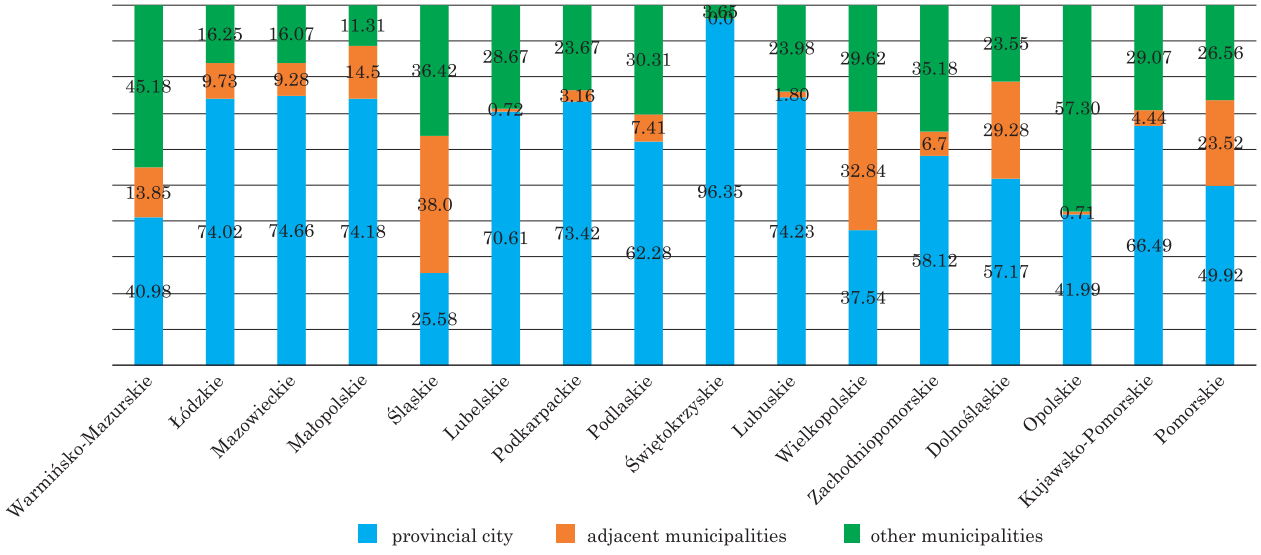

Fig. 3. The distribution of subsidies granted to individual provinces under the MdM programme
Source: authors' own work

(Fig. 3). It can clearly be seen that most financial aid is granted to big cities.

Interesting conclusions referring to the aforementioned statements are provided in an analysis of conclusions submitted under the MdM programme in 2014 with regard to the area of flats put into use in individual provinces (BGK 2014). It may prove to be significant because of the differences between the numbers of individual limits in cities and other areas of provinces that could be significant for the amounts of funds utilised in individual municipalities. The authors calculated the percentage of living space put into use with division into kinds of spatial units separated in the programme (*1*, *2*, *3*) and compared these values to the percentage distribution of the number of applications in these spatial units (Fig. 4).

The overview clearly indicates the differentiation of the use of funds utilised in the programme for

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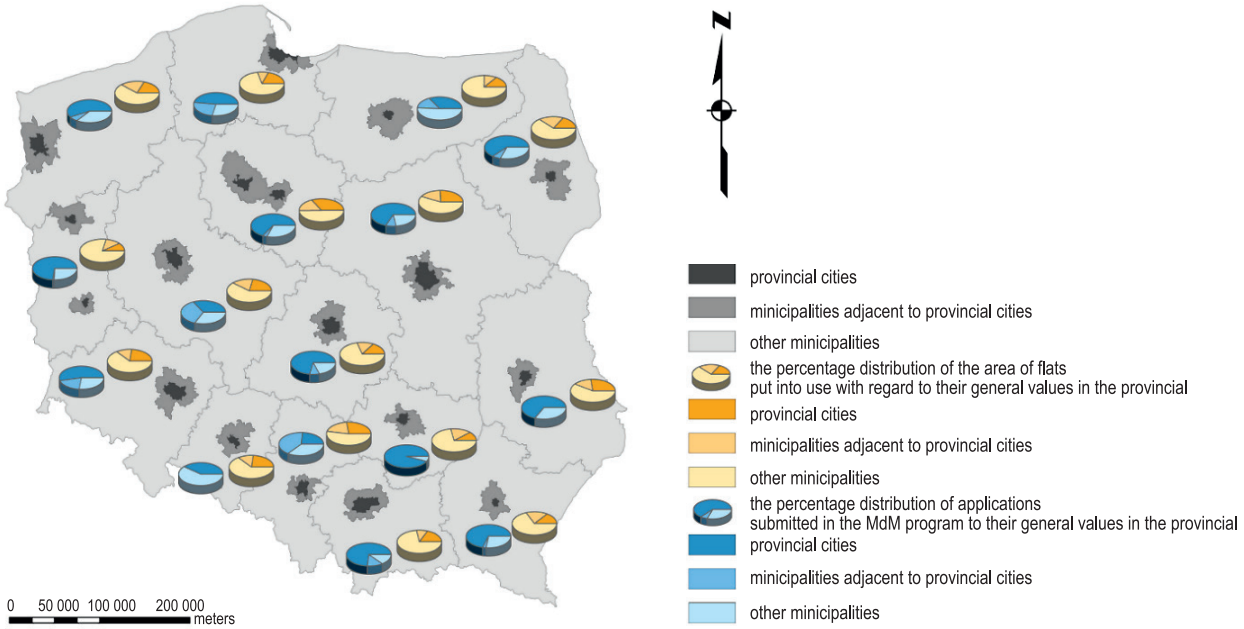

Fig. 4. The percentage distribution of areas of flats put into use, and applications submitted under the MdM programme with regard to their general values in provinces
Source: authors' own work

the individual spatial units of provinces. It turns out that most applications are considered in big cities, which has already been ascertained above. In other areas (in the 'field'), most of the built flats are put into use. This is an obvious fact resulting from the territorial and demographic scope of provinces. Thus, it is even more surprising that most of the applications and granted subsidies refer only to large urban units. This suggests a certain shortage of information or a difficult procedure for the acquisition of subsidies, which result, for example, from locations situated far away from banks offering preferential mortgage credit in the MdM programme. However, the fact of such a structure of the number of applications and the amounts of financial aid with regard to areas of flats put into use confirms the conclusions about the marginalisation of the peripheral areas of provinces.

The further stage of the research concerned an analysis of the level of price limits (L_M) specified for each quarter of the year. These limits result in subsidies that can be obtained for the purchase of a flat; they are calculated using a special key depending on a number of factors described above.

It turns out that differences in subsidies for a specific target group classified depending on the location towards central areas can be significant (Fig. 5). In central cities of individual regions they are approx. 20% higher on average, but the difference may reach 40% or higher for some of them; in the case of Warsaw it amounts to 71%. In the case of Warsaw and some other big provincial cities, such a big difference is obvious, but the situation in Warmińsko-Mazurskie and Świętokrzyskie provinces is worth considering. The factors reflecting the level of replacement prices of 1 sq. m. of living area suggest a higher deficit of living space in the area of Olsztyn and Kielce than in other cases.

Analysed limits were juxtaposed with offer prices of flats put up for sale on the primary market in individual provinces (Fig. 6). Data concerning prices were gathered with the use of the website (Gawin 2019). It turns out that the limits used in the MdM programme are often lower than prices of 1 sq. m. of flats.

This results in the unavailability of flats under MdM programmes on some local markets. Their high price in relation to specific limits blocks

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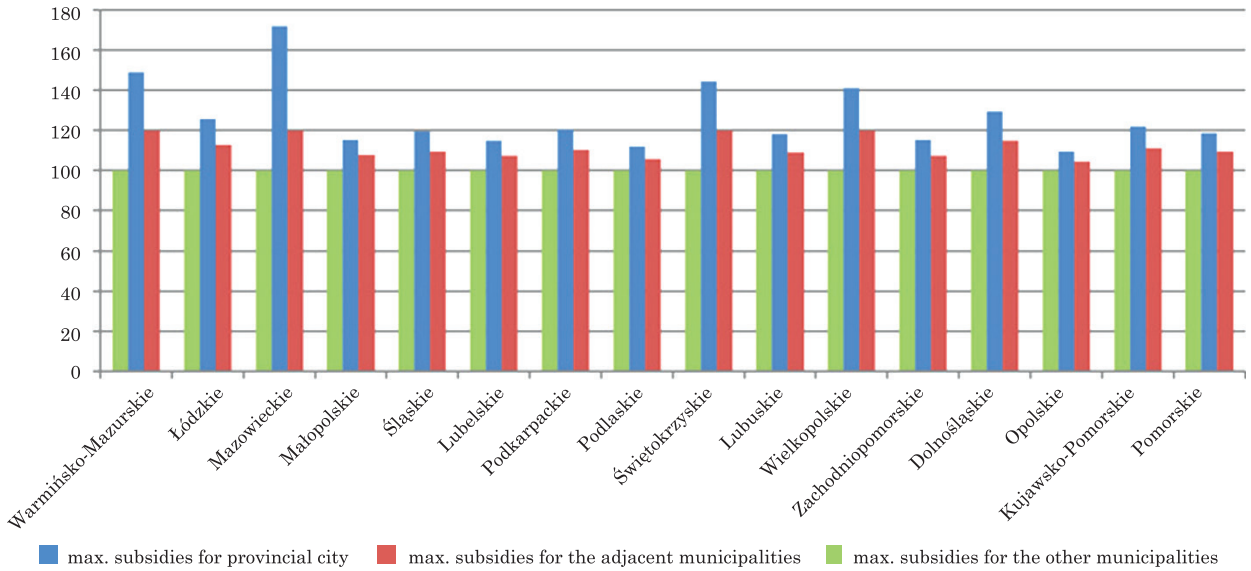

Fig. 5. Differences in the amount of maximum subsidies under the MdM programme, depending on the location of the investment. Subsidies for municipalities that are not located in the direct neighbourhood of provincial cities are determined as 100%

Source: authors' own work

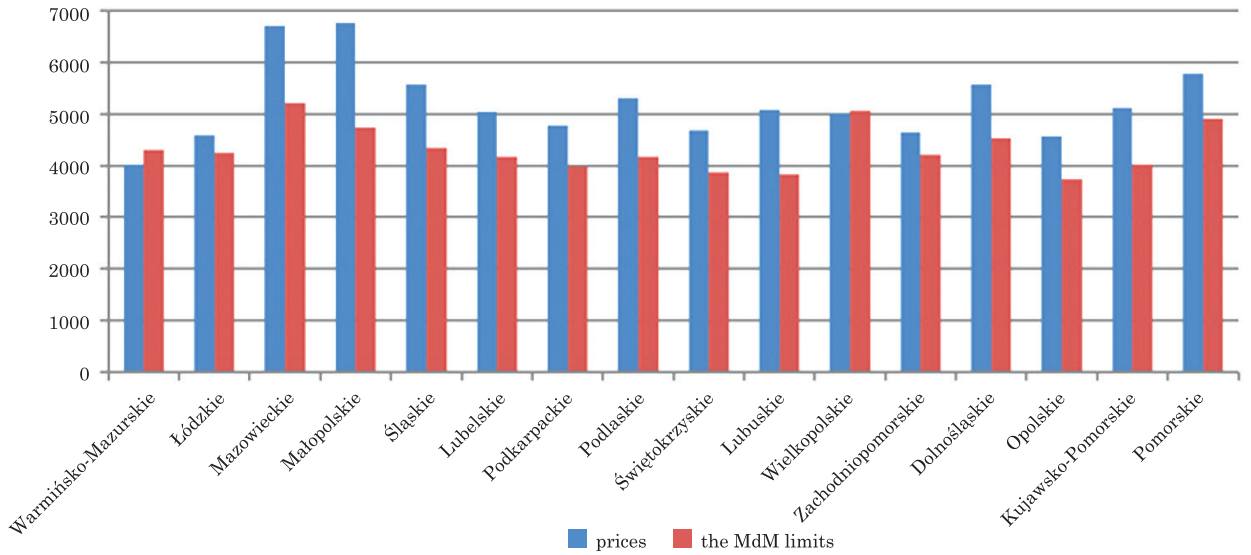

Fig. 6. The average level of offer prices on the primary market and the average amount of limits under the MdM programme for individual provinces in 2014

Source: authors' own work

the possibility of their purchase in accordance with the rules of the programme. This, in turn, leads to the frequent concealing of the actual cost of purchase of a flat by shifting part of the price, e.g. to auxiliary premises (cellars and garages are sold obligatorily at higher prices than resulting from the market analysis during the purchase of the flat). It is also worth considering if the increase in prices of flats on the primary market observed at the end of the year is caused by the functioning of MdM. This can mean

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that actual beneficiaries of the programme are developers, who make use of the will to purchase flats in the MdM programme by raising their prices.

The results of the authors' analyses were finally confirmed by an analysis of the distribution of areas of flats under construction in individual administrative units (with division into areas *1*, *2*, *3*) per inhabitant in relation to the amount of subsidies allocated to these units under the MdM programme (also per inhabitant). It seems obvious that the direction of support should stimulate the housing market and be correlated with the area of flats being put into use. However, this is not so. Table 1 presents the average amounts of subsidies per inhabitant of the areas (*1*, *2*, *3*) and the area of flats per inhabitant put into use in 2014 according to the same pattern.

In an attempt to confirm the thesis that subsidies resulting from the MdM programme are not actually granted to those who need them most, the correlation was examined between the index of areas of new flats per inhabitant with division into areas *1*, *2*, *3* and the index of subsidies per inhabitant in the same areas. The data used for determining the relationship are contained in Table 1 (columns 9 and 10). The Pearson product-moment correlation coefficient reached the level of 0.38 and did not indicate any serious relationship between variables adopted for the analysis of the relationship between both data (Table 2).

Table 1. Data concerning the functioning of the MdM programme and the development of the housing industry in programme support areas

Kind of area	Name	Usable area of flat put into use	Number of applications	Percentage of all applications	Amount of support	Percentage share in province	Number of inhabitants	Area of flats per inhabitant	Amount of suport under MdM
		m^2		%	milions of PLN			sq.m-/P	PLN/P
1	2	3	4	5	6	7	8	9	10
1	Olsztyn	41 371	309	1.93	7.22	35.44	173 831	0.237996	41.53459
2	Warmińsko--Mazurskie	37 523	120	0.75	2.44	13.76	58 300	0.643619	41.85249
3		210 579	443	2.77	7.96	50.80	1 178 206	0.178729	6.756034
1	Łódź	101 115	415	2.60	9.66	71.43	706 004	0.143222	13.68264
2	Łódzkie	87 066	57	0.36	1.27	9.81	182 985	0.475809	6.94046
3		350 677	109	0.68	2.12	18.76	1 465 824	0.239235	1.446286
1	Warsaw	717 263	1 943	12.17	56.09	67.44	1 735 442	0.413303	32.3203
2	Mazowieckie	319 362	297	1.86	6.97	10.31	427 763	0.746586	16.29407
3		1 029 974	641	4.01	12.07	22.25	3 146 685	0.32732	3.835783
1	Cracow	310 076	901	5.64	21.38	73.49	761 873	0.406992	28.06242
2	Małopolskie	174 728	178	1.11	4.18	14.52	263 226	0.663795	15.87989
3		656 331	147	0.92	3.26	11.99	2 340 459	0.280428	1.392889
1	Katowice	76 275	159	1.00	3.42	23.80	301 834	0.252705	11.33073
2	Śląskie	110 838	256	1.60	5.08	38.32	821 782	0.134875	6.181688
3		695 088	253	1.58	4.87	37.87	3 459 858	0.200901	1.407572
1	Lublin	61 867	228	1.43	4.90	65.71	341 722	0.181045	14.33914
2	Lubelskie	68 433	2	0.01	0.05	0.58	126 036	0.542964	0.396712
3		301 777	117	0.73	1.99	33.72	1 634 776	0.184598	1.217292
1	Rzeszów	92 450	219	1.37	4.64	69.09	185 123	0.499398	25.06442
2	Podkarpackie	59 462	11	0.07	0.20	3.47	111 687	0.532399	1.790719
3		394 414	87	0.54	1.48	27.44	1 829 612	0.215572	0.808915

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cont. **Table 1**

1	2	3	4	5	6	7	8	9	10
1	Białystok	79 435	311	1.95	6.39	61.46	295 459	0.268853	21.62737
2	Podlaskie	56 782	36	0.23	0.76	7.11	77 842	0.729452	9.763367
3		173 141	159	1.00	3.11	31.42	802 183	0.215837	3.876921
1	Kielce	59 163	166	1.04	3.70	94.86	198 857	0.297515	18.60634
2	Świętokrzyskie	37 281	0	0.00	0.00	0.00	90 793	0.410615	0
3		159 082	9	0.06	0.14	5.14	969 957	0.164009	0.144336
1	Gorzów Wielkopolski and Zielona Góra	23 915	106	0.66	2.16	21.20	124 145	0.192638	17.39901
2	Lubuskie	38 808	8	0.05	0.18	1.60	65 583	0.591739	2.744614
3		126 081	128	0.80	2.40	25.60	699 327	0.180289	3.431871
1	Poznań	164 228	864	5.41	21.81	35.02	545 680	0.30096	39.96848
2	Wielkopolskie	244 731	775	4.85	19.08	31.41	268 524	0.911393	71.0551
3		646 647	828	5.18	17.21	33.56	2 652 078	0.243827	6.489251
1	Szczecin	72 281	331	2.07	6.94	56.20	407 180	0.177516	17.04406
2	Zachodniopomorskie	43 259	38	0.24	0.80	6.45	134 857	0.320777	5.93221
3		275 734	220	1.38	4.20	37.35	1 173 394	0.234988	3.57936
1	Wrocław	239508	712	4.46	16.87	52.86	634 487	0.377483	26.58841
2	Dolnośląskie	181 491	265	1.66	5.69	19.67	145 316	1.24894	39.15605
3		465 686	370	2.32	6.95	27.47	2 121 935	0.219463	3.275312
1	Opole	16 429	58	0.36	1.18	41.13	119 574	0.137396	9.868366
2	Opolskie	31 999	1	0.01	0.02	0.71	80 933	0.395376	0.247118
3		121283	82	0.51	1.61	58.16	790 532	0.153419	2.036603
1	Bydgoszcz and Toruń	97 409	287	1.80	5.79	44.70	357 652	0.272357	16.18892
2	Kujawsko-Pomorskie	86 462	26	0.16	0.57	4.05	141 910	0.609273	4.01663
3		266 064	201	1.26	3.73	31.31	1 377 492	0.193151	2.70782
1	Gdańsk	122 660	1 311	8.21	32.82	48.32	461 489	0.265792	71.11762
2	Pomorskie	153 618	619	3.88	15.46	22.82	377 115	0.407351	40.99545
3		411 507	783	4.90	17.46	28.86	1 456 464	0.282538	11.98794

Source: authors' own work based on statistical data (Statistics Poland. 2017). Designation of the kind of area: *1* – city being the seat of the head of the province (*wojewoda*) and the provincial council (*sejmik wojewódzki*); *2* – municipality adjacent to the city being the seat of the head of the province (*wojewoda*) and the provincial council (*sejmik wojewódzki*); *3* – other municipalities of the province

Table 2. Results of the analysis of the Pearson correlation for areas of new flats per inhabitant (sq. m./M) and the amount of financial aid per inhabitant under the MdM programme (PLN/M)

Specification	Average value	Standard deviation	sq. m./P	PLN/P
sq. m./P	0.36	0.23	1.00	0.38
PLN/P	15.05	17.29	0.38	1.00

Source: authors' own work prepared with the use of STATISTICA software

A graphic interpretation of the results of the analysis of correlation is presented in Figure 7.

The results of the analysis confirm theses presented in this paper. The funds granted in MdM programme are allocated mainly to large cities where prices of flats are high. In spite of the considerably higher rates of development of the housing industry outside these centres (area of flats per inhabitant), especially in municipalities adjacent to large cities, still central areas consume the highest share of subsidies.

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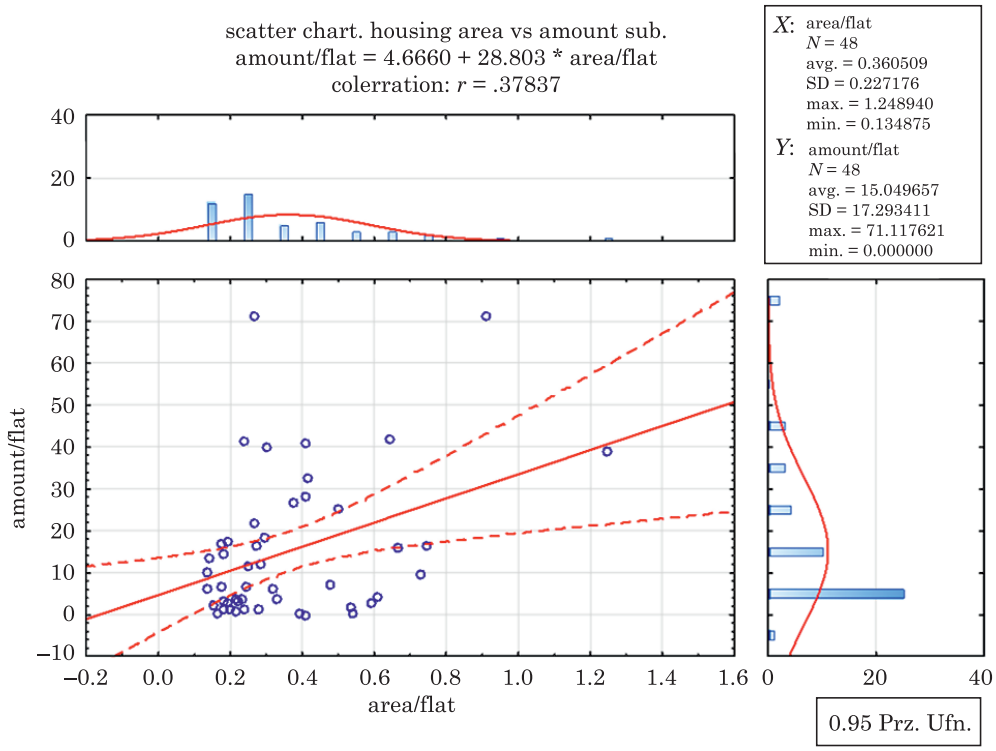

Fig. 7. The chart of the dispersion of variables of new flats per inhabitant [sq. m./M] and the amount of financial aid per inhabitant under the MdM programme [PLN/M] and results of the analysis of correlation of adopted variables

Source: authors' own work

CONCLUSIONS

The aim of the research was to assess the functioning of the government's programmes for the support of credit for the construction or purchase of a flat or house, which have become the primary tool for the formation of housing policy in recent years; it was assumed that they would become the basis of support for Polish families. In the light of the described analyses, the currently functioning MdM programme is not an ideal tool. According to BGK's data, only the amount of 210.9 million PLN, which is slightly over 35% of the planned amount of 600 million PLN of subsidies, was utilised until the end of November on the basis of applications submitted to the bank.

The main problems of the programme do not concern the adjustment of price limits to prices functioning on the market. According to analysts, it is the limits that will ultimately determine the success of the subsidy programme. The amount of limits is not influenced by BGK, which finances the programme (W pierwszym roku… 2019). They are determined by heads of provinces on the basis of data from the Central Statistical Office. The method of calculation itself often brings results that deviate from real market values. This may result in the unavailability of many offers on the primary market or in searching for methods of artificial decrease of the real price of flats. It is worth mentioning here that the increase in prices of residential real property on the primary market that was observed, particularly in large cities at the end of the year, may be caused by the functioning of the programme. This may mean the overestimation of real property prices, which leads us to the conclusion that the programme in fact provides support to developers, which was not its main assumption.

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Another problem of the programme is the lack of equality in the acquisition of financial aid between inhabitants of various municipalities. The programme favours metropolitan development, and its beneficiaries are mainly the inhabitants of large cities. This contradicts the primary aims of the housing policy, which should prevent marginalisation and favour sustainable development. This conclusion is confirmed by the general analysis of the distribution of funds utilised in the programme. Most of them were allocated to only three provinces with extremely strong administrative centres.

In connection with the above, it is worth considering the regulation of the procedure for the determination of price limits that would be consistent with the real market situation. It is also worth putting emphasis on the dissemination of the programme outside large urban centres. Such measures could increase the level of utilisation of funds designated for the programme and improve its efficiency in the aspect of the housing policy of the state.

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SOCIAL INFRASTRUCTURE OF BURIAL NATURE IN POLAND BY VOIVODESHIPS – CONDITIONS AND CHANGES*

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ABSTRACT

Eurostat and the Central Statistical Office (GUS) forecasts predict that the demographic aging rate will have doubled by 2050. The consequence of this situation will be an increasing death rate and a dynamic increase in the demand for space for depositing corpses and remains. Nowadays, no research has been conducted on the social infrastructure of burial nature. That is why the aim of the research, which results presents this article, was to determine the resource in the aspect of mentioned above infrastructure by voivodeships (number and distribution of cemeteries, crematoria, number of deaths, new cemetery investments). This research has been based on the data provided by the Local Data Bank, Polish Funeral Association, the District Sanitary and Epidemiological Stations, National Heritage Board of Poland and the Cremation Society of Great Britain. The results indicate regional differences in the development of burial facilities. In addition, the research allowed to determine the conditions and changes in the aspect of functioning of cemeteries and crematoria in Poland.

Key words: cemetery, crematorium, voivodeship, burial facilities, cremation, burial

INTRODUCTION

Social infrastructure includes a wide range of facilities, objects and institutions. It is an essential feature of the proper functioning society and economy (Mirkowski 1996, Borcz 2000). Rutkowska (2007) adds social organizations and religious facilities to the social infrastructure classification. According to the Polish Classification of Building Facilities introduced by the Regulation of the Council of Ministers of December 30, 1999 (Journal of Laws 1999, No. 112, item 1316) "Buildings intended for religious worship and religious activities" (class 1272) include cemeteries and related facilities, crematoria. For this reason, burial facilities should be incorporated in the social infrastructure (Długozima 2019). Gajewski (1979), Borsa (2004) and Chmielewski (2010) include burial to the service infrastructure. To sum up, burial infrastructure is created by technical devices serving the settlement unit in "the process of the handling the deceased" (Thomas 1991, p. 126) i.e. cemeteries and crematoria. Social infrastructure plays important

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role in promoting economic growth and it is an integral part of spatial structure of defined area (Rutkowska 2007). The aim of the study was to identify and characterize Poland's resource in social infrastructure of burial nature, i.e. cemeteries and crematoria by voivodeships and to indicate trends and conditions in the planning of these objects.

The necessity to conduct research in the field of burial infrastructure was determined by:
- no research has been conducted on the social infrastructure of burial nature in Poland, both on national and regional scale;
- a report by the Supreme Audit Office about the management of municipal cemeteries in Poland which pointed many problems, including legal ones (SAO/NIK 2016);
- dynamic growth of crematoria in Poland (in 1991 there was 1 facility, in 2007 – 10, in 2016 – 51, in 2017 – 53, and at the beginning of 2019 – 61 facilities).

Furthermore, the Central Statistical Office predicts that the population in Poland will decrease from approximately 38.5 million to 34.8 million (in the period between 2014 and 2050). Despite advances in medicine, which contribute to a permanent, significant reduction in mortality and lead to permanent extension of life expectancy, all demographic forecasts assume a slow increase in deaths, due to the fact that the population of the post-war population enters the post-productive age phase (Szukalski 2016). The above statement justifies the necessity to conduct research in the field of burial. In addition, no statistics are available in Poland regarding the number of burials by type (cremation, inhumation). There is a lack of central database aggregating information about cemeteries (number, type). Polish crematoria do not provide information on the number of cremations carried out.

Meanwhile, in the world statistics related to burial and data about distribution of crematoria and cemeteries form the basis planning burial investments (Fisher 1992, Santarsiero et al. 2000, Croucamp and Richards 2002, Van Steen and Pellenbarg 2006, Coutts 2011, Larkin 2011, Kjøller 2012, Kjøller 2013). The lack of integrated spatial policy in the aspect of burial determines the socio-economic, functional and spatial, environmental and aesthetic – compositional problems. Research carried out at 162 cemeteries in the Mazowieckie (48 objects), Podkarpackie (81 objects) and Warmińsko-Mazurskie (31 objects) Voivodeships showed the lack of suitable areas for new burials (Długozima 2011). One of the determinants is dynamical urbanization processes, which affect the deficit of free space predestined for burial functions (SAO/NIK 2016, Długozima 2019).

Irrational use of cemeteries space (Osiekowicz and Podciborski 2013), intensification of historical cemeteries development lead to degradation of composition of the cemetery by (Długozima 2011, SAO/NIK 2016). Thus affects the negative social perception of the cemetery space (Tudor et al. 2013). Cemeteries apart from fulfilling the basic function of burying the dead are an integral part of the space and in Polish cultural tradition play an important role. It is a zone of sacrum, archives, a museum, a park (Kolbuszewski 1996, Rugg 2000, Francis 2003, Worpole 2003, Harvey 2006, Długozima 2011) and an important element supporting the functioning of the settlement unit's natural enviroment (Gilbert 1991, Laske 1994, Usulu 2010, Skår et al. 2018).

According to the Nature Conservation Act of 16 April 2004 cemeteries are classified as green areas (article 5.21, Journal of Laws of 2004, No. 92, item 880). Due to the increase in social acceptance for cremation (PORC/CBOS 2001), the crematorium is becoming the second element of burial nature infrastructure nowadays more and more often set in a land use in Poland (Długozima 2017, 2019).

RESEARCH OBJECTIVE, RESEARCH AREA, MATERIAL AND METHODS

It should be emphasized that cemeteries and crematoria are facilities dedicated to burial purposes, they have a very wide collection of designations (including: green area, building, building intended for religious

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worship and religious activities) – Figure 1. In addition, cemeteries have different meaning and different study domain for many disciplines. Cemeteries must be planned and designed in collaboration with different disciplines. Researchers agree that planning and designing of cemeteries is a difficult task (Lehrer 1974, Capels and Senville 2006, Basmaijan and Coutts 2010, Długozima 2011). Because they are very different from other types of public services in terms of functionality. They impact on local community, natural environment, spatial structure of settlement unit and its use. Cemeteries are an important component of the space and should be included in the development of settlement units and cultural landscape (Francaviglia 1971, Pogodziński 1974, Francis 2003, Knercer 2004, Długozima 2011, Chudak 2012, Rosegnal 2015).

Therefore, the aim of the research is to analyze the number of cemeteries and crematoria, their distribution by voivodeships and to determine the changes and conditions of establishment and enlargement of burial facilities in Poland.

The characteristics in terms of burial infrastructure facilities by voivodeships (number and distribution of cemeteries, crematoria, the share of municipal and historic cemeteries in the total number of cemeteries) were elaborated. This research has been based on the data provided by the Local Data Bank, National Heritage Board of Poland, the District Sanitary and Epidemiological Stations and Polish Funeral Association. The Supreme Audit Office's report (2016) noted that in the last decade, only a handful of local governments have decided to build or extend the boundaries of existing municipal cemeteries. Part of the research was identification of cemeteries established and enlarged in the period 1999–2019. In addition, to show the main factors determining the condition and quality of burial infrastructure and changes, population data by voivodeships were collected.

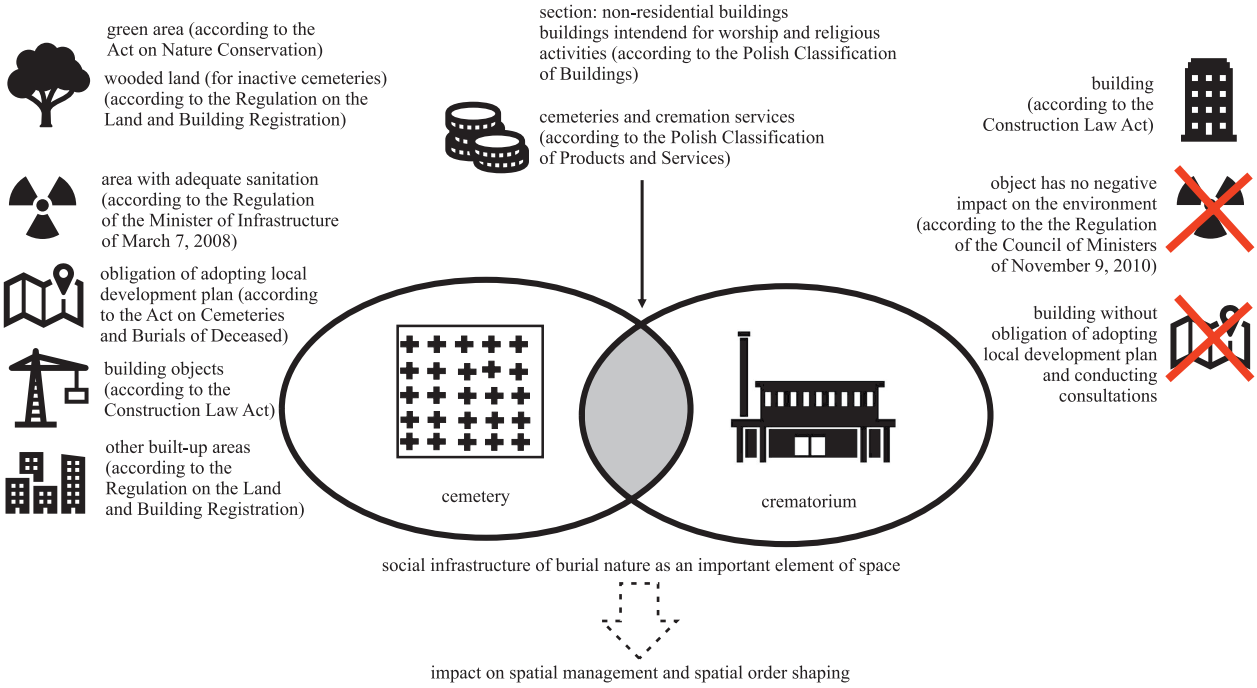

Fig. 1. Cemetery and crematorium – social infrastructure of burial character as an important element of spatial management
Source: own study

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RESULTS

Cemeteries in Poland

According to the Central Statistical Office, as at 31 December 2017, there were 15 944 cemeteries in Poland (Table 1). Their total acreage was 18 293.59 ha. 1920 cemeteries have the status of municipal object, which represents 12% of the total number of cemeteries in Poland (for comparison: there were 17 792 civil cemeteries, of which 2876 were municipal objects in 1970) (CSO/GUS 1970). It should be emphasized that the Central Statistical Office collects data about green areas in Poland, including cemeteries. However, these data do not take into account the legal status, owner/manager or the area of each cemetery, but only the total number and total area. There is no data aggregating information about: location, area, cemeteries capacity, their current state of development and type (municipal, denominational, war cemetery – basic classification of cemeteries in Poland, according to the legal regulations). On the other hand, National Heritage Board of Poland has 25 609 cemeteries record cards (cards were also established for individual graves), but data are available only for historic cemeteries. In addition, these cards are not very up-to-date (most of the cards were established in the 1980s and 1990s).

In order to compare the number of cemeteries by voivodeships the index of the cemetery area per 1000 population was used, based on the American Planning Association (APA) and Association for Public Service Excellence (ASPE) – Table 2. Highest rate was recorded in the Podlaskie Voivodeship (0.81 ha) with an average cemetery area of 1.35 ha. At the same time, one of the lowest number of municipal cemeteries in Poland (17) were recorded in this voivodeship. Equally high, as for Polish conditions (average 0.48 ha), cemeteries area per 1000 population occurs in the Warmińsko-Mazurskie Voivodeship. In addition, the richest his-

Table 1. Number and cemeteries area in Poland by Voivodeships

Voivodeship	Number of cemeteries				Area of cemeteries	
	Total [pcs.] (1)	historic cemeteries (2)	municipal cemeteries (3)	% of total (3) in (1)	total [ha] (4)	average area [ha]
Dolnośląskie	1 187	335	277	23.3	1 365.43	1.25
Kujawsko-Pomorskie	1 100	141	41	3.7	920.91	0.84
Lubelskie	1 044	514	29	2.8	1 299.98	1.25
Lubuskie	567	53	328	57.8	688.26	1.21
Łódzkie	648	143	12	1.9	1 155.54	1.78
Małopolskie	1 199	346	128	10.7	1 172.12	0.98
Mazowieckie	1016	331	26	2.6	2 094.73	2.06
Opolskie	762	129	41	5.4	567.42	0.74
Podkarpackie	1363	358	92	6.7	1 302.86	0.96
Podlaskie	711	332	17	2.4	958.91	1.35
Pomorskie	797	136	96	12.0	901.17	1.17
Śląskie	924	105	132	14.3	1 352.60	1.51
Świętokrzyskie	432	179	18	4.2	674.94	1.54
Warmińsko-Mazurskie	1 766	579	148	8.4	1 118.53	0.63
Wielkopolskie	1 309	314	59	4.5	1 515.56	1.24
Zachodniopomorskie	1 119	201	476	42.5	1 204.63	1.03
Total	15 944	4 196	1 920	12,0	18 293,59	1,15

Source: own study based on Local Data Bank and National Heritage Board of Poland (as at 2018 year)

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Table 2. Cemeteries area in Poland by Voivodeships

Data for voivodeship			Data for cemeteries		
Name	population	area [ha]	area [ha]	% of total	area/1000 population
Dolnośląskie	2 902 547	1 994 670	1 365.43	0.07	0.47
Kujawsko-Pomorskie	2 082 944	1 797 134	920.91	0.05	0.44
Lubelskie	2 126 317	2 512 246	1 299.98	0.05	0.61
Lubuskie	1 016 832	1 398 793	688.26	0.05	0.68
Łódzkie	2 476 315	1 821 895	1 155.54	0.06	0.47
Małopolskie	3 391 380	1 518 279	1 172.12	0.08	0.35
Mazowieckie	5 384 617	3 555 847	2 094.73	0.06	0.39
Opolskie	990 069	941 187	567.42	0.06	0.57
Podkarpackie	2 129 138	1 784 576	1 302.86	0.07	0.61
Podlaskie	1 184 548	2018702	958,91	0.05	0.81
Pomorskie	2 324 251	1 832 193	901.17	0.05	0.39
Śląskie	4 548 180	1 233 309	1 352.6	0.11	0.30
Świętokrzyskie	1 247 732	1 171 050	674.94	0.06	0.54
Warmińsko-Mazurskie	1 433 945	2 417 347	1 118.53	0.05	0.78
Wielkopolskie	3 489 210	2 982 650	1 515.56	0.05	0.43
Zachodniopomorskie	1 705 533	2 289 732	1 204.63	0.05	0.71
Total	38 433 558	31 269 610	18 293.59	0.06	0.48

Source: own study based on Local Data Bank and National Heritage Board of Poland (as at 2018 year)

toric sepulchral resource was identified in Warmia and Mazury (32.8% – 579 objects of 1766 are listed in the voivodeship register of monuments). The lowest rate of the cemetery area per 1000 population is in following voivodeships: Śląskie (0.3 ha), Małopolskie (0.35 ha), Mazowieckie (0.39 ha) and Pomorskie (0.39 ha). In 2018, most cemeteries were located in the countryside (83%) – Figure 2.

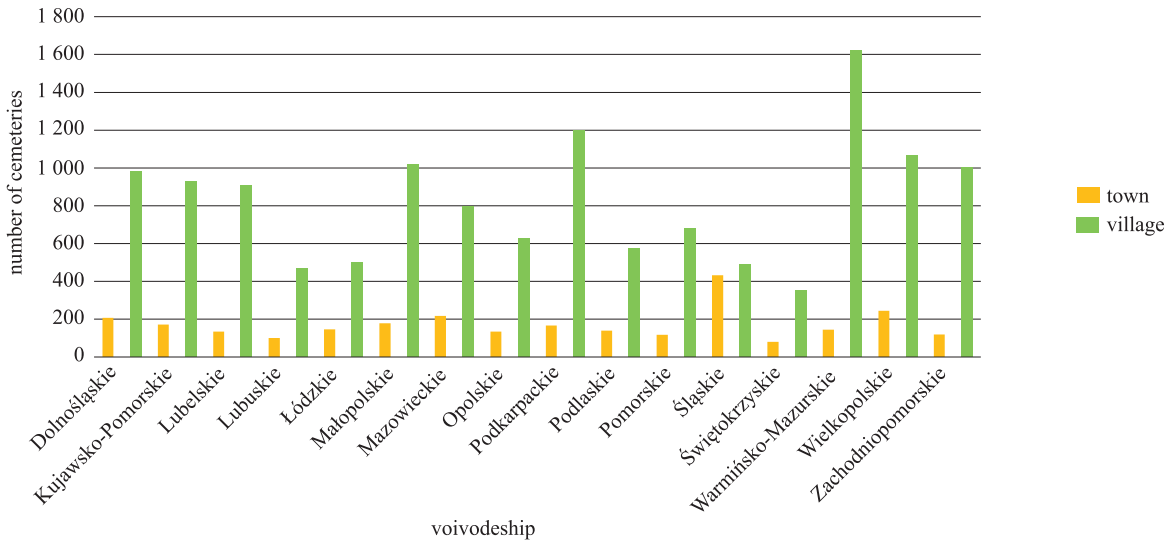

Fig. 2. Number of cemeteries by voivodeships and location (in town, in country) (as at 2018 year)
Source: own study

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Crematoria in Poland

Analysis of cremation statistics of the International Cremation Statistics provided by the Cremation Society of Great Britain proves that Poland is one of the most rapidly developing markets of cremation services in Europe. By 2007 there has been ten crematoria in Poland. After 2010 a sudden growth of the number of crematoria was recorded (2012 – 20 objects, 2016 – 51, 2017 – 53, 2018 – 54, 2019 – 61). In 2019, there were 61 crematoria across Poland (Fig. 3). It should be emphasized, that in Poland there are no databases that inform about the number of burials by formulas: inhumation on cremation. Polish crematoria do not inform about the number of cremations. There is no central registry of burial sites and crematoria.

In **Dolnośląskie Voivodeship** there are nine crematoria (Głogów – two objects, Garbce, Jaszków, Jelenia Góra – two objects, Strzelin, Wrocław – two objects). Municipal cemeteries constitute 23,3% of total number of sepulchral facilities in Lower Silesia (Dolny Śląsk), including new cemeteries opened in Jelenia Góra Cieplice (2000), Borzygniew (2003), Nowogrodziec (2011), Strzegom (2012), Jaszków (2013), Żeleźnik (2015), Smolec (2018). In the recent years burial needs of inhabitants were secured by expansion of the cemeteries in Kłodzko (2013), Bolesławiec (2016), Polkowice (2017) and Brzeg Dolny (2018). The construction of municipal cemetery in Kryniczno (Wisznia Mała commune) is also planned. In **Kujawsko-Pomorskie Voivodeship** there are four crematoria in: Białe Błota near Bydgoszcz,

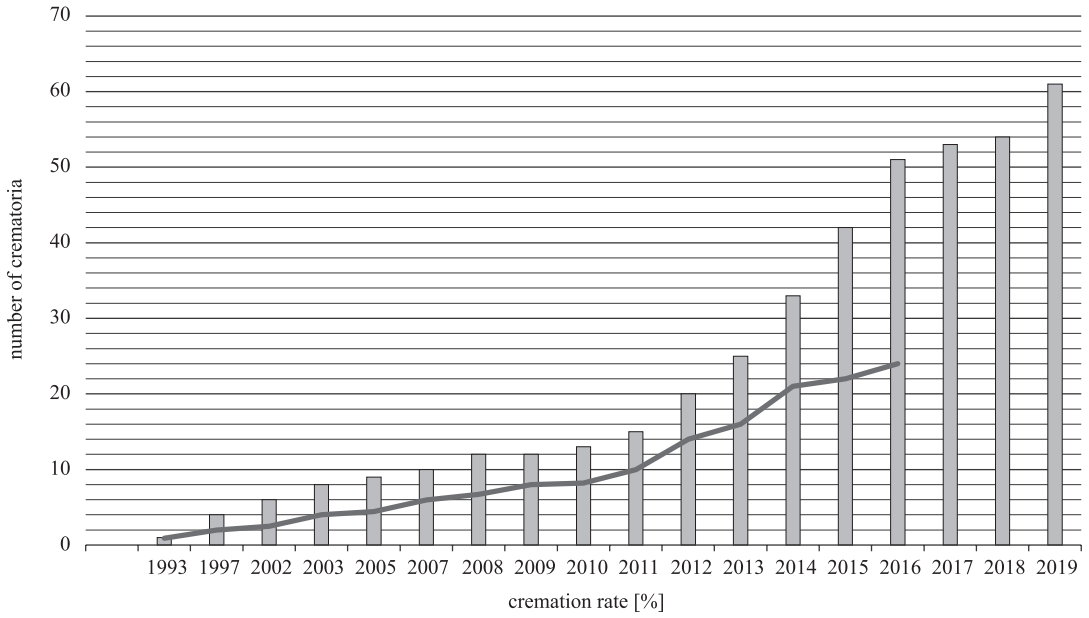

Fig. 3. Number of crematoria and cremation rate (expresses the percentage of cremation in the total number of burials) in Poland 1993–2019
Source: own study

Characteristics of burial social infrastructure by voivodeships

The location of crematoria and cemeteries in Poland (especially municipal facilities) indicates significant regional differences in the aspect of development in burial social infrastructure by voivodeships (Fig. 4).

Nowa Chełmża, Toruń and Włocławek. Municipal cemeteries in Grudziądz-Kobylanka (2002), Nowa Chełmża (2005) and Starorypin Prywatny (2006) were opened. The cemetery in Więcbark was expended (2016). There is one crematorium (Czerniejów) in **Lubelskie Voivodeship**. Among 29 active municipal cemeteries in the region, new

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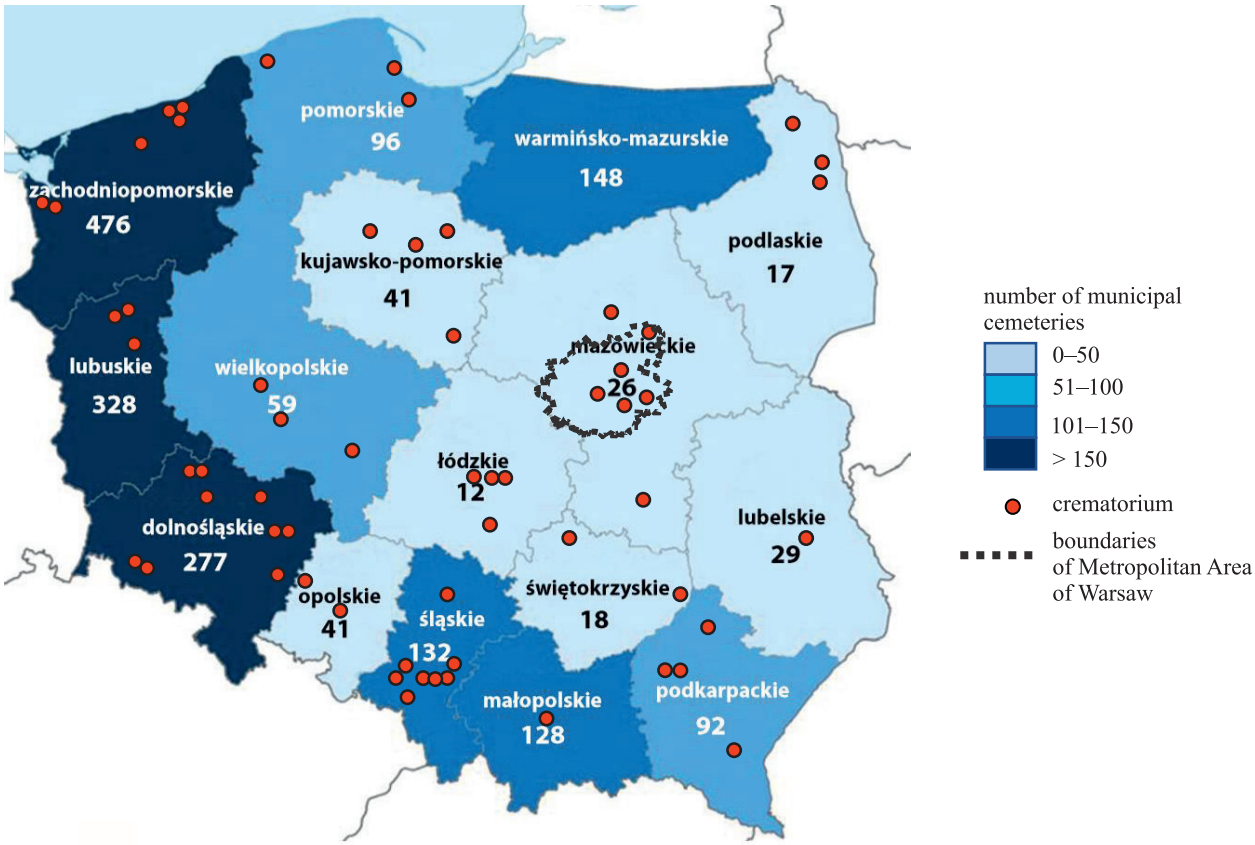

Fig. 4. Communal cemeteries and crematoria in Poland by Voivodeships
Source: own study (as at January 2019)

burial investments were identified in Stara Wieś (2009), Opole Lubelskie (2014), Łuków (2016), Kobylany (2018). The cemetery in Świdnik was also expanded (2017). In **Lubuskie Voivodeship** 57.8% of total number of cemeteries are municipal facilities. The new cemetery was opened in Zielona Góra (2008). There are three crematoria in region: Górzów Wielkopolski – two objects and Skwierzyna. In addition, new burial investment is planned in Tomaszów (Żagań commune). The municipal cemetery in Gorzów Wielkopolski was also expanded (2014). In **Łódzkie Voivodeship** there are four crematoria. Three of them are located in Łódź where nearly half of all the bodies of the deceased are cremated. The fourth one can be found in Bełchatów. This region is characterized by the lowest number of municipal cemeteries (12 facilities). New cemeteries in Wieluń (2010), Andrespol (2011) and Opoczno (2016) were opened. The municipal cemetery in Radomsko is being expanded. There is one crematorium in **Małopolskie Voivodeship** located in Kraków Podgórki Tynieckie. In the region, cemeteries in Kraków-Batowice (2006), Mętków (2014), Dulowa (2017) and Limanowa (2017) were expanded. In addition, the cemetery in Dobczyce was modernized (2017). New municipal cemeteries in Tarnów-Klikowa (2008), Rdziostów (2016), Nowy Targ (2016) were opened. There are seven crematoria in **Mazowieckie Voivodeship** in: Otwock, Pruszków, Warszawa, Antoninów, Radom, Przasnysz-Sierakowo and Wyszków. Five facilities are located in Metropolitan Area of Warsaw. Investments of expanding municipal cemeteries took place in Szydłowiec (2009), Płock (2018) and Ciechanów (2019). New burial facilities with municipal status

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Table 3. Population in Poland by Voivodeships

Voivodeship	Population (2018)	Number of deaths				Share of rural areas in total area [%]	Share of rural inhabitants in population [%]	Share of people employed in agriculture [%]
		2000	2005	2017	tendency			
Dolnośląskie	2 901 225	28 287	28 603	32 038	↑	89.0	30.1	5.5
Kujawsko-Pomorskie	2 077 775	19 727	19 411	21 252	↑	95.4	39.4	15.4
Lubelskie	2 117 619	23 228	23 182	23 427	↑	96.1	53.7	26.5
Lubuskie	1 014 548	8 894	9 135	10 285	↑	95.3	35.0	8.7
Łódzkie	2 466 322	31 961	31 273	31 172	↓	93.6	36.8	13.1
Małopolskie	3 400 577	28 503	28 965	31 852	↑	89.1	51.4	11.9
Mazowieckie	5 403 412	52 064	51 743	57 237	↑	90	35.7	11.0
Opolskie	986 506	9 378	9 471	10 880	↑	92	48	11.9
Podkarpackie	2 129 015	18 129	18 289	19 327	↑	93.3	58.6	17.9
Podlaskie	1 181 533	11 802	11 854	12 526	↑	95	39.7	24.3
Pomorskie	2 333 523	18 083	18 503	21 650	↑	93.9	35.1	7.0
Śląskie	4 533 565	45 989	46 315	51 404	↑	69.9	22	2.6
Świętokrzyskie	1 241 546	13 377	13 620	14 330	↑	94.4	54.8	21.8
Warmińsko-Mazurskie	1 428 983	11 777	12 420	14 423	↑	97.5	40.8	12.7
Wielkopolskie	3 493 969	31 811	30 234	33 261	↑	95	44.9	13.0
Zachodniopomorskie	1 701 030	15 018	15 267	17 788	↑	93.8	31	8.0
Poland	38 411 148	368 028	368 285	402 852	↑	92.1	41.1	12.0

Source: own study

in Antoninów (1999), Glinojeck (2002), Pruszków--Gąsin (2003), Wieliszew (2016) and Pionki (2019) were opened. In addition, in 2011 a new parish cemetery in Korytnica (Trojanów commune) was established. Parish cemetery in Łosice was also enlarged (2013). In **Opolskie Voivodeship** there are two krematoria in Opole and Skarbimierz. New municipal cemeteries were opened in Bąków (2015) and Wołczyn (2017). In the recent years burial needs of inhabitants were secured by expansion of the cemeteries in Brzeg (2013), Kluczbork (2015) and Kędzierzyn-Koźle (2017). The Central Municipal Cemetery in Opole-Półwieś was revitalized in 2012. In **Podkarpackie Voivodeship** there are four crematoria in Rzeszów, Stalowa Wola and Mielec – two objects. New municipal cemeteries were built in Sanok (Southern Municipal Cemetery, 2000), Sarzyna (2001) and Krosno (2015). Municipal cemeteries in Rzeszów-Wilkowyja (2016), Przemyśl (Zasanie, 2017) were also expanded. Construction of the municipal cemetery in Jarosław is being finalized. Public consultations were completed and local development plan for a new municipal cemetery in Jarosław was adopted. There are three crematoria in **Podlaskie Voivodeship** in: Białystok, Karakule and Suwałki. There is one new municipal facilities located outside the administrative boundaries of Białystok in Karakule (2010). The municipal cemetery in Grajewo was also expanded (2012). Righ now there are three crematoria in **Pomorskie Voivodeship** in: Gdańsk, Roszkowo and Słupsk. Burial needs of inhabitants were secured by opening new cemetery in Krzyżanowo (2008) and expansion of the cemeteries in Cewice (2013), Gdańsk – Łostowice (2014) and Kosakowo (2018). **Śląskie Voivodeship** is the most densely populated region in Poland. The urbanization index is very high and cremation is the most popular there. There are nine crematoria there: in Bytom, Chorzów, Częstochowa, Dąbrowa Górnicza, Jasienica, Katowice, Ruda Śląska (two objects) and Żory. New municipal cemeteries were built in Dąbrowa Górnicza (2000), Częstochowa (2003), Żywiec (2005), Knurów (2006), Chorzów – Klimzowiec (2011) and Miasteczko Śląskie

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(2012). Burial spaces in Czechowice – Dziedzice (2008), Jastrzębie-Zdrój (2014) and Świętochłowice (2014) were expanded. In Silesia the new parish cemetery in Pielgrzymowice was built (2010) and parish cemetery in Kozy (2015) was enlarged. Municipal cemetery built in the Syrynia village in 2016 and relocated due to the construction of water reservoir from Nieboczowy is a national phenomenon. In **Świętokrzyskie Voivodeship** there is two crematoria in Skarżysko-Kamienna and Sandomierz. No new cemetery facilities were identified in period 1999–2019. Cemeteries with municipal status were expanded in Busko-Zdrój (2001), Kielce – Cedzyna (2017), Starachowice (2017) and Suchedniów (2019). In 2014 parish cemetery in Kazimierza Mała (Kazimierza Wielka commune) was expanded. It is symptomatic, there have been some protests against investments of crematoria in Pińczów and Chmielnik, which shows that traditional burial will be still dominant there. In **Warmińsko-Mazurskie Voivodeship** there are no crematoria. Burial needs of inhabitants were secured by opening new cemeteries in Iława (2005), Bartosze (2014), Gołdap (2015) and expansion of the cemeteries in Szczytno (2007), Elbląg (2015) and Braniewo (2018). In **Wielkopolskie Voivodeship** there are crematoria in Poznań, Kalisz and two crematoria in Gorzów Wielkopolski. The construction of new municipal cemeteries was carried out in Luboń (2004), Durzyn (2014). Enlargement of existing cemeteries in Trzcianka (2017), Międzychód (2018) and Słodków-Kolonia (2018) took place. In addition, new parish cemetery in 2008 was opened in Czapury (Mosina commune). The construction of crematorium in the village of Kijewo was protested. In **Zachodniopomorskie Voivodeship** there are six crematoria in: Koszalin (three objects), Police, Ramlewo and Szczecin. In the recent years burial needs of inhabitants of region were secured by opening new cemeteries in Stargard (2002), Szczecinek, Barlinek (2010), Szczecin – Gumienice (2013) and expansion of the cemeteries in Goleniów (2010), Międzyzdroje (2011), Koszalin (2015), Ustronie Morskie (2015), Świnoujście (2016), Kluczbork (2016). The municipal cemetery in Płoty is being expanded.

Conditions and changes in the aspect of planning burial infrastructure

In Poland disproportions in the development of social infrastructure of burial character have been noticed. Location, quality of burial facilities (area, legal status) are determined by historical, cultural and legislative conditions. 48% of cemeteries built in period 1999–2019 were located in rural areas. The vast majority have the status of municipal cemeteries (approx. 90% of total number). Report by the Supreme Audit Office (2016) pointed many problems about the management of municipal cemeteries in Poland and socio-cultural factors which determining the modern condition of burial facilities (progressing secularization, imitation of Western solutions). This report predicts that the share of municipal cemeteries in Poland will increase. Spatial distribution of municipal cemeteries in Poland is unequal. The highest share of municipal cemeteries in total number of cemeteries are in Lubuskie (57.8%), Zachodniopomorskie (42.5%) and Dolnośląskie (23.3%) Voivodeships – in areas inhabited before II World War by Protestant people. Most of the local cemeteries were owned by Churches and religious associations. As a result of geopolitical changes after II World War many denominational cemeteries lost their users. In the period form 1970s to 1990s they were communalized and nowadays they are property of local government. The smallest number of municipal cemeteries occur in the following voivodeships: Świętokrzyskie (18), Podlaskie (17) and Łódzkie (12). Denominational cemeteries managed by the Roman – Catholic Church authorities dominate there. In the period 1999 – 2019 52 new cemeteries were established in Poland. This indicates a low dynamic in the field of burial infrastructure.

An obstacle in planning investments is a lack of suitable areas that meet the conditions set out in the legal provisions. The basic acts regulating the establishment and maintenance of cemeteries in Poland include: the Act of January 31, 1959 on Cemeteries and Burials of the Deceased (Journal of Laws 1959, No. 11, item 62), Regulation of the Minister of Municipal

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Economy of August 25, 1959 on determining which areas in terms of sanitation are suitable for cemeteries (Journal of Laws of 1959, No. 52, item 315), Regulation of the Minister of Infrastructure of March 7, 2008 on requirements for cemeteries, graves and other places of burial of corpses and remains (Journal of Laws 2008, No. 48, item 284), the Building Law Act of May 16, 2003 (Journal of Laws 2003, No. 207, item 2016), the Act on Nature Conservation of April 16, 2004 (Journal of Laws of 2004, No. 92, item 880) (Długozima 2019).

Acts regulate the width of the sanitary protection zones (from 50 to 150 m), elements of spatial development and determine the requirements for burial facilities. Poland belongs to a small group of countries that impose on its citizens the obligation to bury the deceased in the cemetery (Dziewulak 2012). After 2012 the share of municipal cemeteries increases, which is associated with law regulations.

The amendment to the Act of 2012 on the Treasury Property Management introduced the possibility of free transfer of land for communal purposes, including cemeteries (Journal of Laws 1991, No. 107, item 464). Spatial distribution of crematoria is varies regionally. Polish law prohibits the scattering of the ashes of a deceased person and the storage of urns with ashes outside the cemetery. Crematorium construction was regulated in the provisions of Article 3 of the Regulation of the Council of Ministers of November 9, 2004 on determining the types of investments that may significantly affect the environment and the detailed conditions qualifying the investment to draw up a report on environmental impact (Journal of Laws 2004, No. 257, item 2573) as potentially having a significant impact on the environment. Therefore, the necessary conditions included: conducting an environmental impact assessment of the investment and social consultations. Under the new Regulation of November 9, 2010 (Journal of Laws of 2013, item 1235), crematoria ceased to be subject to these rigors, which translated into a dynamic growth of crematoria in Poland (Długozima 2019). After 2010 a sudden growth of the cremation services was recorded. This increase was caused by the fact that more and more crematoria were being established with the help of European Union funding programmes (for example Regional Operational Programmes in particular voivodeships). The uneven distribution of crematoria in Poland is primarly determined by historical and cultural factors. The most dynamically developing regions in Poland in the aspect of cremation services are Dolnośląskie Voivodeship and Śląskie Voivodeship. One of the highest urbanization rate in Poland (share of rural areas in the total area of voivodeships below 90%) and a small share of people employed in agriculture make the cremation index high there. Data collected in 1994 and 2001 in surveys entitled „On dying and death" carried out by the CBOS (Public Opinion Research Center in Poland) show certain dependencies: The more educated and the younger the people are, the more they accept the fact that the body of the dead person may be cremated. The number of people approving cremation increases with the level of education, type of settlement unit (higher acceptance rates for cremation in the city than in the countryside). A positive attitude towards cremating people among the young people is frequently caused by lack of so-called „historical burden". For those who survived World War II crematoria remind of concentration camps, Holocaust and mass extermination of millions of human beings. If we have a look at social and professional groups, the fewest supporters of cremation can be found among people employed in agriculture. That is why, low acceptance rates for cremation is in the countryside. Although right now the Congregation for Doctrine of the Faith in its instruction on burying the bodies of the dead and keeping their ashes does not see any doctrinal reasons for forbid cremation, Catholic Church still prefers burying the corpses of people in the blessed grounds of cemeteries (Suchecki 2009).

Mentioned above socio-cultural conditions determined the spatial distribution of burial infrastructure by voivodeships. Agricultural regions (high share of rural areas in the total area, high share of farmers) are characterized by the lowest number of municipal cemeteries and small number of crematoria (Lubelskie, Podlaskie, Świętokrzyskie Voivodeships).

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CONCLUSIONS

There is a lack of central databases aggregating information about cemeteries, crematoria and theirs location and quality. There is also a lack of activities concentrated on forecasting, monitoring phenomena related to burial which makes difficult to conduct integrated spatial policy in the aspect of sustainable development and spatial order. It is symptomatic that even in the Chief Sanitary Inspectorate there are no detailed data about cemeteries and pre-burial houses (e.g. report on the state of sanitation in 2017). Identification of cemeteries, monitoring availability of free burial spaces as well as valorisation of areas fulfill requirements for new places of burial should form the basis of spatial planning in relations to burial infrastructure (Larkin 2011). An integrated approach to burial infrastructure would allow planning new burial places, preventing conflicts related to irrational decisions in investing in burial facilities.

It is indispensable to create social acceptance for cremation (no database, no education of the Polish society and treating the crematorium as service facility without obligation of adopting local development plan or conducting an environmental impact assessment of the investment, while crematoria, like cemeteries in the Polish Classification of Building Facilities, are defined as religious facilities). This form of burial contributes to alleviating the problem of overcrowded cemeteries as well as not very aesthetic ones. This is a big problem especially for authorities of large cities. It is important to consult investment plans related to burials with residents, simultaneously educating and promoting burial facilities as essential elements of development and social infrastructure. The conclusions of the research correspond with the Supreme Audit Office report (2016) especially in the relation to cemeteries location. Due to socio-cultural and economic changes as well as urbanization and lack of suitable areas that meet the conditions set out in the legal provisions, it is necessary to amend the anachronistic Act on Cemeteries and Burials of the Deceased (Journal of Laws 1959, No. 11, item 62).

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EVALUATION OF PUBLIC CONSULTATION IN AN ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURE. A CASE STUDY

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ABSTRACT

The objective of the paper is to evaluate a public consultation under a procedure for environmental impact assessment of an extension and alteration project of a palace in Kijany, municipality of Spiczyn, Lubelskie Voivodeship, eastern Poland. An evaluation questionnaire survey was developed to acquire reliable information about consultation meetings under the procedure that mainly involved residents of the municipality of Spiczyn and environmental organisations. The questionnaire survey was conducted in March and April 2019 and involved 45 respondents. Most of them evaluated positively the public consultation. What they found most important was the clear presentation of legal, financial, economic, and environmental aspects of the project. The respondents believed the equal treatment of participants of the meetings regardless of their position to be a great advantage.

Key words: social consultation, restoration, infrastructure projects, local development, infrastructure investments

INTRODUCTION

The business activity may cause various changes in the natural environment the intensity of which is difficult to predict. It is, therefore, necessary to forecast these changes, especially when deciding to start a project. Assessment of planned actions should provide the basis for selecting solutions that are the best for the environment and do not hinder economic growth. A duly performed environmental impact assessment procedure (EIA) can contribute to the prevention of environmental degradation, protect human health, create better conditions for economic and social growth, and protect cultural assets (Prus et al. 2018).

The essence of the environmental impact assessment is to determine the effects of the project. It should take into account measurable and non-measurable environmental consequences that vary not only in terms of type but also duration, geographical extent, and interactions. Essential parts of the EIA are the environmental risk assessment (assessment of the impact on human health and life), and wildlife risk assessment. Note that 'impact' means an event

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or action that changes the environment and has a specific direct effect. The same impact can have different effects under different conditions. These can, in turn, have further consequences, which means the impact has indirect effects. Effects can be permanent or temporary, positive or negative; they can differ in range and be cumulative or synergistic (Jendrośka and Bar 2005, Król et al. 2017).

The EIA evaluates the impact on the environment, both natural and anthropogenic, material environment, cultural asses, the landscape, health and living conditions of people, and social behaviour. Inclusion of the public in the process is a vital aspect of the environmental impact assessment procedure. On the one hand, it is necessary to take into account the effects of the impact of planned projects or actions under plans and strategies, on the other, the public has the right to access information about the condition of the environment and anthropogenic changes and participate in administrative decisions regarding the environment (Act of 3 October 2008… Polish Journal of Laws of 2019 No. 199, item 630).

The environmental impact assessment should include all possibilities of eliminating, minimising, or offsetting any negative impact on the environment. It is the obligation of the entrepreneur or project owner to conduct and fund the environmental impact assessment for their project. The assessment should be comprehensive, offer alternative solutions to avoid threats, irreversible changes, and short- and long-term impact (Morrison-Saunders and Retief 2012).

The objective of the paper is to evaluate a public consultation under a procedure for environmental impact assessment of an extension and alteration project of a palace in Kijany, municipality of Spiczyn, Lubelskie Voivodeship, eastern Poland.

MATERIALS AND METHODS

The tool used for the evaluation of the consultation organised by the Head of the Municipality of Spiczyn was a questionnaire survey drafted for the consultation process. The online and paper questionnaire survey was conducted in March and April 2019. The survey was blind, which allowed the respondents to express their opinions about the quality of the public consultation freely. The questionnaire contained close-ended (single-choice) questions. Some questions offered the option 'other' and a field for a response not provided among the proposed options.

The survey yielded 45 completed questionnaires. The data were input into a spreadsheet and analysed in depth. Charts accompany the analysis. Data are presented mainly as percentage values. They were analysed statistically and factually.

The survey was used to assess the quality of the social consultation under the environmental impact assessment. It also revealed the preferences and expectations of the local community towards the effects of the planned project.

Study area profile

The investigated area is situated in a heritage palace and park complex in Kijany, municipality of Spiczyn. Kijany is a village in the Łęczna District, Lubelskie Voivodeship (Fig. 1). It borders on such villages as Ludwików, Stawek, Spiczyn, Stoczek, and Ziółków.

The palace complex in Kijany occupies 10 ha. The park was there already in the 17th century as a regular garden. In the second half of the 19th century, it was given a more landscape-oriented character (Dudkiewicz et al. 2015). The palace is currently used by Foundation Think Tank. The palace stands amid a manor park and an avenue with 27 limes. The palace and park complex consists of a palace outhouse, two houses for four families of labour each, stables (converted into a school), a barn, drying building (now a warehouse), a former baker's, mill, school of agriculture with a park, and former sugar factory (1853) partially burnt in 1901 with two buildings left standing: factory administration (so-called building F) and the sugar warehouse where a health care centre is located today.

According to the local zoning plan of the municipality of Spiczyn, the real estate is located in zones UP – public services and ZP – park greenery.

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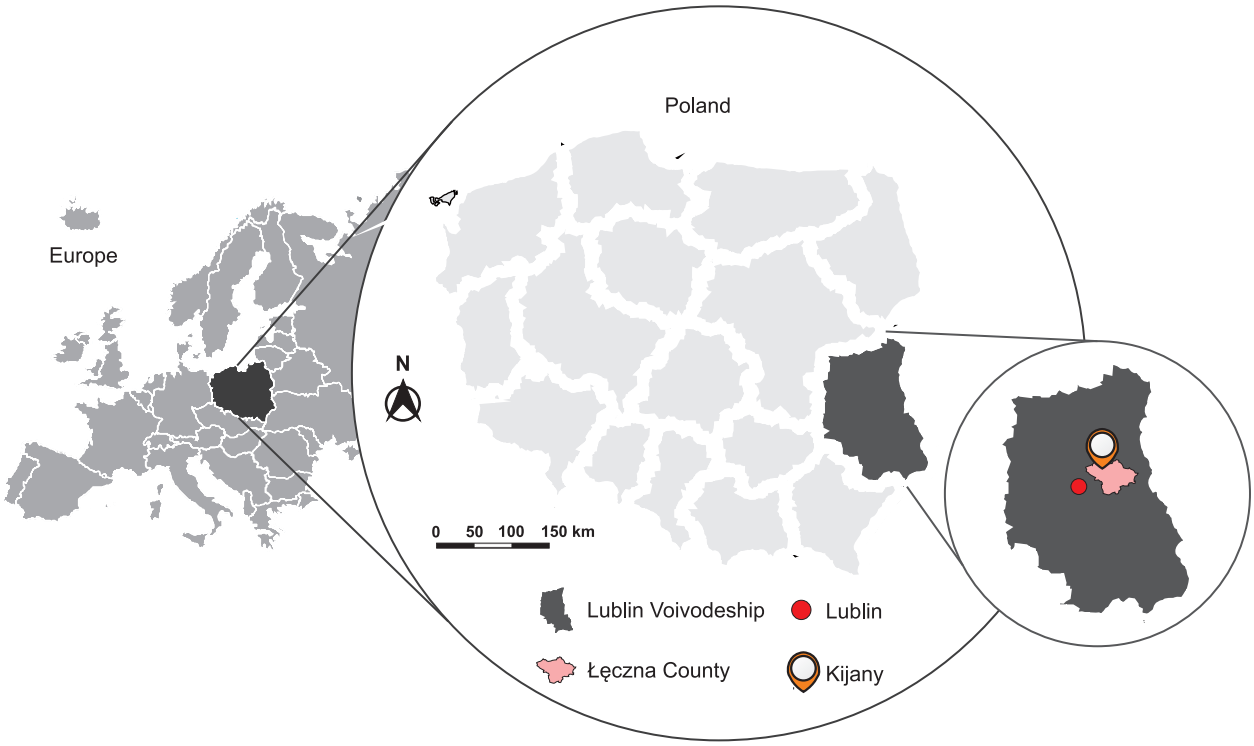

Fig. 1. Administrative location of Kijany, Lubelskie Voivodeship, Łęczna District
Source: own work

The whole park and palace complex has been listed, which imposes several limitations regarding its use. Any investment or construction projects require a permit from the Voivodeship Heritage Conservation Officer.

The historical park is a public space accessible to all. After the school of agriculture was closed down, the palace remained vacant. Its condition deteriorated by year, which is evident from a leaky roof, shattered windows, or rotten floors. In 2015, the declining palace was rented to the foundation for 30 years. There are former manor buildings in the northern part that are used as a housing estate. It is a four-family house (today No. 18), the outhouse, and the baker's. The manor complex further includes the drying building, the barn, and the stables, today owned by a school of agriculture complex.

The palace and garden lost their splendour as a result of wartime operations and destructive management of owners who followed the Lublin Agricultural Association (Gawrońska et al. 2019a). The fact that the Kijany council had no concept for the utilisation of the palace and park complex contributed to its further demise. Apart from a few relics, the interior of the palace has been bereft of its original equipment and ornaments. The park has been growing wilder, losing its original spatial arrangement. It calls for restoration (Dudkiewicz et al. 2015). Most of the circulation routes in the park have been lost. Only the main park avenue from the reception part deeper into the park remains.

The planned project

There are two critical aspects to the design and implementation of the restoration and land use concept for the area. The first one is the heritage conservator's requirements as the palace and park complex is a listed monument. This fact predetermines the form and type of land use concept for the area and its parts. According to the local zoning plan of the municipality of Spiczyn (2004):

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– any projects, including construction projects, require prior heritage conservation conditions and requirements to be specified and a permit by the Lubelskie Voivodeship Heritage Conservation Officer in Lublin;
– any works in functional areas with listed objects have to be consulted with the Lubelskie Voivodeship Heritage Conservation Officer in Lublin;
– if any cultural assets listed in cultural asset records are to be demolished, a permit of the Lubelskie Voivodeship Heritage Conservation Officer in Lublin has to be obtained pursuant to concise image and architectural documentation.

Another group of conditions affecting the form of the restoration and land use are design requirements based on the needs of modern users and location, physiographic, environmental, and climate conditions. The design specifications are assumed to meet the expectations for a modern green area perceived not only as a walking space but a local public culture, education, pastime, recreation, and amusement hub. As the historic palace is planned to be adapted to conform to cultural, educational, and tourist functions, so should its surroundings. The whole area of the park will be a public space open for residents and visitors. It will draw the local cultural life, provide educational functions, be a meeting spot, and a place of active leisure. The historic park is located near the Wieprz River Landscape Park and improves the tourist attractiveness of the Wieprz River Valley. It can host school trips, local events, and outdoors cultural events.

The central element of the park composition is the palace building (Fig. 2). It is the starting point

Fig. 2. The palace in Kijany (September 2014)
Source: photo by Proch (2014), commons.wikimedia.org, licence: CC BY-SA 3.0 PL

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of main view corridors and compositional axes. The relationship with the external fluvial and agrarian landscape is important for the composition of the park. The park space is disturbed and spoiled by such elements as fences, defunct wells, or foul water drainage structures that were not there originally. The restored park in Kijany will be mainly a site of leisure, both active and passive. The park has been divided into three functional parts:

– the palace building providing the educational function,
– the park section providing walking and rest space,
– the park section with reception and leisure functions.

The primary assumption is to restore and convert the palace driveway and past circulation routes. The reception function will be enhanced by plant compositions of a significant ornamental qualities. Not only the garden will be revitalised. The palace will host a John III Sobieski educational centre. The basement of the left wing will offer a video arcade and two horror rooms. They will be equipped with scenery and multimedia. Below the ballroom, there will be a puzzle room.

The bathrooms on the ground floor will be upgraded. The right wing will have a coffee bar and a café with kitchen facilities. The project includes a waiting room and a cloakroom. The left wing will have two video arcades and a panoramic view room. There will be a wellness centre named after John III Sobieski's wife, Marie Marysieńka Casimire in the palace. The left wing will also feature a 17th-century mores room with displays, a multimedia timeline room (with the key events of the 17th century John III Sobieski was involved in), a room with a scale model of the Battle of Chocim and a remembrance hall. All the rooms will have an educational and museum function. The attic will have two conference rooms. The remaining premises will be for the personnel.

Circulation will involve park paths and avenues with two flights of outdoor wooden stair. The proposed park layout draws on past circulation. The planned paths run on past paths except for short sections of new paths providing access to park furniture. The geometric flower bed was replaced with an oval planter. The avenues were designed in conformity with the topography with a two-per-cent downgrade. An avenue encompassing the building was introduced behind the palace to facilitate circulation and natural access from the driveway to the outhouse. The circulation in the park appreciates the needs of children, the elderly, and people with disabilities. There is a car park with 27 parking bays, two disabled parking bays, and two bus parking bays right to the entrance (east side).

The park design offers several areas of active and passive leisure. Passive leisure focuses on the square with a gazebo. The open wooden gazebo will be surrounded by spots of low, ornamental flowers to provide as much sunlight as possible for pedestrians resting after a walk along shady avenues leading to the structure. The framework structure grants easy access from all sides. The youngest users of the park will enjoy active leisure. Playground equipment style should be uniform and focused on natural materials. At least one device should dominate the space. It should have several towers linked with various access elements requiring physical fitness and slides.

ENVIRONMENTAL IMPACT ASSESSMENT

The environmental impact assessment is a complex task both in terms of administrative procedure and forecasting the environmental effects of the project. As a decision-aiding tool, a duly performed environmental impact assessment can provide information about the actual meaning of conflicts and contribute to rational and transparent decision-making both for authorities and the public. In the case of a conflict and subjective approach to the project, interested parties must participate in the decision-making process both for the decision-makers to gather information and to provide democratic control over the decision to these parties.

Virtually any business activity generates conflicts of interests, investment projects in particular. It is most often a conflict between the maximum profit for the business and clean and calm surroundings for local communities. Any planned investment

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project has the potential for conflicts between the local government and local community (Gawrońska et al. 2019b). It is particularly true for infrastructure projects. This is why decisions made under conflict conditions require appropriate procedures. According to Micińska (2011), broad involvement of the public is a significant component of effective environmental impact assessment, design, evaluation, and development. Public participation in procedures has both advantages and drawbacks (Glucker et al. 2013). The benefits of public participation in the environmental impact assessment include:

a) building of a civil society;
b) facilitated access to information about the environment and planned investment projects;
c) contribution to the environmental awareness of the public and shared responsibility for decisions made;
d) participation in the formation of the social and economic order as well as spatial management of the area;
e) mitigation of social conflicts.

The key weak points of public participation in the environmental impact assessment are:

a) forcing the project owner to conduct additional analyses, which increases project costs;
b) no liability of protesters for legal and economic consequences of the conflict;
c) a failure to comprehend the nature of the environmental impact assessment as the public is not always knowledgeable about the topic and able to interpret documents submitted under the procedure;
d) and even abandonment of the project.

One of the key components of the environmental impact assessment is the environmental impact report, which should be submitted together with the request for an environmental impact assessment consent decision. The goal of the report is to analyse whether the project can be completed in an environmentally safe manner. The environmental impact assessment should include project implementation, operation, and decommissioning. A duly conducted analysis will enable the project owner to conduct the investment taking into account environmental protection issues (Glasson et al. 2012).

The environmental impact assessment is often conducted in an incogitant manner where certain activities are performed routinely without an appreciation of their meaning. Virtually all projects are approached the same way regardless of whether it is a relatively small service point or a massive endeavour with potential substantial environmental ramifications. This fact affects the quality of environmental impact reports. Bar et al. (2011) identified several weakest points of such reports:

a) lack of fully developed alternatives or clear preference for one solution, most favourable for the applicant;
b) usually very short list of mitigation measures and very general recommendations and suggestions rather than specific steps towards prevention or setoff as actions aimed at controlling negative consequences of the project;
c) scarce and very selective description of environmental components;
d) unreliable measurement and observation data;
e) maps, plans, and diagrams with faulty content and formal defects;
f) incorrect nomenclature and factual errors in documents.

The efficiency of investment processes hinges to a large extent of the provision of appropriate environmental documentation. When administrative procedures are based on unreliable evidence or decisions founded on such material, the number of official challenges grows, and the project can be postponed up to several years.

PUBLIC PARTICIPATION IN PROJECTS

Involvement of the public in matters of public importance should improve the efficiency of the decision-making process and the quality of public services (Ran 2012). What is important is the mutual understanding between the authorities and society to reduce the risk of potential conflicts. Commitment to public issues often takes the form of public consultation. The process is aimed at optimising future decisions by giving the participants the opportunity to voice their demands and proposed solutions (Saab 2018).

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An idea to revive any space while ignoring the people who live there, without their approval of the proposed changes and an action plan for various disadvantaged groups, may lead to failure. The participants of the process are stakeholders (in other words, users of the area) from local businesses, real estate owners, potential project owners, to local government units and public administration (Król and Muchová 2018). The core of social participation is the direct or indirect involvement of citizens in public matters that affect them (Hartley and Wood 2005). Literature provides various definitions of the notion of public participation. Arnstein (1969) provided a classic understanding of public participation. She focused on the aspect of decision-making, possibility of suggestion and control as the principle for comprehending the nature of stakeholder involvement. According to Kahila-Tani et al. (2016), public participation is a process whereby representatives of the public can influence, and indirectly control the decision of authorities when such decisions affect their private interests. Public participation is the involvement of individuals and groups in public decision-making regarding matters important for the community (Dembicka-Niemiec and Szafranek 2016). Additionally, the Act of 3 October 2008 on disclosure of information on the environment and its protection, public participation in environmental protection, and environmental impact assessment (Act of 3 October 2008… Polish Journal of Laws of 2019 No. 199, item 630), hereinafter the EIA Act), guarantees public participation in matters related to the environmental protection and obliges authorities to document the active participation of the public in the procedures. The EIA Act provides an essential means for announcing public information and an active and effective pursuit of citizens' rights through the involvement of individuals and communities in procedures affecting decisions regarding environmental protection.

Apart from the provisions of the EIA Act, aspects of public participation can be found in the Zoning Act of 27 March 2003 (Polish Journal of Laws of 2019 No 80, item 730). It provides for the submission of applications, representations, opinions by citizens and grassroots organisations (including environmental ones) regarding draft zoning conditions and directions, local zoning plans, or voivodeship zoning plans. The Zoning Act provides for the obligation to inform about public-space projects and consult them through public notices about the instigation of such procedures in public announcements. Note that spatial management is inherently relevant to environmental protection. Therefore, the Zoning Act can be a tool for introducing the public to environmental protection issues on the territorial and even administrative plane (Izdebski and Zachariasz 2013).

RESULTS

To determine the opinion of local communities regarding the subject matter of a project is an important part of administrative procedures that involve public participation. Consultation helps verify the perception of the project and its public acceptance by reaching many people affected by it. It further guarantees the determination of the best possible, the most useful, and socially acceptable solutions.

The questionnaire survey involved 45 respondents, most of whom were 36 to 55 years old (22 people). The next most numerous group of 13 included people aged 70 and above. The least represented groups were 18 to 35 years (5 questionnaires) and 56 to 70 years (5 questionnaires).

The first consultation meeting was convened by the Head of the Municipality of Spiczyn on 12 September 2014 in the primary school in Kijany. Due to a sparse turnout, the Head requested another meeting, which took place on 28 September 2014 in the school of agriculture complex in Kijany. It was attended by residents, representatives of the local government, environmental organisations, and councillors.

The first meeting (on 12.09.2014) gathered only 16 people. The other was much more successful with 29 participants. Half of the respondents were residents of the municipality (24 people). The group of councillors (9) and environmentalists (7) were numerous as well. The local government was represented by only five respondents (Fig. 3).

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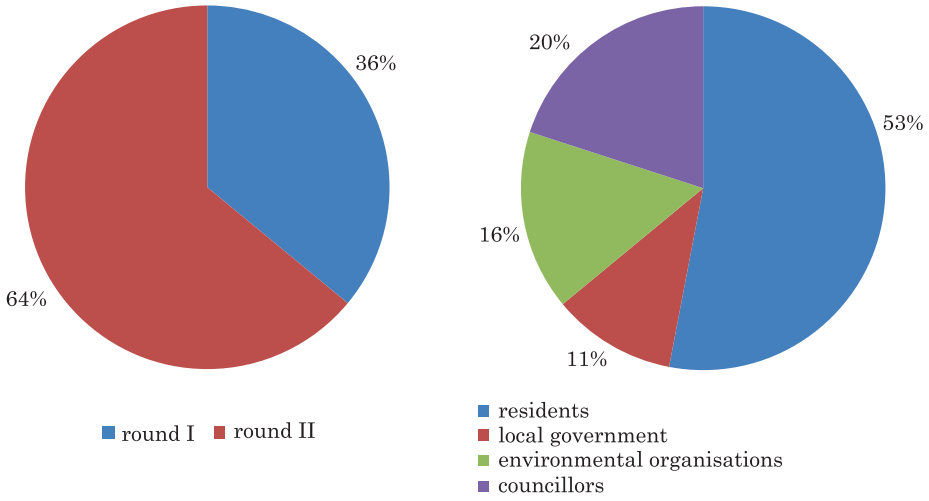

Fig. 3. The percentage distribution of the presence of the respondents in individual rounds of meetings and social groups participating in the meeting
Source: own work

One of the key questions in the questionnaire was to indicate the preferred form of contact. It is important to reach each group participating in meetings when planning the forms and methods for announcing public consultation. The temporal framework of the process is crucial, as well. In optimal conditions, the public is informed about a meeting two weeks in advance to be able to learn about relevant issues.

The largest group of respondents (49%) indicated the municipality's website as the most effective way of communication. About 22% of the respondents learnt about the meeting from local media. Only slightly less, 16% found out about it when using social media. The respondents believed posters and leaflets to be the least effective methods of notifying about a meeting. Hence, the electronic media was the primary means of advertising.

The largest group learnt about the meeting four to six days ahead (16 people) or two weeks in advance (11 people). Only three respondents declared having learned about the meeting date one day before it took place. Most respondents indicated the interest in local affairs, the possibility to join the decision-making process, and the possibility to shape the public space as the main reasons for taking part in the consultation. Only 4% of the respondents believed that it was their civic duty to participate (Fig. 4).

The respondents appreciated the technical aspect of the consultation such as the presence of a professional, unbiased moderator during meetings, neutral place of meetings, and a comfortable room. The consultation drew mostly people who lived near the project site and owners of neighbouring plots.

The respondents believed the project would affect the tourist value of the municipality and improve the economic growth of the local labour market, better land use, and environmental protection (Fig. 5).

An important component of the consultation process is a convenient date and place (easy access by various means of transport, a car park nearby). Another important factor is accessibility for people with disabilities so that all participants can arrive comfortably. The respondents reacted positively to the presence of visual aids such as models or colourful posters that presented the subject matter of the consultation in a clear way to people without expert knowledge.

The last question concerned the time of the meeting and transport accessibility. Most of the respondents, two-third, agreed that the time was convenient, and the place could be accessed with ease (Fig. 6). Over 75% of the respondents considered information about the subject matter of the consultation to be reliable.

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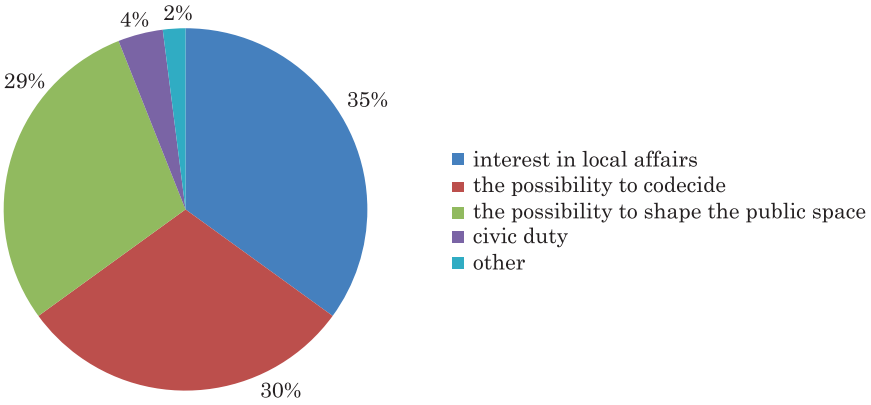

Fig. 4. The main reason for participating in the consultation
Source: own work

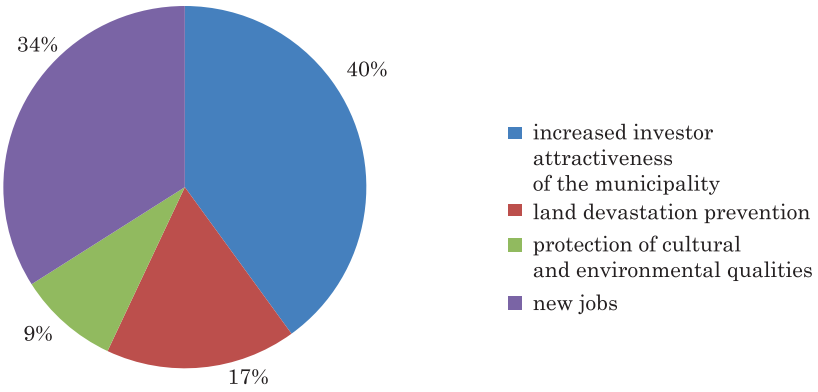

Fig. 5. Expectations for the project
Source: own work

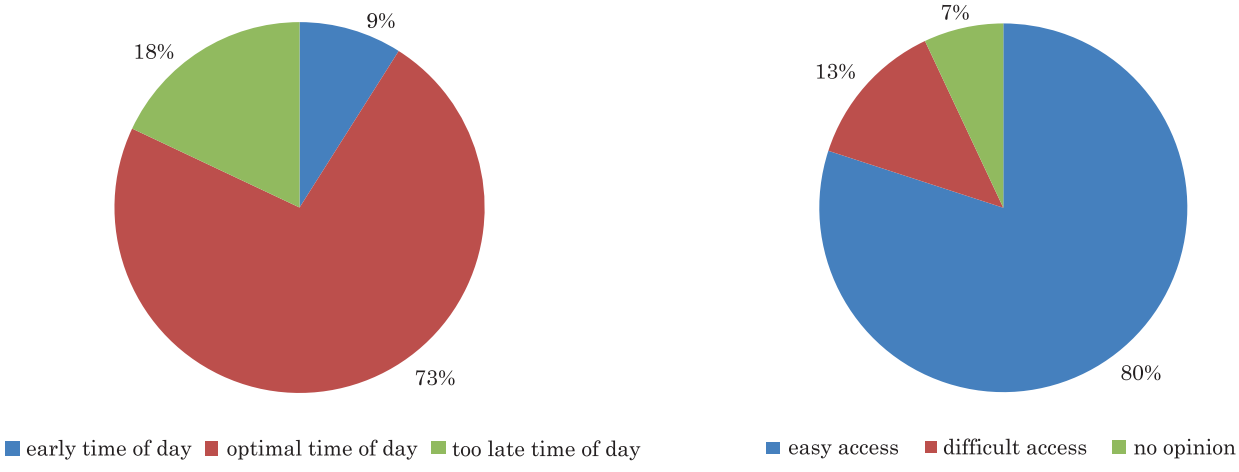

Fig. 6. Assessment of the time of day the consultation meetings were held and the transport accessibility of the meeting venue
Source: own work

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A similar share of them declared a will to participate in future consultations.

The key matter regarding consultations with residents is the improvement of communication both as regards the announcement of the planned meeting and its goals and notification about the results of the consultation and the way representations are handled. The trust between residents, administration, and project owner can be built by early start of consultation at the stage of defining project conditions.

The possibility of co-decision-making is one of the crucial components of public participation. It establishes a partnership of the local government and residents. Participants of the consultation were aware o their active role in the decision-making process regarding the project. The consultation meetings were evaluated as useful with some room for improvement in certain areas. Note that advertising is not co-decision-making. It is, therefore, important that consultation is scheduled before any binding decisions.

SUMMARY AND CONCLUSIONS

An evaluation questionnaire survey was developed to acquire reliable information about consultation meetings under the environmental impact procedure for an alteration project for the palace and park complex that mainly involved residents of the municipality of Spiczyn and environmental organisations. Most of them evaluated the public consultation positively. What they found most important was the clear presentation of legal, financial, economic, and environmental aspects of the project. The respondents believed the equal treatment of participants of the meetings regardless of their position to be a great advantage.

The history of Polish local government is full of examples of failed consultations, which exacerbated conflicts and difficulties instead of achieving a consensus. It is particularly true for consultations regarding matters much protested by particular social groups such as residents protesting a bothersome investment project in their area. In the case of the public consultation under the environmental impact assessment procedure for the extension and alteration project of the palace in Kijany, the dates of consultation meetings were advertised well in advance and the invited participants included representatives of various social and professional groups interested in the project.

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IDENTIFICATION OF DEVELOPMENT DETERMINANTS OF GREEN INFORMATION SYSTEMS FOR URBAN AREAS – POLISH CASE STUDY

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ABSTRACT

The green information systems (green IS) address the demand for information about green spaces in both urban and non-urbanized areas. This systems are part of green infrastructure (GI) and National Spatial Data Infrastructure (NSDI). GI are very important for the urban environment, and it improves the quality of life. There are various types of urban greenery. The green IS can support the management, maintenance, monitoring, protection and revitalization of urban greenery and all GI. This systems contribute to the sustainable development of urban areas, the development of smart and green cities and spatially enabled societies where community members are involved in local projects. In Poland, few cities have so far taken the effort to create a green IS due to the costs of starting and maintaining the system. Municipalities give up the creation of this system because it is not a good first necessity. However, green infrastructure is developing in Poland and there is a strong demand for green IS for easier GI management. Therefore, the aim of the research was to identify various determinants (factors) that may affect the development of green IS in Poland. Analysis of determinants is necessary and important from the point of view of knowledge of mechanisms affecting the development of green IS and may be useful to develop a strategy for further activities promoting the creation of green IS in all cities in Poland. The research results provided the basis for distinguishing groups of impact factors due to their specificity and showed which instruments are applied to them taking into account global and local initiatives.

Key words: green information system**,** green cadastre, urban greenery, green infrastructure, spatial data infrastructures

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INTRODUCTION

The literature review shows a multitude of studies on determining the significance of urban greenery or the green infrastructure for society (Molla 2015) and how important the green information systems (green IS) are for sustainable development (Dedrick 2010 Jenkin et al. 2011), however, there is still a lack of comprehensive research identifying the development determinants of green IS. Knowledge of the latter will allow us to understand what mechanisms affect the direction of development of these systems and discover specific expectations from green IS.

For the needs of this study, the green IS was defined as a system for recording and tracking urban green spaces in various cities around the world. Green areas are very important for the urban environment, and various types of urban greenery exist. The green IS supports the management, maintenance, monitoring, planning and protection of urban greenery (Lelova and Blikov 2012) – Figure 1.

The development of a green IS contributes to the expansion of urban green spaces, and it enables cities to be better prepared for natural disasters and climate change. A comprehensive register of parks and other green spaces containing information about plant species is required to improve planning and policy-making in cities. Green spaces have to be protected for environmental reasons and to improve the health of urban residents and their quality of life (UNDP 2016). Numerous information systems supporting the management of urban green spaces have been developed in recent years (GEO INFO Strategies 2018 Marian 2014 UNDP 2016). Those systems have been implemented to:

- develop a database for planning and monitoring the management of urban green spaces and the relevant resources,
- inventory the existing urban green spaces,
- minimize labour needs,
- facilitate planning and reporting of maintenance services in urban green spaces.

The developed systems account for the growing demand for urban green spaces and their role in the social, environmental and economic dimensions (Table 1).

Considering the above information the green IS should be developed not only with the involvement

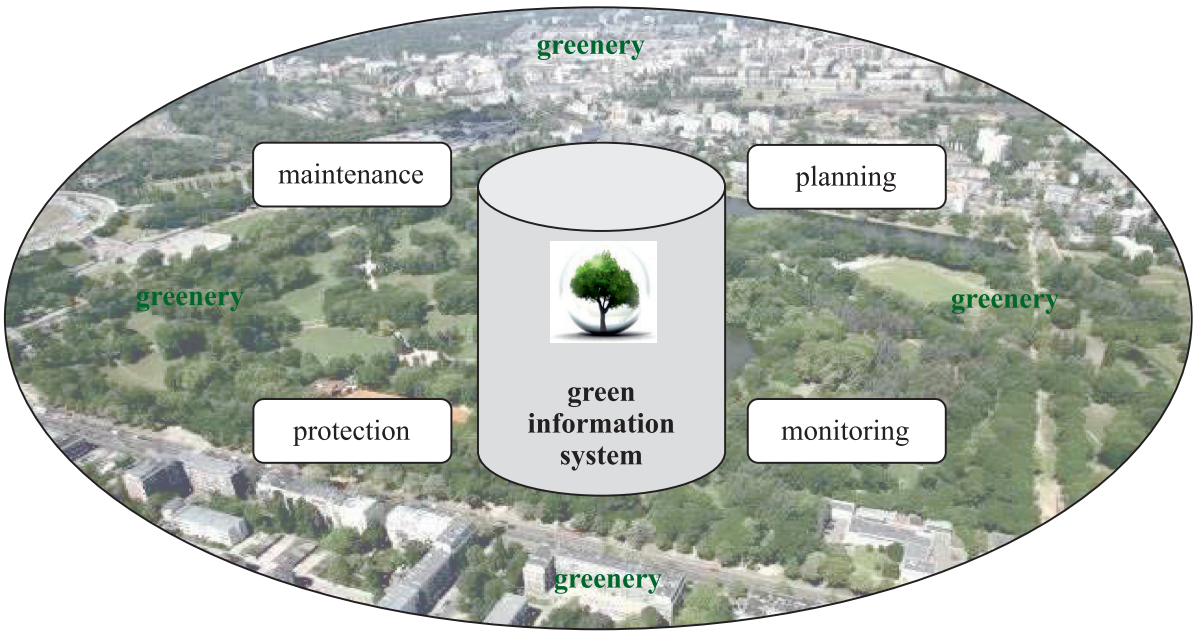

Fig. 1. The role of a green information system for urban areas
Source: own elaboration

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Table 1. Significance of urban green spaces

Social dimension	Economic dimension	Environmental dimension
Greater aesthetic appeal	increase in property value	greater biological diversity
Stronger social bonds	stimulation of local business	improved air quality, pollutant absorption, oxygen production
Improved well-being	reduction in heating and air-conditioning costs	reduction in the quantity of rainwater evacuated by sewers
Slower traffic	effective wastewater management and reduction in watering costs	reduction in noise levels
Stress reduction	business development in green districts	lower temperature in the shade
Improved concentration in children	trees have a high return on investment for pollution reduction	bird and insect habitats

Source: own elaboration based on Kosmala and Okołowicz (2014)

of advanced technology, but they should also be adapted to social needs (Enemark et al. 2014) and should promote the achievement of sustainable development goals (UN 2015, Dawidowicz and Źróbek 2017, 2018) to improve living conditions and social relations. The green IS should be an effective system which is integrated with the Land Administration System (LAS) (Williamson et al. 2010) and fit-for-purpose (Enemark et al. 2014).

Despite successively published scientific research on green IS (Dedrick 2010 Jenkin et al. 2011) and guidelines for the implementation of green IS (Brocke et al. 2012, Mishra et al. 2014), difficulties in implementing information systems for urban greenery in EU countries are still being recorded (Naumann et al. 2011). They result from various reasons, eg. inadequate funding, lack of experience in the implementation of individual project phases; lack of economic motivation, because the benefits of using green infrastructure are difficult to measure in financial terms. Hence, there are significant discrepancies in the creation of GI, not only in EU countries, but also at the level of individual cities in different countries. It is difficult to compare the scope of GI implementations, as in most cases there is no full data on this subject (Baycan et al. 2002).

In Poland, few cities have so far taken the effort to create a green IS due to the costs of starting and maintaining the system. Municipalities give up the creation of this system because it is not a good first necessity. However, green infrastructure is developing in Poland and there is a strong demand for green IS for easier GI management. Therefore, the aim of the research was to identify various determinants (factors) that may affect the development of green IS in Poland. Analysis of determinants is necessary and important from the point of view of knowledge of mechanisms affecting the development of green IS and may be useful to develop a strategy for further activities promoting the creation of green IS in all cities in Poland. The research results provided the basis for distinguishing groups of impact factors due to their specificity and showed which instruments are applied to them taking into account global and local initiatives.

MATERIALS AND METHODS

The subject of the research were determinants influencing the development of green IS. Empirical and qualitative research was carried out. Determinants were selected after analyzing the literature and reports and legal acts. The study involved an analysis of national and EU laws, local regulations, selected projects and procedures relating to the management of urban green spaces. The authors also relied on the results of a survey carried out in selected departments and institutions which keep databases on urban green spaces. Determinants were grouped due to their properties:

– key legal framework (national and EU laws),
– Key technology (systems reviews),

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– Key trends (global development paradigms, research directions),
– Key initiatives (local and international activities promoting green infrastructure).

The scope of the research process is presented in Figure 2.

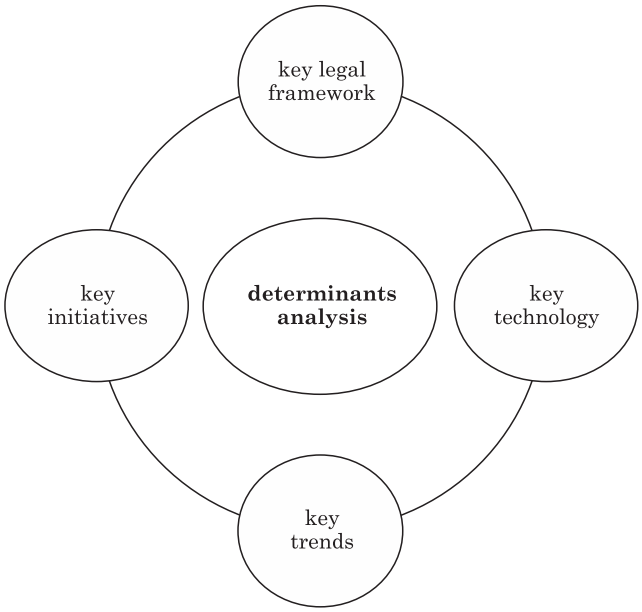

Fig. 2. The scope of the research
Source: own elaboration

RESULTS AND DISCUSSION

Key legal framework

EU Programs and Directives. Sustainable management of nature resources is an important and constructive element of international politics. In the General Union Environment Action Program adopted by the European Commission in 2013 'Living well, within the limits of our planet' (Decision EP 2013) the following strategic objectives are mentioned, taking into account the development of urban greenery in an interdisciplinary approach:
– to protect, conserve and enhance the Union's natural capital,
– to turn the Union into a resource-efficient, green, and competitive low-carbon economy,
– to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing,
– to maximise the benefits of the Union's environment legislation by improving implementation,
– to increase knowledge about the environment and widen the evidence base for policy,
– to secure investment for environment and climate policy and account for the environmental costs of any societal activities,
– to better integrate environmental concerns into other policy areas and ensure coherence when creating new policy,
– to make the Union's cities more sustainable,
– to help the Union address international environmental and climate challenges more effectively.

The Strategy "Europe 2020" (Europe 2020) supporting programs in the field of environment and climate change, energy, transport, industry, agriculture, fisheries and regional development, for sustainable management and management of natural resources is also important for EU member states. According to Europe 2020, resource management should be: intelligent, sustainable (taking into account the long-term effects of resource management) and pro-social. The goal of the flagship initiative for a resource-efficient Europe is to invest and innovate through policies related to climate change, energy, transport, industry, raw materials, agriculture, fisheries, biodiversity and regional development.

The European Commission (EC 2013) promotes the Green Infrastructure Strategy, for which it received a mandate from the European Council and the European Parliament "as a contribution to further integration of biodiversity issues with other EU policies" (Biodiversity strategy 2011). The strategy refers to the GI, which is a successfully tested tool that provides ecological, economic and social benefits through natural solutions. It helps us understand the value of benefits that nature provides to society and mobilizes investments to sustain and improve them. As a new policy concept, GI sets ambitious goals to bridge the gap between the different sectors and to integrate benefits for biodiversity with those

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for socio-economic interests, to improve delivery of ecosystem services, climate change mitigation and, more than that, it aims to promote innovative solutions and the use of same land for multiple purposes (Čivić and Jones-Walters 2014). The report (EC 2012) identified groups of functions performed by green infrastructure, ecosystems as the protection of ecosystems and biodiversity, providing services and improving their functioning, shaping living conditions and improving health, supporting the development of green economy and sustainable water and space management. Whereas in the report (EC 2016) attention was drawn to the interdisciplinary nature of entities responsible for implementation to implement the GI concept, where the most important economic sectors are: finance, construction (in the scope of green roofs, green walls), health (in the scope of availability of elements of green infrastructure for residents), environmental protection (prevention and adaptation to climate change), industry (cost-benefit analysis in the field of green infrastructure development). Green infrastructure can make a significant contribution to many of the EU's main policy objectives, in particular regarding regional and rural development, climate change, disaster risk management, agriculture and forestry (Neumann et al. 2011).

Analysis of legal regulations concerning urban green spaces in Poland. Environmental protection and management are regulated by numerous legal acts. The Environmental Protection Law (2004) defines green spaces as developed land which is occupied by technical infrastructure and buildings, is covered by vegetation and is open to the public, in particular parks, pocket parks, promenades, boulevards, botanical gardens, zoos, playgrounds, historical parks, cemeteries, roadside trees, squares, historical fortifications, buildings, storage yards, airports, railway stations and industrial sites. The most important legal acts relating to environmental protection and their provisions are presented in Table 2.

Highly generalized laws which create interpretation problems (such as tree replacement requirements) and frequent changes in legislation pose the greatest obstacles to the protection of urban green spaces

Table 2. Environmental protection in selected legal acts

Legal act	Provisions relating to environmental protection
Environmental Protection Law of 16 April 2004	Permission is not required for the removal of: a shrub or a cluster of shrubs occupying an area of up to 25 m^2; trees whose circumference at the height of 5 cm above ground does not exceed the value specified for the given tree species; trees and shrubs growing on private property which are not felled for business purposes. The property owner will pay a license fee for removing a tree or a shrub. The fee is stated in the felling license and is collected by the competent authority (municipal governor or city mayor). Under the felling license, the property owner may be required to transplant trees or plant at least one new tree for every removed tree.
Act on the Protection and Maintenance of Historical Monuments of 23 July 2003	The removal of a tree or a shrub growing on property entered into the register of monuments has to be approved by the regional monument conservation officer.
Public Roads Act of 21 March 1985	The road administrator is responsible for maintaining, planting and removing roadside trees and shrubs.

Source: own elaboration based on legal acts

(Masłowska-Gądek 2017). Local zoning plans should contain clear provisions regarding the protection of urban greenery, but Polish authorities do not make full use of their law-making powers. The existing solutions should be promoted and new options should be made available in urban planning documents to improve the quality of life in cities (Burlińska 2013). Some Polish cities, such as: Jaworzno, Kraków, Łódź, Warsaw, Olsztyn and Wrocław, implement internal procedures both at the urban level (resolutions adopted by city mayors) and at the level of the competent departments or institutions (internal standards that do not have to be approved by city mayors) to improve the quality of urban green spaces (Biejat 2017). Many Polish cities have developed or are currently developing urban greenery plans based on geographic information systems (GIS). In Olsztyn, replacement tree planting is an important

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element of the city's sustainable tree management policy. The local authorities work closely with local community members to identify areas that are in greatest need of trees (Łukaszkiewicz 2013). A comprehensive green cadastre will support the development of uniform standards for urban green spaces and will contribute to the sustainable management of urban greenery on the national scale.

Key technology

Fit-For-Purpose Land Administration System. Local governments use the most extensive and stable technology to conduct land administration.

The term "Land Administration System" (LAS) was first used in the literature in 2005 (Williamson et al. 2010). The Land Administration System is the infrastructure for implementing land policies and land management strategies that are consistent with sustainable development principles. The system incorporates a platform for the exchange of data between various institutions, a legal framework, processes, standards, land information, management and dissemination systems, as well as technologies that support allocation, the real estate market, property valuation, monitoring of land use and demand on the real estate market. Numerous countries are currently in the process of developing their Land Administration System. Databases from many public registers, including cadastres, land registries, tax registries and land-use plans, are being integrated to improve the registers' functionality and provide effective support for other systems and economic processes. The Land Administration System should be designed to meet public information needs, secure property ownership rights and effectively support sustainable management of property and natural resources, including green spaces.

The term "fit-for-purpose" is not new, but what is new is that it has been recently used in the context of building sustainable land management systems. Fit-for-purpose Land Administration System should adapt flexibly to the needs and problems of regions and local communities rather than blindly follow advanced techniques and standards. The discussed approach is participatory and inclusive, and it is fundamentally based on the concept of human rights. It delivers numerous benefits, including opportunities for building Land Administration System within a relatively short time and at relatively low cost. The fit-for-purpose approach enables governments and land professional to resolve global land issues. The discussed approach is realistic and scalable, and it could deliver numerous benefits in the intermediate timeframe.

A fit-for-purpose approach (Enemark et al. 2014) includes the following elements:
- flexible in the spatial data capture approaches to provide for varying use and occupation,
- inclusive in scope to cover all tenure and all land,
- participatory in approach to data capture and use to ensure community support,
- affordable for the government to establish and operate, and for society to use,
- reliable in terms of information that is authoritative and up-to-date,
- attainable in relation to establishing the system within a short timeframe and within available resources,
- upgradeable with regard to incremental upgrading and improvement over time in response to social and legal needs and emerging economic opportunities.

Every country needs to adapt its legal and institutional framework to implement the above elements of the fit-for-purpose approach. The above implies that the fit-for-purpose approach should have a sound legal basis, should be gradually implemented within a sound land administration framework, and the information should be made available to all users.

Geographic information systems for urban greenery management on the example of selected Polish cities. Polish cities differ in their ability to manage urban green spaces effectively and rationally. Some cities subscribe to the smart city concept and rely on modern technology and the creative potential of the local residents to popularize social initiatives and raise funds for the development of urban green spaces.

Participatory environmental management is a recent approach to the effective management

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of public greenery. One of the most noteworthy programs is the "Count on green" project which relies on softGIS tools (Putkowska et al. 2017). The participants fill out an interactive questionnaire, and the collected data are used to formulate conclusions about the quality of green urban spaces. The project was a success, and it revealed that the softGIS platform is a highly promising tool for encouraging community participation in the management of urban greenery in the digital era. The project generates information relating to the participants' preferred recreational sites and routes in natural surroundings, urban green spaces which are badly designed and not adequately maintained, urban open spaces that lack vegetation, and the participants' opinions regarding residential greenery. The project was promoted by a series of articles on the website of the Sendzimir Foundation, a competition for school students who designed the ideal playground, city games, information in the local media and promotional meetings. The campaign encouraged local residents to fill out an interactive questionnaire. According to the local authorities, the project has made an invaluable contribution to long-term urban renewal planning. The project will be continued with the involvement of local community members. The institutions and organizations responsible for the management of urban green spaces in Kraków, Łódź and Poznań participated in three workshops as part of the project (Putkowska et al. 2017).

The **www.naprawmyTo.pl** website, where local residents can report problems and contribute ideas, has been launched in 17 Polish cities (Laboratorium EE 2012). The **"Million Trees**" mobile application is yet another example of community participation in urban greenery management. Warsaw residents can use the application to indicate areas where trees are scarce. If trees cannot be planted in the suggested location, the application provides the user with the reasons for the above (Google Play 2018).

In Kraków, local residents can communicate with the Urban Greenery Board, report problems and suggest ideas for managing urban green spaces via the Collectively platform. The advertising slogan promoting the mobile application is "**My city – my concern**". The application has been launched to demonstrate that local residents can solve problems in collective effort. Through the platform, Kraków's residents can find out about the local planning process and can report problems to the Urban Greenery Board. The users can suggest community campaigns and monitor other users' activity online. In the future, the application will be expanded to include new functionalities, including online communication with other public institutions and automatic classification of user reports (Magiczny Kraków 2018). Kraków's cohesive and long-term policy of urban greens development is presented in the official document entitled "Directions for the development and management of urban green spaces for 2017–2030" (Kraków 2017). As part of this plan, dispersed urban green areas will be combined into a cohesive system, greenery maintenance standards will be improved and perfected, and urban green spaces will be managed with the involvement of modern GIS tools. Kraków has launched the Green Spaces Register, an online platform which supports management operations. The Urban Greenery Board relied on the register to develop R3Trees, a mobile application for managing urban green spaces. R3Trees can store vast amounts of information relating to urban greenery, including historical data, and it supports greenery management. The application can be used to communicate with service providers, commission services, report on the performed services, effect payments and impose fines on defaulting service providers. The system can be installed on personal computers as well as tablets and smartphones (R3Trees Mobile). System users have different access levels, and access can also be restricted locally, for example to a district or a park. Local residents can also report problems by submitting the GPS coordinates of the problem area via the platform (Atlas pokrycia terenu… 2016). Kraków is the first Polish city to have implemented a modern tool for managing urban green spaces.

The "naprawmyTo" service had been tested in Olsztyn in 2012. The local authorities rely on traditional paper document workflow, and mobile applications and geosurveys are not used. Social

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consultations take place during meetings, and the relevant information is available on the city's website. The tested service contained useful information about the location of urban vegetation as well as green areas that are neglected, inadequately planned or deficient in vegetation. The application contained scalable maps, and the results could be visualized on different scales in space and time. The maps were easy to update to monitor the latest trends. The resulting data could be highly useful for municipal GIS systems (Putkowska et al. 2017). If a tree cannot be planted in a suggested location, the application provides the user with the reasons for the above. Not all locations are suitable for planting trees and numerous factors have to be taken into account, including protective zones around railway tracks and flood embankments, property ownership, presence of underground infrastructure, street lamps, posts, other trees and buildings, as well as local zoning plans. The application can suggest alternative locations for planting trees (Google Play 2017).

Urban green spaces can be inventoried with the use of the Monit-Air application as part of the Integrated Spatial Data Monitoring System for Improving Air Quality in Kraków (Kraków 2017). Trees can be accurately mapped by laser scanning. Information about tree health is available to greenery inspectors who can monitor changes in the condition of urban greenery (Więcławska 2016). In some cities, trees are inventoried during local surveys which are conducted at the beginning of a construction project or when felling licenses are issued. Inventories are often conducted with the use of paper documents, and they cover small areas, such as private property. Numerous requests concerning the removal of tall trees are submitted by residents of housing estates, but the results of these inventories are not available to the public (Biejat 2017).

Trend analysis

Sustainable Development Goals (SDG). All Land Administration Systems (LAS) as well as green information systems (green IS) should support the sustainable land management and policy moving towards achieving Sustainable Development Goals – SDG (UN 2015). SDG alongside continuing development priorities, such as the eradication of poverty, health, education and food security, and nutrition, it sets out a wide range.

Deep interconnections and many cross-cutting elements ahead the new Sustainable Development Goals (17) and targets (169) are reflecting the integrated approach (UN 2015).

The particular importance of green IS is to achieve Goal 11: Sustainable Cities and Communities (Make cities inclusive, safe, resilient and sustainable). There needs to be a future in which cities provide opportunities for all, with access to basic services, energy, housing, transportation and more. The relevant targets will be related to the launch of green IS:

- **11.3.** By 2030, enhance inclusive and **sustainable urbanization** and capacity for participatory, integrated and **sustainable human settlement planning and management in all countries**;
- **11.4.** Strengthen efforts to protect and safeguard the world's cultural and **natural heritage**;
- **11.6.** By 2030, reduce the adverse per capita **environmental impact of cities**, including by paying special attention to air quality and municipal and other waste management;
- **11.7.** By 2030, provide universal access to safe, inclusive and accessible, **green and public spaces**, in particular for women and children, older persons and persons with disabilities;
- **11.A.** Support positive economic, social and **environmental links between urban, peri-urban and rural areas** by strengthening national and regional development planning.

Smart Cities. The smart city concept integrates advanced information and communication technology (ICT) solutions in the process of managing urban areas. This multifunctional concept advocates an intelligent approach to problem solving (Stawasz and Sikora-Fernandez 2015). Rapid technological progress in the past 30 years has encouraged national and local authorities in various regions of the world to define a set of guidelines for deploying ICT tools to stimulate

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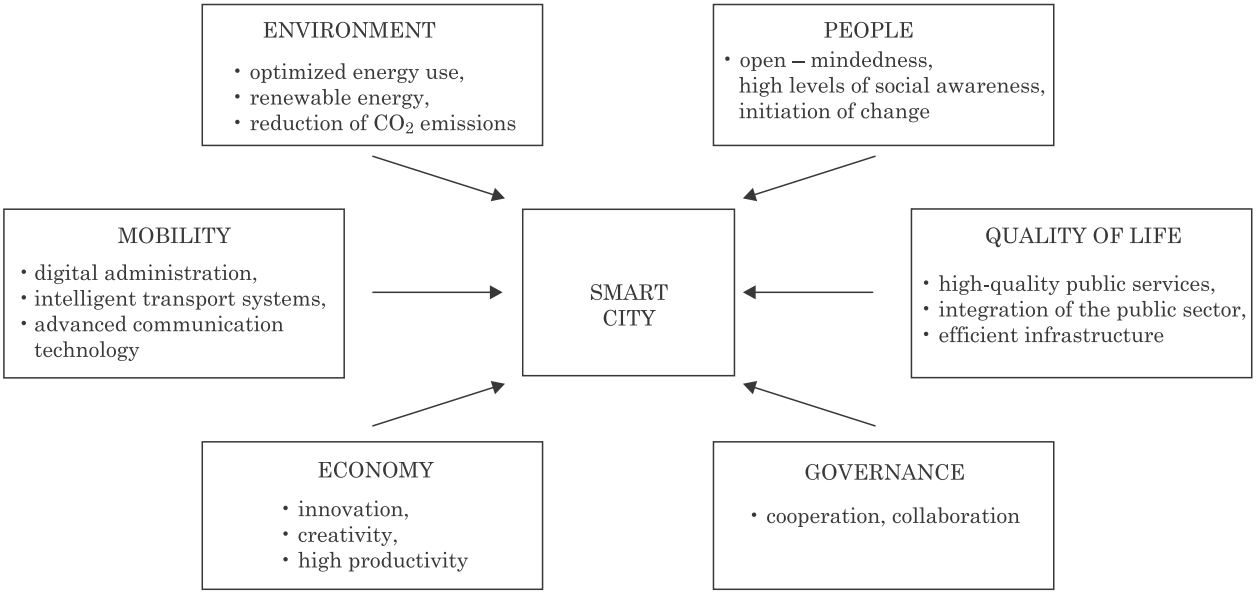

Fig. 3. Characteristic factors of smart cities
Source: own elaboration based on the TUWIEN Team (2018)

urban development. However, consistent criteria for describing a city's "smart" status have not been laid down to date (Tranos and Gertner 2012). The availability and quality of ICT solutions is not the only criterion defining a smart city, and the relationship between ICT infrastructure and economic performance is equally important (Roller and Waverman 2001). There is no single definition of a smart city because the characteristic elements of an intelligent city are difficult to describe. Various definitions have been proposed in the literature. According to Komninos (2002), smart cities are territories with high capacity for learning and innovation, which are built on the creative potential of their population, research and development institutions, higher education institutions, and digital infrastructure for communication and knowledge management. In addition to their technological advancement, intelligent cities are also characterised by suspensivity, creation and distribution of wealth, investment in infrastructure, reduction of poverty and social exclusion (Marceau 2008) and unique urban management strategies (Van der Meer and Van Winden 2003). The above definition accounts for the multidimensional character of smart cities and their ability to transform the urban environment.

Despite their inability to propose a cohesive definition of a smart city, researchers are in agreement on the number of factors that make up the concept. The characteristic factors of a smart city are presented in Figure 3.

Spatially Enabled Society. The concept of a Spatially Enabled Society (SES) marks the growing demand for timely and accurate spatial information. It is derived from the concept of an Information Society (IS) which is defined as a society where advanced digital information and communication technologies are the main drivers of economic growth and the main sources of income for most citizens (Goban-Klas and Sienkiewicz 1999). Steudler and Rajabifard have elaborated on the above concept and argued that an information society should also be spatially enabled (FIG 2012). Spatial enablement denotes the ability to add location to the existing information (localization of knowledge about objects in space), which enables societies to harness

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the existing knowledge about land and water, its legal and economic status, resources, potential uses and hazards. A spatially enabled society relies on the concept of location to organise information and processes. This is one of the strategic goals of many development programs initiated by governments.

Spatial enablement enhances innovation, transparency and democracy. This concept marks the beginning of a revolution in the realm of spatial information. Societies and governments have to be spatially enabled and provided with the right tools and information to make appropriate decisions.

The SES concept creates new opportunities for nations and societies. Its main goal is to promote the effective use and supply of spatial information and services. For this goal to be met, the extent to which spatial data is made available, the quality of spatial information and the relevant responsibilities have to be regulated by law (Onsrud 2010). Flexible legislation could significantly expand the role of SDI in promoting good governance. In a paper analysing the role of SDI in governance, Box and Rajabifard (2009) emphasised the role of governance and defined the most effective governance concepts. They observed that governance is traditionally regarded as a "steering" function which provides leadership and creates a framework for collective decision making. However, in the context of SDI, governance becomes the basic tool for institutional arrangements, and it encompasses functions such as coordination and management. These functions expand the scope of governance to include the implementation of decisions.

Governance plays a key role in SDI; therefore, social participation and spatial enablement foster agreements that bind people with spatial resources (data and technology). However, other functions are also needed to effectively channel collective efforts towards the achievement of common goals.

A socially enabled society derives numerous benefits from access to spatial information and services and relies on these resources to manage land and water. The SES concept has been incorporated into government programs in many countries. The importance of spatial information for strategic policy development decision-making has also been recognised at the local, regional and national level. A socially enabled society operates largely in a virtual world, but these initiatives have to be accompanied by institutional and structural reforms regarding the use of spatial information and SDI as access platforms.

Key activities

Spatial Data Infrastructure (SDI). The past decade has witnessed the development of Spatial Data Infrastructures (SDI), which encompass basic network infrastructures as well as platforms promoting the vision of a spatially enabled society (SES). The aim of the SDI is to provide societies and governments with access to spatial data and to assist them in making the right decisions, in particular decisions relating to spatial management. In this context, the SDI and Land Administration Systems, which contain information about the legal status of property, can be used to generate valuable data for various sectors of the economy. These data are generated and used by different entities. Therefore, the SDI contributes to social awareness and community participation in public life.

The SDI concept was developed on the assumption that the development of products and services based on data gathered at all levels of public administration and society, from government agencies to the private sector and individuals, can promote economic growth, social stability and environmental protection. Spatial data integrated on a single platform play a key role in this context. The first efforts to develop a national SDI were made in the United States in 1990. In successive years, networks for sharing spatial data were launched in other countries. The concept of a pan-European infrastructure for spatial information emerged in 2001. The legal framework for creating SDI in Europe was provided by the INSPIRE Directive (Directive for establishing an Infrastructure for Spatial Information in the European Community) which was adopted by the European Parliament and the Council in 2007 (INSPIRE Directive 2007).

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Table 3. Spatial data themes proposed by the INSPIRE Directive with an indication of the themes that relate to urban green spaces

Annex to INSPIRE Directive	No	Theme
Annex I	1	coordinate reference systems
	2	geographical grid systems
	3	geographical names
	4	administrative units
	5	addresses
	6	cadastral parcels
	7	transport networks
	8	hydrography (complex)
	9	**protected sites (complex)**
Annex II	1	elevation
	2	**land cover**
	3	orthoimagery
	4	geology
Annex III	1	statistical units
	2	buildings
	3	**soil**
	4	**land use**
	5	human health and safety
	6	utility and governmental services
	7	**environmental monitoring facilities**
	8	production and industrial facilities
	9	**agricultural and aquaculture facilities**
	10	population distribution — demography
	11	area management/restriction/regulation zones and reporting units
	12	natural risk zones
	13	atmospheric conditions
	14	meteorological geographical features
	15	oceanographic geographical features
	16	sea regions
	17	**bio-geographical regions**
	18	**habitats and biotopes**
	19	**species distribution**
	20	energy resources
	21	mineral resources

Source: own elaboration based on the INSPIRE Directive (2007)

The SDI concept has various definitions. According to one of them, SDI consists of legal, organizational, economic and technical measures which create public access to spatial data relating to the national territory and geographic information services, make effective use of geographic information to increase the competitive advantage of the national economy in accordance with the principles of sustainable development, promote rational management of geographic data at the national and local level, and contribute to the development of an information society (GISPLAY 2014). The INSPIRE Directive (2007) defines the infrastructure for spatial information as metadata, spatial data sets, spatial data services, technologies, processes and procedures which are applied and shared by public authorities and third parties who co-create the infrastructure.

The above definitions indicate that the SDI concept has emerged to enable various communities to access, use and share spatial data in the process of pursuing different goals. The key function of SDI is to provide a mechanism for integrating spatial data, including cadastral and topographic data, for the needs of the decision-making process. The SDI concept has been implemented in many countries. Modern SDI are platforms that integrate multilevel and hierarchical systems of GIS data and property data based on partnership agreements concluded at the local, regional, national, international and global level. This approach supports effective network management, and it provides institutions and private users with access to spatial information across national borders. The described concept contributes to the development of a spatially enabled society whose members can use information effectively to save money, time and effort. Data can be acquired from many sources without the need for costly copies and maps, and datasets can be integrated (Table 3) to give rise to new services.

The INSPIRE Directive (2007) has laid down five main principles for developing a unified spatial information infrastructure in Europe:

– data should be collected only once and properly stored and maintained by the relevant institutions and services,

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– the continuity of spatial data should be ensured with the aim of acquiring information from various sources and sharing data with multiple users and applications,
– spatial data should be stored at an appropriate (one) level of public administration and made available to operators at other levels,
– spatial data necessary for the proper management of space at all levels of government should be publicly available (without conditions that limit and/or hamper free data use),
– potential data users should be provided with information about the types of available spatial data, the requirements for accessing spatial data as well as information that enables them to determine whether these data meet their individual needs.

Various spatial data themes have been proposed by the INSPIRE Directive (2007), but despite the above, the SDI can be flexibly expanded in the future. The proposed spatial themes are presented in Table 3, and the themes that are directly or indirectly related to the collection and sharing of information on urban green spaces are marked in bold font.

National SDI are used for a variety of purposes, in particular for coordination of space, analyses, property management and land administration. The significance of the SDI in the context of cadastral reform was emphasized in the Bogor Declaration in 1996. The signatories concluded that the spatial cadastral framework, usually a cadastral map, should be the fundamental reference layer within a nation's spatial data infrastructure (UN/FIG 1996). Every system should have specific functionality: the cadastre generates information about property, whereas SDI organises spatial information.

The Land Administration System concept emphasises the need for data integration and proposes changes to the principles of cooperation between the main stakeholders. Above all, it recognises that SDI is a vital tool for collaboration and sharing spatial data. The combined resources of the cadastre and SDI will provide the authorities and the public with unprecedented access to information about land use. The SDI is a major milestone on the way to a spatially enabled society.

Green city competitions. The European Green Capital Award (EGCA 2019) is the result of an initiative taken by 15 European cities (Tallinn, Helsinki, Riga, Vilnius, Berlin, Warsaw, Madrid, Ljubljana, Prague, Vienna, Kiel, Kotka, Dartford, Tartu & Glasgow) and the Association of Estonian cities on 15 May 2006 in Tallinn, Estonia. This award has been granted since 2010 by the European Commission. It is important to reward cities which are making efforts to improve the urban environment and move towards healthier and sustainable living areas. The satisfaction involved in winning a prestigious European award spurs cities to invest in further efforts and boosts awareness within

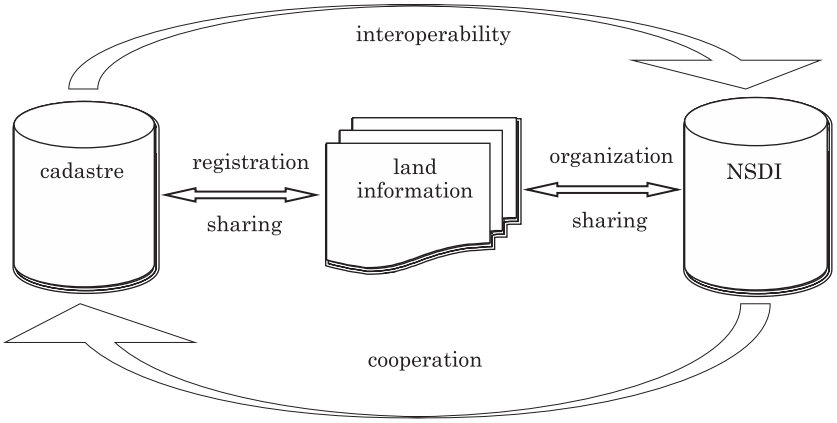

Fig. 4. The relationship between the cadastre and the national SDI
Source: own elaboration

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the city as well as in other cities. The award enables cities to inspire each other and share examples of good practices in situ.

Starting in 2010, one European city is selected each year as the European Green Capital of the year. The award is given to a city that:
- has a consistent record of achieving high environmental standards.
- is committed to ongoing and ambitious goals for further environmental improvement and sustainable development,
- can act as a role model to inspire other cities and promote best practices to all other European cities.

The award aims to provide an incentive for cities to inspire each other and share best practices, while at the same time engaging in friendly competition. In other words, the cities become role models for each other.

Two competitions promoting green city have been launched in Poland, i.e. '**Green cities**' and '**Eco City**'. The Green Cities competition – Towards the Future (GDOS 2019), organized by the Ministry of the Environment, is addressed to cities that carry out environmental protection activities. The competition promotes modern, ecological investments in various areas of urban life and activities aimed at sustainable urban development. The competition is open to cities with poviat rights and municipalities whose projects or investments started not earlier than in 2006 and ended at least 1 month before submitting the competition application.

The competition is conducted in three categories:
- environment and health: projects or investments that directly affect the health of residents, in particular in the field of sustainable transport, greenery in the city and air protection;
- resource saving: projects or investments that affect the saving of natural resources, in particular in the field of water and sewage management and water protection, waste management, energy efficiency;
- environmental education: educational projects or projects implemented by cities that promote environmental behavior among residents.

The inspiration for the Green Cities competition – towards the future is the concept of the European Green Capital.

The ECO-CITY Competition (GRIDW 2019) aims at promoting environmental sustainability by awarding those among large and small-sized municipalities in Poland which are leaders in environmentally responsible sustainable development. **ECO-CITY** project is being organized for the fifth time this year. The project involves a range of events including the Poland-wide contest for municipalities, a conference on environmental sustainability, and a number of associated activities such as seminars and meetings for sharing best practices. Complex greenery design is a long-term process which effects (e.g. in the case of tree plantings) can be felt only after many years, so it is very important to include future challenges and problems in it. **ECO-CITY** is a space for exchange of experiences between city authorities, which helps to imitate good practices.

SUMMARY AND CONCLUSIONS

Despite the fact that urban greenery is not often considered as a good of first necessity, especially in the last decade many factors have appeared that promote greenery in cities and its optimal management using modern information technology. It has been noticed that green information systems are becoming more and more popular and needed.

The green IS is a cohesive information system which can offer considerable support for managers of urban green spaces. Many of green IS contributes to the development of smart cities, fit-for-purpose land administration systems and spatially enabled societies. Cities need reliable information systems to manage urban green spaces in line with the principles of sustainable development. A cohesive green IS can raise the standards for maintaining green areas and can contribute to the implementation of transparent management policies.

Research results have shown a multitude of determinants that influence and guide the development

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of green information systems. They were grouped due to their properties on: key legal framework (national and EU laws), key technology (systems reviews), key trends (global development paradigms, research directions), key initiatives (local and international activities promoting green cities). All conditioning factors are related to and result from each other. Designing new systems will be conditioned and closely related to the identified determinants. The study showed that there is a growing trend of pursuing green cities and developing systems supporting urban greenery management. More impressive results in running green IS could be obtained by implementing Sustainable Development Goals (SDG) solutions in EU or national law. Then one would expect that the development of green IS would be uniform and standardized in different countries.

Cohesive management standards can facilitate the development of urban green spaces and can support the identification of areas where maintenance and remedy measures are most needed. The green IS will provide tools for proposing alternative development scenarios, evaluating and comparing those solutions based on preliminary assumptions and indicators. This is a highly useful feature in complex systems where various management scenarios have to account for the needs of diverse stakeholder groups.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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CHANGES AND CORRELATIONS IN LAND-USE STRUCTURE WITHIN THE ADMINISTRATIVE BOUNDARIES OF A TOWN – A CASE STUDY

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ABSTRACT

Urban areas continuously evolve. The main drivers of spatial change in towns and cities are urbanization processes. The aim of this study was to analyze changes in the process of urban development spanning a period of 30 years and to analyze the correlations between the distribution of various land-use types. The results were compared with the land use balance made in the 1970s. In the present study, the distribution of different land use categories in urban space was mapped with very high accuracy. The results of this study validate that areas with specific functions tend to coexist, whereas other areas exist separately in different parts of the town. Active urbanization processes were observed in the analyzed town. Developed and urbanized areas (mainly with residential functions) were significantly expanded in the analyzed period. The spatial and functional structure of the analyzed town and its development potential within the administrative boundaries are influenced by the geographic location, which significantly obstructs further expansion of developed areas. The proposed methodology can be used to improve land management in urban areas and can be implemented in other spatial units.

Key words: land use, urban change, Spearman's rho, Geographic Information System, succession of functions

INTRODUCTION

Urban areas continuously evolve. The spatial development of human settlements is determined by natural conditions which play the key role in the establishment of cities and towns, initiation of new activities and changes in urban structures. Urbanization processes are the main drivers of spatial change in contemporary cities and towns (Słodczyk 2001, Longley 2002, Araya and Cabral 2010, Amin et al. 2012, Onose et al. 2013, Feltynowski 2017, Senetra and Szarek-Iwaniuk 2019). The urban fabric is characterized by a succession of functions, where selected functions are rapidly replaced with other functions (Miszewska 2000). Effective urban planning requires a thorough understanding of the changes that take place in the rapidly evolving urban environment (Yang 2002, Sanchez 2004, Sancar et al. 2009). Developed areas in cities and towns have exerted irreversible changes in the natural environment. Developed areas are centers of social and economic activity, and they act as landmarks that give cities and towns their unique character. Undeveloped land is characterized by low levels of transformation of the natural environment, and it does not differ considerably from rural land outside the administrative boundaries

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of a city or town (Liszewski 1973). Various statistical and cartographic methods are used in studies of urban space. Geographic information system (GIS) tools support analyses of the rate of changes in space, but detailed rules for mapping spatial changes have not been proposed to date (Kałamucki and Buk 2010, Kuźma and Stachowicz 2016). While analyzing the city spatial structure, Matczak (1999) relied on a network of regular squares to analyze the land use structure and the co-occurrence of different land-use types in urban space.

Changes in land-use in urban areas are usually analyzed based on satellite data (e.g. Corine Land Cover), but the resolution of satellite images for small and medium-sized towns is generally low. These data sources are characterized by low accuracy and a high degree of generalization. The advantage of the research, based on space inventory presented by the authors, is a great precision of the distribution of selected land-use categories in city space.

The aim of this study was to describe changes in the process of urban development spanning a period of 30 years and to analyze the correlations between the distribution of different land-use types: residential areas, services, industrial and storage facilities, urban greens and recreational areas, other developed areas, water bodies, forests, agricultural land and other undeveloped land. The results were compared with the land use balance made in the 1970s (Grocholska 1973). In the present study, the distribution of different land use categories in urban space was mapped with very high accuracy. The results allow for tracking changes occurring in city space and evaluate the presence of particular land-use categories.

MATERIALS AND METHODS

Research area

The study was carried out in Ostróda, located in the Ostróda county, Region of Warmia and Mazury in Poland (Fig. 1). Ostróda has a population of 32,996, and it occupies an area of 14.15 km^2 (Central Statistical Office 2019). The town is situated in the Iława Lakeland whose geomorphological features were shaped during the last glacial period. There are five lakes, marshes and forests within the town's administrative boundaries. Ostróda has good access to public transport networks, which contributes to the development of the local economy, services and tourism. Its geographic location drives the development of built-up and urbanized areas. Numerous water bodies and marshes pose a barrier to spatial development (Fig. 2).

The sources of data and methods

The sources of data for the presented analysis were land-use maps developed in 1988 (Borejszo 1988) and 2017 based on detailed surveys and orthophotomaps. The maps are highly detailed and accurate.

The following categories of areas were used to classify land-use types in Ostróda:
- developed and urbanized areas: residential areas, roadways and transport networks, services, industrial and storage facilities, urban greens and recreational areas, other developed areas;
- undeveloped areas: water bodies, forests, agricultural land and other undeveloped land.

Due to the necessity to standardize the legends of both maps, for the research on land-use changes in 1988 and 2017, forests and agricultural land were included in the category: other undeveloped areas.

The analysis relied on cartographic and statistical methods, and data were processed in ArcGIS and Statistica software. Cartographic and statistical methods were deployed in the first stage of research (land-use structure and changes). The source materials (the map of 1988, survey results and orthophotomaps for generating a valid land-use map) were calibrated and subjected to vectorization to produce a set of shape files with different land-use categories. The process of generating base maps is laborious and time consuming, but it accurately renders the spatial structure of the examined area. A spatial database containing information on land use in 1988 and 2017 was developed. The resulting data were used in calculations to determine the main changes in land use in the analyzed period.

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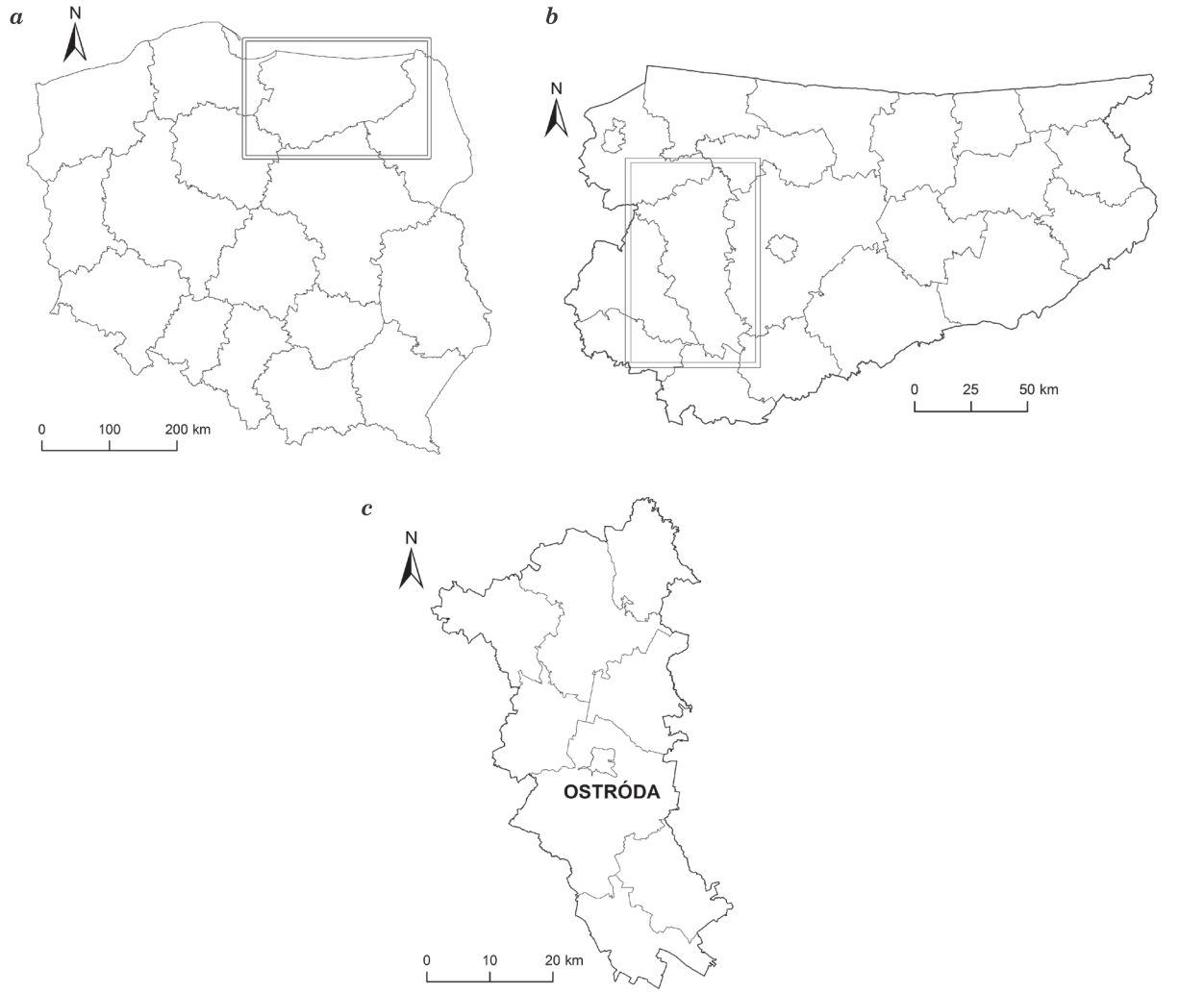

Fig. 1. Area of the study: *a* – location of the town of Ostróda in Poland; *b* – the region of Warmia and Mazury; *c* – Ostróda county
Source: own study

The co-occurrence of different land-use types was determined in the second stage of the study. The map of Ostróda was overlaid with a grid of polygons measuring 500 x 500 m each. The size of the polygons supported a detailed analysis of the study area. A total of 79 polygons were created, and each polygon was assigned a unique name (Fig. 3). The area occupied by every land-use type was calculated inside every polygon. The resulting data were exported and processed statistically, including the correlation analysis.

The co-occurrence of different land-use types was evaluated by Spearman's rank correlation analysis (Spearman`s rho). This non-parametric measure assesses the monotonic relationship between random variables. The values of Spearman's rank correlation coefficient range from -1 to 1, where a positive value denotes the presence of a positive correlation, and a negative value denotes a negative correlation. Spearman's rho represents the correlations between different land-use types. In this study, the results were regarded as statistically significant at $p \leq 0.05$.

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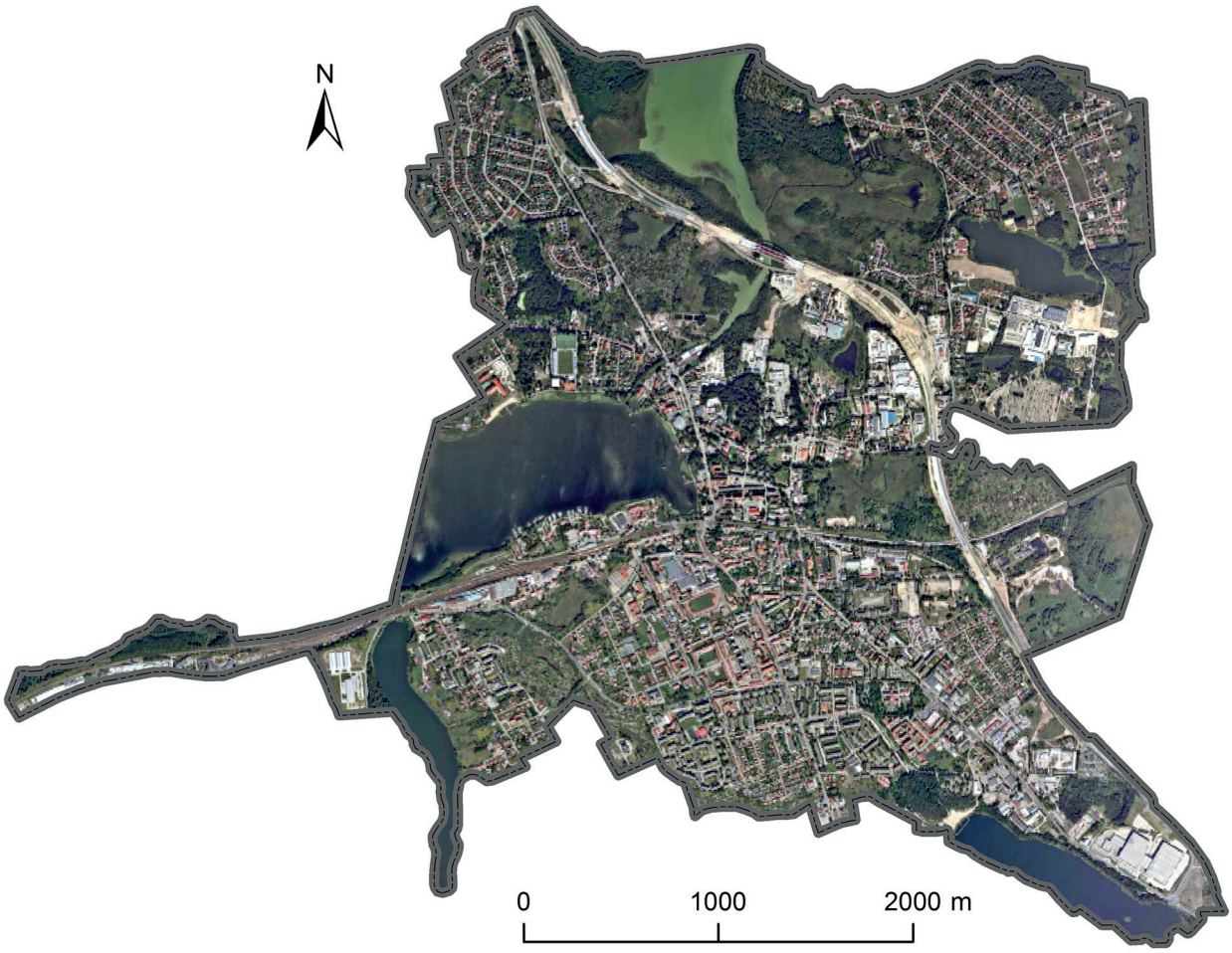

Fig. 2. Ortophotomap of Ostróda
Source: own study

Unlike Pearson's correlation coefficient, Spearman's rho can be used to evaluate non-linear relationships (Spearman 1904, Kendall 1948, Hauke and Kossowski 2011). Spearman's rank correlation analysis is deployed in geographic studies. Hauke and Kossowski (2011) compared the values of Pearson's product-moment correlation coefficient and Spearman's rank correlation coefficient as well as their statistical significance for different sets of data describing regional indices of socio-economic development. Spearman's rank correlation analysis was applied to test for a relationship between the mean land-use/land-cover change and the size of protected areas (Maiorano et al. 2008). The authors measured the changes in land-cover/land-use between 1990 and 2000 using two Corine land cover maps. The discussed measure was also used to investigate the relationships between land use and water quality (Tu 2011, Ding et al. 2015).

Changes in land-use were investigated over a period of 30 years, and the correlations between various categories of land in Ostróda were evaluated.

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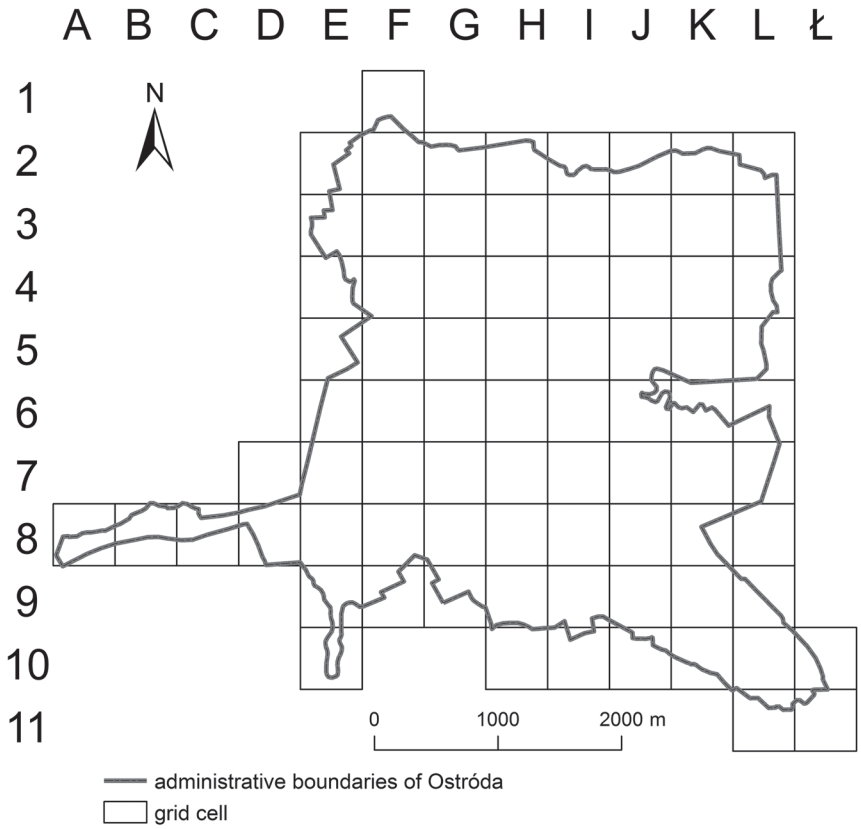

Fig. 3. The grid of polygons measuring 500 x 500 m overlaid on the research area
Source: own study

RESULTS AND DISCUSSION

Changes in land-use structure

Ostróda is a town with a favorable geographic location and good access to public transport networks, factors that drive its dynamic development. These factors have contributed to a steady increase in the proportion of developed and urbanized areas which covered 58.37% of the town's territory (8.26 km^2) in 2017. Urban growth is considerably affected by environmental factors, mainly the distribution of water bodies and terrain features. In some cases, environmental features pose a considerable barrier to growth, in particular in development projects covering large territories.

A comparison of land-use patterns revealed considerable changes between 1988 and 2017 (Fig. 4) . The area and proportion of undeveloped land decreased by 20% in the analyzed period which can be attributed mainly to urban expansion. Undeveloped land would have been depleted at a faster rate had it not been for the fact that the growth potential of Ostróda's urbanized zones is limited by the town's geographic location and the presence of lakes, marshes and protected areas.

Considerable changes were observed in the proportion of land occupied by services (whose area doubled) due to changes in the national economy after the political transformations of 1989. The area occupied by roadways and transport networks increased by approximately 30% as a result of technological progress and the growth of the automotive industry.

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The proportion of land occupied by industrial and storage facilities decreased in the analyzed period. Residential areas have the highest share of urban land use, and their share of total land increased from 34.4% in 1988 to 40% in 2017. In the analyzed period, the area of land occupied by residential functions increased by nearly 40% from 2.36 km^2 to 3.30 km^2. The share of residential areas in the total area of the town increased by 6.5% from 16.8% in 1988 to 23.3% in 2017. These changes induced a minor decrease in the area occupied by urban greens and recreational premises. In Ostróda, urban expansion is limited mainly by local physiographic conditions, and future residential projects are most likely to target developed and urbanized areas. The town also has a high share of undeveloped land (18.73%), mostly marshes, meadows and tree clusters (including Natura 2000 areas). However, most undeveloped land does not constitute a land reserve for future development projects. Ostróda abounds in lakes which occupy 14.2% (2.01 km^2) of its area. A high proportion of undeveloped lands, water bodies, services, urban greens and recreational areas as well as good access to public transport networks significantly contribute to Ostróda's tourism potential. An analysis of the share of uninvested areas in 2017 and its suitability for development also revealed that protected areas account for nearly 15% of Ostróda's territory (36% of undeveloped land).

The gained results were confronted with the land use balance in Ostróda from 1970 in order to broaden the time horizon (Grocholska 1970). One did not decide, however, on a direct comparison of the results in the charts or tables due to the fact that the author had considered different land-use categories. Moreover, in the group of developed and urbanized areas, one could distinguish only two categories: residential areas and roadways and transport networks. In this research, six categories were distinguished. What is more, the surface of the city was smaller by several km^2 in the time range between 1988 and 2017. In 1970, the city occupied 9.39 km^2, but in the research period, it was 14.15 km^2.

In the land-use structure in 1970, developed and urbanized areas were dominant. They covered 44.52% of the city space. The residential areas selected by Grocholska (1973) covered 37.17% of the city space and the roadways and transport networks covered 7.35%. Over a third of the city space (35.25%) was agriculturally used and 14.05% was covered with water bodies. In relation to 1970, the surface and the share of developed and urbanized areas increased in 2017. The agricultural area was marginal (0.21% of the city surface in 2017). The results show that the acreage of developed and urbanized areas, particularly residential areas, still grows and cover next larger areas previously used for agriculture or undeveloped

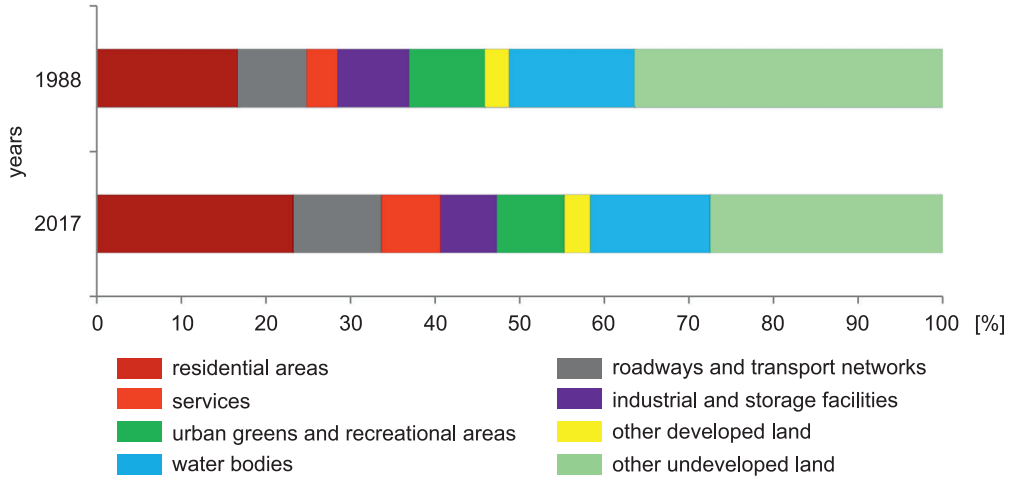

Fig. 4. Land-use structure in Ostróda in 1988 and 2017
Source: own study

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areas. These processes increase residential density in the existing residential areas, but they also lead to the development of residential functions on undeveloped land in the vicinity of the existing residential districts.

Co-occurrence of different land-use types

The co-occurrence of different land-use types in Ostróda in 2017 was measured by Spearman's rank correlation analysis (Table 1). Selected land-use types tended to coincide, whereas other land-use types existed in isolation; however, the observed correlations were not statistically significant.

The highest positive correlation was observed between residential areas and services (0.4614). This correlation is characteristic of urban space where residential buildings often host service outlets. Urban residents require access to commercial services, but also educational, health care and public administration facilities. A positive correlation was also noted between residential areas and transport networks (0.2074). The highest negative correlation was determined between residential areas vs. water bodies (-0.3138), other undeveloped land (-0.1807) and industrial and storage facilities (-0.1692). Transport networks were most strongly correlated with services (0.3870) and industrial and storage facilities (0.2974), and they were bound by a negative correlation with water bodies (-0.2416). Services were correlated mainly with residential areas and transport networks, and they were bound by a weaker correlation with urban greens and recreational areas (0.1468). Industrial areas tended to co-occur with transport networks (0.2974) as well as other undeveloped land (0.1724). Industrial facilities are usually zoned outside the urban core and residential areas, and they require good access to transport networks. Water bodies were weakly correlated with forests (0.0961) and were bound by negative correlations with most land-use types. The results of this study validate the co-occurrence of selected land-use types in urban areas which contribute to an improvement in the standard of living.

CONCLUSIONS

The land-use structure of an urban area is influenced by environmental factors as well as socioeconomic factors. The existing land-use types enable cities and towns to fulfill specific functions and create a supportive living and working environment for the local residents. The studied phenomenon can also be analyzed in a reverse direction – land management and the allocation of different activities to specific units of area lead to environmental transformations, mainly changes in water relations and the depletion

Table 1. Co-occurrence of different land-use types in Ostróda in 2017

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	**1.0000**	0.2074	0.4614	-0.1692	0.0536	-0.0346	-0.3138	-0.1400	0.1810	-0.1807
2		**1.0000**	0.3870	0.2974	0.0742	0.1802	-0.2416	-0.0771	-0.0410	0.0070
3			**1.0000**	-0.0054	0.1468	0.0911	-0.1554	-0.2735	-0.0656	-0.1352
4				**1.0000**	0.0198	0.0065	-0.0729	0.0103	-0.0633	0.1724
5					**1.0000**	0.0372	0.0026	-0.1331	-0.0615	-0.0027
6						**1.0000**	-0.0920	-0.1091	-0.0264	-0.0430
7							**1.0000**	0.0961	-0.0621	-0.1435
8								**1.0000**	-0.0633	0.1207
9									1.0000	-0.0911
10										1.0000

Key: *1* – residential areas; *2* – roadways and transport networks; *3* – services; *4* – industrial and storage facilities; *5* – urban greens and recreational areas; *6* – other developed land; *7* – water bodies; *8* – forests; *9* – agricultural land; *10* – other undeveloped land
Source: own elaboration

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of plant cover. This is an inevitable process because urbanization relies on vacant land reserves or minimally developed land. Sound urban planning solutions and local zoning plans prevent chaotic urban growth.

The changes in the land-use structure of Ostróda between 1988 and 2017 were driven by numerous factors, where the political transformations of 1989 and Poland's accession to the European Union played the key role. The spatial and functional changes associated with land-use allocation in the analyzed town revealed the greatest decrease in the proportion of vacant land as a result of progressing urbanization. The urban fabric of Ostróda was characterized by a succession of functions, where selected functions were replaced with other functions to cater to the town's burgeoning needs. The development of built-up and urbanized areas (mostly residential) is constrained mainly by natural barriers (water bodies, marshes, protected areas).

The results of this study and the existing planning documents suggest that only a small proportion of undeveloped land in Ostróda will be developed in the future. Most undeveloped land in the town does not constitute a land reserve for future development projects.

The obtained results constitute empirical confirmation of the observed phenomena, which confirms the validity of the adopted methodology. The proposed methodology can be used to improve land management in urban areas and can be implemented in other spatial units, including small and medium-sized towns, large cities, urban districts, and rural areas.

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