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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.
The primary aim of the journal and its mission are to spread information and guidance relevant both for authorities responsible for the effective land administration (local, regional and central), scientists and teachers.

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EFFECTS OF LAND CONSOLIDATION IN SOUTHERN POLAND

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ABSTRACT

Motives: The fragmentation of land and the distribution of plots in rural areas negatively affects the profitability and efficiency of agricultural production. Land consolidation is an activity that facilitates the improvement of the spatial structure and at the same time contributes to the sustainable development of rural areas. European Union (EU) funding helps to improve, among others the area structure of agricultural land in the EU countries.
Aim: From these premises, the purpose of the work results, which is the assessment of the effects of the performed consolidation of land with EU funding. The detailed analysis covered 16 precincts from the Podkarpackie voivodeship and 3 precincts from the Świętokrzyskie voivodeship. The assessment of the consolidation of land was made in 19 consolidated objects in the years 2007-2020. In practice, there is a problem of how to demonstrate the effects of land consolidation? This article proposes to present the four most important effects of land consolidation in the form of the following coefficients: W_1 (coefficient of reducing the number of plots as a result of consolidation), W_2 (coefficient of increasing the average plot area in the consolidation facility), W_3 (coefficient of reducing the number of plots in an individual farm as a result of consolidation), W_4 (index of road network density in merged area) are a reliable image of the results of the land consolidation performed in the studied area.
Results: The results were obtained. Index W_1 in the examined objects indicated the result of 34.0% for the Podkarpackie voivodeship, and 28.8% for the Świętokrzyskie. Index W_2 in the Podkarpackie voivodeship is 27.0%, and in the Świętokrzyskie it is higher and amounts to 29.7%. Index W_3 which amounts to 39.4% of the average number of plots in a farm in the Podkarpackie voivodeship and much higher, amounting to 46.6% in the Świętokrzyskie. Index W_4 for the Podkarpackie voivodeship is + 14.7%. However, for the Świętokrzyskie it is only + 3.7%. Summing up, the study analyzed four indicators showing the effects of land consolidation in southern Poland. The results obtained for these two voivodeships were similar. However, unsatisfactory in terms of the effects of land consolidation.

Keywords: effects of land consolidation, land fragmentation, agricultural area, cadastral plots, Poland

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INTRODUCTION

The consolidation of land is a surveying work, as a result of which there is a change in the object (objects) of property rights. The merger is a complicated procedure, because unlike the division of real estate or the delimitation of real estate, in most cases it concerns several dozen entities, and sometimes even several hundred or several thousand. For this reason, the legal regulation of this process must on the one hand be very precise, as well as anticipate almost all possible situations that may arise, and on the other hand, flexible enough to prevent attempts to paralyze it [Kwartnik-Pruc & Trembecka, 2019].

LITERATURE REVIEW

Almost 100 years of development of land consolidation that took place in Poland shows the multi-criteria nature of this procedure. EU funding helps to improve, among others the area structure of agricultural land in the European Union (EU) countries [Pawlikowska et al., 2017; Bieda, et al., 2014]. Agricultural area in the EU countries covers most of the land of the whole country [Klimach et al., 2020].

Figure 1 shows the agricultural area in individual EU countries. The agricultural area is the area that may be included in land consolidation works. Poland takes 9th place out of 27 EU member states, where 1st place is the largest percentage of agricultural area in relation to the country's area. Additionally, the very large fragmentation of the agricultural area in Poland makes us one of the leading countries that urgently need land consolidation [Stręk & Noga, 2019; Janus & Taszakowski, 2018; Noga et al., 2017; Balawejder & Leń, 2016]. The problem of excessive fragmentation of land concerns, among others: Bulgaria [Di Falco et al., 2010; Moteva, 2020], Cyprus [Demetriou, 2018], Czech Republic [Sklenicka, 2016], Estonia [Jürgenson, 2016], Finland [Vitikainen, 2014], Hungary [Cegielska et al., 2018], Latvia [Jankava et al., 2014], Lithuania [Pašakarnis & Maliene, 2010], Slovakia [Muchová & Petrovic, 2019], Spain [Crecente et al., 2002], The Netherlands [Louwsma et al., 2020; Stańczuk-Gałwiaczek et al., 2018].

According to the research conducted by the FAO, the results of which are presented in Figure 2, we can see the level of fragmentation of land and agricultural land. Poland is in the medium height group. We managed to leave the high group thanks to the mergers and exchanges of land with EU funding under the programs: Sectoral Operational Program (SOP) and Rural Development Program (RDP).

Figure 3 shows the status of the introduction of land consolidation instruments. Poland has the status of an ongoing land consolidation program. This

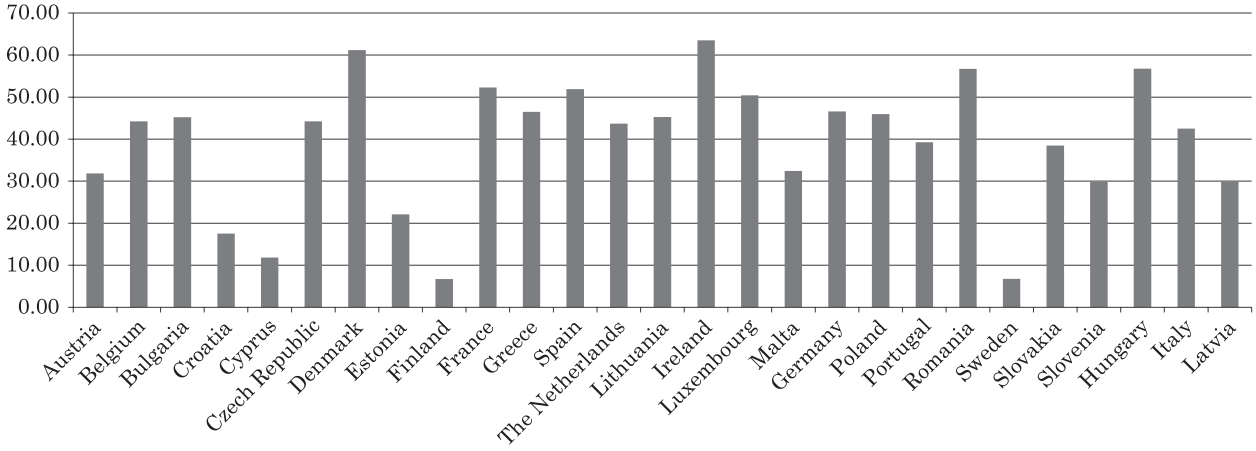

Fig. 1. Agricultural areas in individual EU countries
Source: own research based on data from FAO Estimate, 2016 [http://www.fao.org/countryprofiles/index/en/?lang =en&iso3=POL, date: 20.02.2021].

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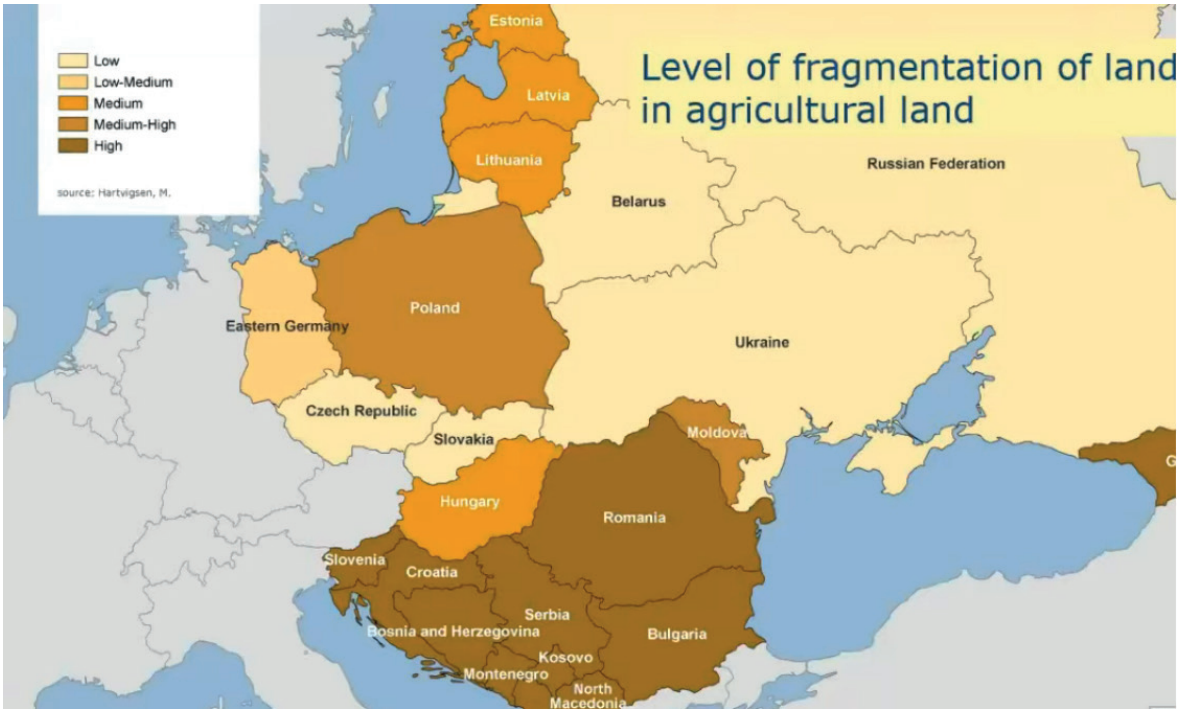

Fig. 2. Level of fragmentation of land and agricultural land
Source: Veršinskas et. al., 2020.

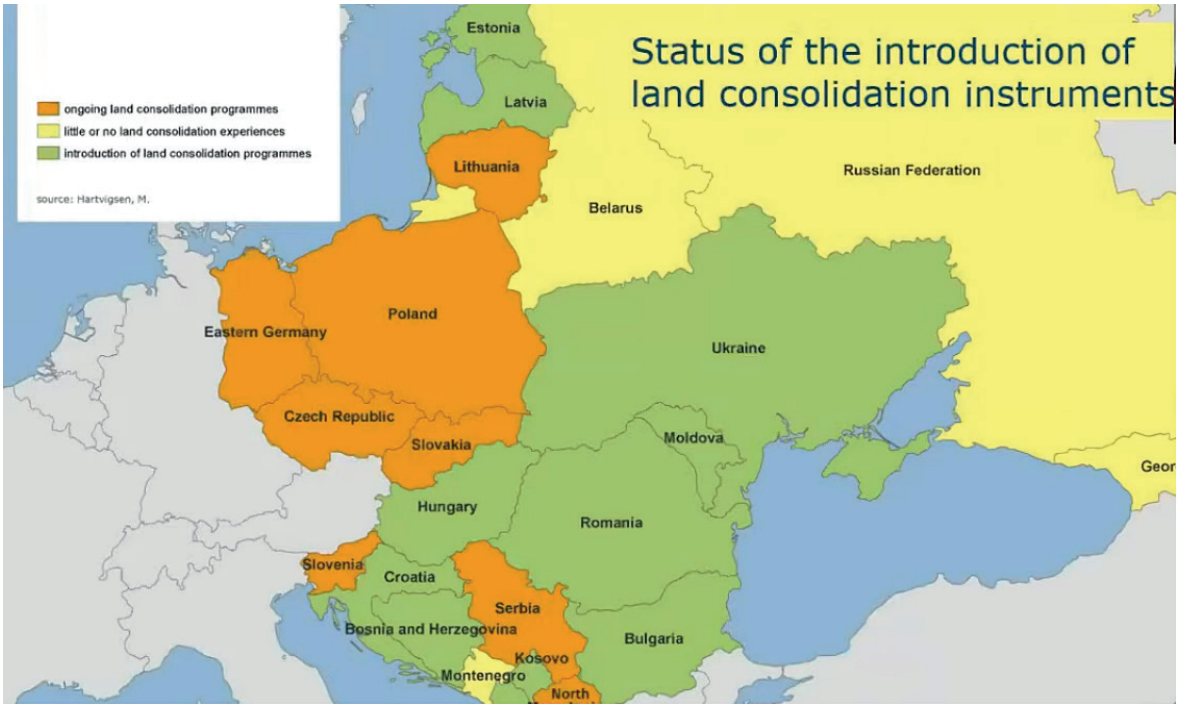

Fig. 3. Status of the introduction of land consolidation instruments
Source: Hartvigsen, 2015.

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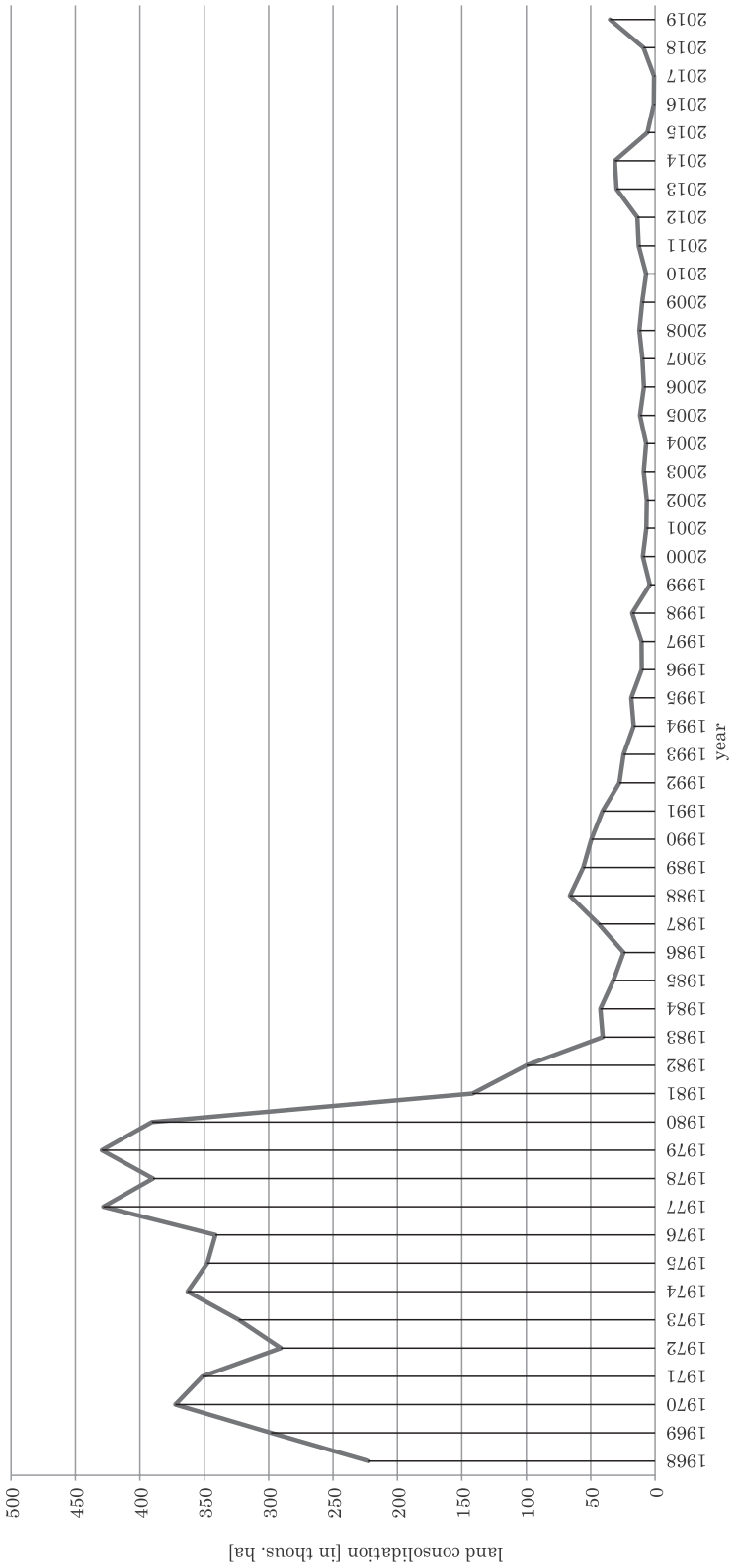

Fig. 4. Scope of land consolidation in Poland in 1968–2019
Source: own research based on data from MRiRW.

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is related to the EU programs SOP and RDP, which have been implemented in Poland since 2004 until now, based on the Act on the consolidation of land [Act, 1982]. In Poland, land consolidation has been carried out for almost 100 years, introduced by the Act on land consolidation in 1923 [Act, 1923].

As shown in Figure 4, most land consolidation was carried out in the 1970s. Later, the area of land merged decreased and increased slightly in the years 2013–2014 at the end of the RDP 2007–2013 program and in 2019, the RDP 2014–2020 program. Until now, only 19% of the administrative area of Poland has been consolidated in Poland. According to Woch, Janus, Syp and Miklewski [2018], the demand for consolidation works is very high. The greatest demand for over 50% of the area of communes occurs in south-eastern Poland [Basista & Balawejder, 2020; Basista, 2020], including in the Podkarpackie voivodeship [Balawejder & Noga, 2016].

These premises result in the purpose of the work, which is the assessment of the effects of the consolidation of land with EU funding under the RDP program. The scope of the research covered two adjoining voivodeships: Podkarpackie and Świętokrzyskie. According to the distribution of EU funds, the Podkarpackie voivodeship receives much more of them than the Świętokrzyskie voivodeship. Therefore, a detailed analysis covered 16 precincts from the Podkarpackie voivodeship and 3 precincts from the Świętokrzyskie voivodeship. The assessment of the performed land consolidation was made in 19 consolidated objects in the years 2007–2020. In practice, there is a problem of how to demonstrate the effects of land consolidation? This article proposes to present the four most important effects of land consolidation in the form of the following coefficients: W_1, W_2, W_3, W_4 are a reliable image of the results of the land consolidation performed in the studied area. The study analyzed four indicators showing the effects of land consolidation, which is extremely important for the improvement of the area structure of farms and the rational formation of land configuration.

RESEARCH OBJECT

The subject of the research are towns situated in Poland, belonging to the Podkarpackie and Świętokrzyskie voivodeships. The Podkarpackie voivodeship covers an area of 1,784,576 ha and covers 5.71% of the country's territory. On the other hand, the Świętokrzyskie voivodeship covers an area of 1,171,050 ha, occupying 3.74% of the territory of Poland. In terms of the number of inhabitants, the Podkarpackie voivodeship (119 inhabitants/km^2) ranks 9th in Poland. It is the southernmost voivodeship of Poland, which is graphically presented in Figure 5. The Podkarpackie voivodeship is divided into 21 districts and 4 cities with district rights.

On the other hand, the Świętokrzyskie voivodeship is inhabited by about 1.23 million people, which gives a population density of 106 inhabitants/km^2.

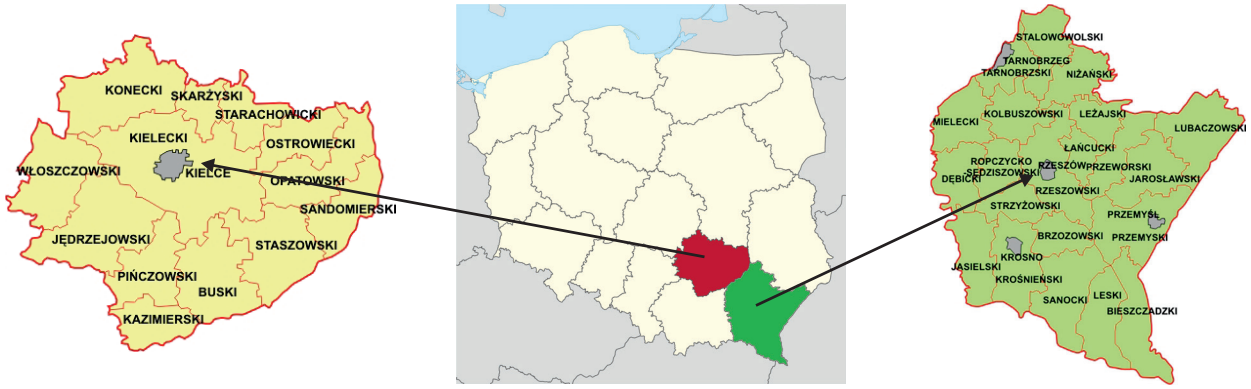

Fig. 5. Research object – Świętokrzyskie voivodeship (left) Podkarpackie voivodeship (right)
Source: own research based on data from https://osp.org.pl, date: 20.02.2021.

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Table 1. Summary for Poland with the division into the voivodeships discussed

Research area	Surface		Agricultural land		Private land		Population
	ha	%	ha	%	ha	%	inhabitants/km^2
Podkarpackie voivodeship	1784576	5.7	971434	54.4	984509	55.2	119
Świętokrzyskie voivodeship	1171050	3.7	764669	65.3	813459	69.5	106
Poland	31270627	100.0	19177780	100.0	18181348	100.0	123

Source: own research based on data from the EGiB, as of January 1, 2021.

The voivodeship consists of 13 districts and one city with the district status of Kielce.

As shown in Table 1, in the Podkarpackie voivodeship, agricultural land that may be subject to consolidation covers 54.4% of the area of the Podkarpackie voivodeship. On the other hand, agricultural land in the Świętokrzyskie voivodeship covers 65.3% of the voivodeship's area. If we analyze the potential participants of consolidation, the land of natural persons in the Podkarpackie voivodeship covers 55.2% of the land area of the entire voivodeship. On the other hand, the land of natural persons in the Świętokrzyskie voivodeship is as much as 69.5% of the voivodeship's area.

Land consolidation under SOP in 2004–2006

EUR 17,000,000 was allocated to land consolidation under the SOP in 2004–2006, while EUR 4,191,946 was allocated to land consolidation in the Podkarpackie voivodeship [SOP, 2004]. Comparing the number of submitted applications and the number of concluded contracts – the Podkarpackie voivodeship was second in the country. On the other hand, no land consolidation was performed in the Świętokrzyskie voivodeship. The first EU program that was used is the implementation of consolidation projects under the SOP "Restructuring and Modernization of the Food Sector and Rural Development in 2004–2006" [Regulation, 2004]. This project has been implemented. In 2007, with the completion date of the EU project, the first three mergers from three districts (Przeworski, Jarosławski, Mielecki) of the Podkarpackie voivodeship were completed, including the precincts: Krzeczowice (783 ha), Hawłowice (812 ha), Padew Narodowa (1,853 ha) with a total area of 3,452 ha.

Land consolidation under RDP in 2007–2013

As part of the Rural Development Program (RDP) for 2007–2013, the allocation of EU funds for the consolidation of land with post-merger management was adopted [RDP, 2007]. The RDP 2007–2013 regulation specified the maximum rates that may be allocated to 1 ha of the development of a land consolidation project together with post-merger management [Regulation, 2008]. For the Podkarpackie and Świętokrzyskie voivodeships, it was the amount of 1,400 EUR/ha. The cost of developing a land consolidation project for the above-mentioned voivodeships has been increased because they are characterized by a large patchwork of land as well as particularly difficult topographic conditions.

In total, the area of land consolidation in Poland was 92,704 ha, which is presented in detail in the analyzed voivodeships in Table 2. The entire country, which includes 16 voivodeships, was allocated an amount of EUR 160,000,000 for land consolidation under RDP 2007–2013. The merged areas in the Podkarpackie voivodeship covered the area of 13,422 ha, while the

Table 2. Area of land consolidation implemented in 2007–2013

Research area	Area of land consolidation implemented in 2007–2013	
	[ha]	[%]
Podkarpackie voivodeship	13,422	14.5
Świętokrzyskie voivodeship	1,321	1.4
Poland	92,704	100.0

Source: own research.

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areas of the Świętokrzyskie voivodeship only 1,321 ha. Therefore, the Podkarpackie voivodeship ranks third in terms of its share in the total area of consolidation in Poland in 2007–2013, occupying 14.5%. On the other hand, the Świętokrzyskie voivodeship together with the Opolskie voivodeship took the penultimate place, receiving a 1.4% share in the total area of land consolidation in Poland in 2007–2013. It is worth emphasizing that four voivodeships did not receive any EU funds for land consolidation.

Land consolidation selected for research under RDP in the Podkarpackie and Świętokrzyskie voivodeships

Therefore, as it results from the distribution of EU funds on a national scale, Table 3 presents the completed land consolidation selected for research under RDP in the Podkarpackie and Świętokrzyskie voivodeships. The Podkarpackie voivodeship receives much more funds from the EU than the Świętokrzyskie voivodeship. Therefore, a detailed analysis covered 16 precincts from the Podkarpackie and 3 precincts from the Świętokrzyskie. The assessment of the performed land consolidation was made in 19 consolidated objects in the years 2007–2020. The analysis covered 12,232.18 ha from the Podkarpackie and 2,680.00 ha from the Świętokrzyskie. The research covered a total of 36,565 registration plots. Mergers and exchanges of land in 19 localities were carried out with the participation of 11,014 participants of the consolidation (9,818 participants from the Podkarpackie voivodeship and 1,196 from the Świętokrzyskie voivodeship).

MATERIALS AND METHODS

In order to show the results of the performed land consolidation the effects are presented in the form of coefficients presented in the formulas below. The following coefficients were developed by Authors: Noga, Balawejder and Matkowska [Noga et al., 2018]. Based on the total number of plots on the site before and after land consolidation, the percentage reduction factor in the number of plots as a result of land consolidation W_1 (1) was calculated:

$$W_1 = \frac{L_A - L_B}{L_A} \cdot 100\% \quad (1)$$

where:

L_A – total number of plots in the research facility before consolidation;

L_B – total number of plots in the research facility after consolidation.

Based on the average plot area on the site before and after land consolidation, the percentage coefficient of increasing the average plot area in the site covered by land consolidation W_2 (2) was calculated:

$$W_2 = \frac{D_B - D_A}{D_B} \cdot 100\% \quad (2)$$

where:

D_A – average plot area in the research facility before consolidation;

D_B – average plot area in the research facility after consolidation.

Based on the average number of plots in an individual farm before and after the consolidation, the percentage coefficient of reducing the number of plots in an individual farm was calculated as a result of consolidation W_3 (3):

$$W_3 = \frac{S_A - S_B}{S_A} \cdot 100\% \quad (3)$$

where:

S_A – average number of plots on an individual farm in a research facility before consolidation;

S_B – average number of plots on an individual farm in a research facility after consolidation.

Based on the length of roads and the area of agricultural land in the facility before consolidation, the density of the road network in the G_1 facility was calculated (4):

$$G_1 = \frac{\text{dł. A\_[km]}}{100 \cdot \text{GR\_[ha]}} \quad (4)$$

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where:

dł. A – length of roads measured in kilometers at the test facility before consolidation;

GR – area of agricultural land in [ha].

Based on the length of roads and the area of agricultural land in the facility after consolidation, the density of the road network in the G_2 facility was calculated (5):

$$G_2 = \frac{\text{dł. B\_[km]}}{100 \cdot \text{GR\_[ha]}} \quad (5)$$

where:

dł. B – length of roads measured in kilometers at the test facility after consolidation;

GR – area of agricultural land in [ha].

Based on the density of the road network in the G_1 facility and the road network density in the G_2 facility, the percentage index of the road network density in the W_4 consolidation area was calculated (6):

$$W_4 = \frac{G_2 - G_1}{G_2} \cdot 100\% \quad (6)$$

where:

G_1 – road network density in the research facility before consolidation;

G_2 – road network density in the research facility after consolidation.

The effects presented in the form of coefficients W_1, W_2, W_3, W_4 are a reliable picture of the results of the performed land consolidation [Noga et al., 2018].

RESULTS

The effects of land consolidation is presented in Table 3. The table shows the results of calculating the W_1, W_2, W_3, W_4 coefficients for selected precincts merged under the RDP in 2007–2020 in the Podkarpackie and Świętokrzyskie voivodeships. The detailed analysis covered 16 precincts from the Podkarpackie voivodeship and 3 precincts from the Świętokrzyskie voivodeship. The evaluation of the performed consolidation of land was made in 19 merged objects.

In Table 3, we observe that for land consolidation, 87.3% of the land area of the studied precincts in the Podkarpackie voivodeship and 90.7% of the land area of the studied districts in the Świętokrzyskie voivodeship were assumed. This is due to the fact that the land of the State Forests (PGL) was excluded from consolidation. The coefficient of reducing the number of registration plots (W_1) as a result of consolidation is 34.0% for the Podkarpackie voivodeship, and 28.8% for the Świętokrzyskie. In both cases, it is lower than the rate for Poland, which is 39.3% [Satańczuk-Gałwiaczek, 2017]. The W_1 coefficient is very diverse. It ranges from 10.6% in the village of Tarnogóra, up to 46.3% in the village of Roźwienica, which is graphically presented in Figure 6. On the other hand, the coefficient of increasing the average area of the land plot W_2 in the Podkarpackie voivodeship is 27.0%, and in the Świętokrzyskie it is higher and amounts to 29.7%. The W_2 coefficient is also diversified and ranges from 10.3% in the village of Tarnogóra, to 44.9% in the village of Rudołowice. Detailed values are presented in Table 3 and Figure 6.

Subsequently, calculations were made of another coefficient of reducing the number of plots in an individual farm as a result of consolidation W_3, which is 39.4% of the average number of plots in a farm in the Podkarpackie voivodeship and much higher, amounting to 46.6% in the Świętokrzyskie voivodeship. The calculated W_3 index is very diverse in the examined localities. In Pantalowice, the decrease in the number of plots of land is 20.1%, while in the village of Słupia it is 63.3%, as shown graphically in Figure 6. As shown in Table 3 and Figure 6, the density of the road network before consolidation was 5.13 km/100 ha of GR in the Podkarpackie voivodeship, while in Świętokrzyskie it was only 2.18 km/100 ha of GR. However, the density of the road network before the consolidation is very diverse and ranges from 2.25 km/100 ha of GR in the village of Rozbórz Okrągły, to 9.39 km/100 ha of GR in the village of Hucisko. Subsequently, after consolidation, the road network density was calculated, which is 6.01 km/100 ha of GR in the Podkarpackie voivodeship, while in Świętokrzyskie it was only 2.33 km/100 ha of GR. Detailed road network densities in individual towns after consolidation are presented in Table 3 and Figure 6. In the Podkarpackie voivodeship, the

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Table 3. Effects of consolidation of land in selected localities of the Podkarpackie and Świętokrzyskie voivodeships

Research area	Land consolidation in the village		Number of plots in the village			Average plot area in the village			Average number of plots in an individual farm			Road network density		
			before land consolidation	after land consolidation	W_1	before land consolidation	after land consolidation	W_2	before land consolidation	after land consolidation	W_3	G_1	G_2	W_4
												before	after	
	ha	%	number	number	%	number	number	%	number	number	%	km/100 haGR	km/100 haGR	%
Podkarpackie voivodeship														
Hłudno	1,224.7	96.8	5,284	3,368	36.3	0.24	0.38	36.3	21	11	47.6	6.82	9.3	26.7
Bystrowice	455.56	100	1,147	724	36.9	0.4	0.63	36.4	4.2	2.1	51	4.78	4.78	0
Tyniowice	321.22	100	771	487	36.8	0.42	0.66	36.3	4.2	2.1	51	5.84	5.84	0
Więckowice	297.51	100	594	381	35.9	0.5	0.78	36	4.2	2.1	51	6.36	6.36	0
Roźwienica	621.43	71.6	1,307	702	46.3	0.66	0.89	25.4	2.7	1.7	35.3	6.37	8.26	22.8
Rudołowice	871.1	100	2,727	1,500	45	0.32	0.58	44.9	2.7	1.7	35.3	5.92	7.1	16.7
Rozbórz Okrągły	377.44	100	1,005	740	26.4	0.38	0.51	26.4	2.7	2.4	11.1	2.25	2.69	16.1
Hucisko	438.37	96.2	2,355	1,563	33.6	0.19	0.28	32.1	11.5	8.3	27.8	9.39	9.11	-3.1
Tarnogóra	660.76	46.8	1,881	1,682	10.6	0.35	0.39	10.3	6.9	3.8	44.9	4.1	7.23	43.2
Domacyny	276.48	100	637	489	23.2	0.43	0.57	26.4	3.3	2.6	21.2	2.9	3.45	15.9
Pantalowice	1,142.85	100	3,433	2,283	33.5	0.33	0.5	34	3.5	2.8	20.1	4.08	4.08	0
Łopuszka Mała	330.74	100	1,028	729	29.1	0.33	0.46	28.3	4.7	3.1	34	4.01	3.81	-5.1
Żuklin	454.22	100	1,322	820	38	0.34	0.55	38.2	5	3	40	3.94	4.41	10.5
Rożniatów	510.12	89.1	1,369	879	35.8	0.41	0.65	36.9	5.8	2.3	60.3	4.67	3.9	-19.9
Pełnatycze	533.89	94.7	1,254	851	32.1	0.45	0.67	32.9	6	3.7	38.3	6.18	4.76	-29.9
Harta	2,157	84	7,715	5,144	33.3	0.33	0.42	21.3	9	6	33.3	4.52	6.69	32.4
Overall	10,673.39	87.3	33,829	22,342	34	0.35	0.48	27	8.3	5	39.4	5.13	6.01	14.7
Świętokrzyskie voivodeship														
Słupia	1,260	87.44	1,523	1,021	33	0.83	1.25	33.9	6	2.2	63.3	3.74	3.85	3
Wielkopole	130	100	211	167	20.9	0.62	0.78	21.3	5	2.8	44	0.52	0.49	-4.9
Raszków	940	84.76	1,002	675	32.6	0.94	1.42	33.9	4	2.7	32.5	2.3	2.65	13.1
Overall	2,330	90.73	2,736	1,863	28.8	0.79	1.15	29.7	5	2.6	46.6	2.18	2.33	3.7

Source: own research.

lowest road network density in Rozbórz Okrągły is 2.69 km/100 ha GR. On the other hand, the largest one is in Hłudno, amounts to 9.30 km/100 ha of GR. In the Świętokrzyskie voivodeship, the road network density after consolidation is the lowest in Wielopol, it is 0.49 km/100 ha of GR. On the other hand, the largest one is in Słupie, it is 3.85 km/100 ha of GR, but it is 5.45 km /100 ha of GR lower than the highest in the Podkarpackie. To illustrate the road network density in detail, the percentage of the road network was calculated, as shown in Table 3 and Figure 6.

Overall, the road network indicator for the Podkarpackie voivodeship is +14.7%. However, for the Świętokrzyskie voivodeship it is only +3.7%. However, the road network index varies considerably in individual villages. It ranges from +32.4% in the village of Harta, to -29.9% in the village of Pełnatycze, where the density of the road network has decreased.

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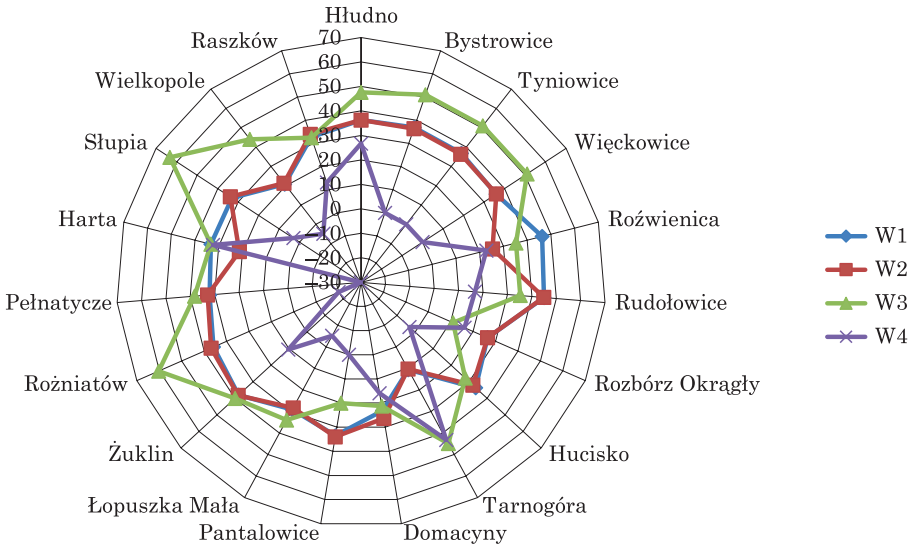

Fig. 6. Effects presented in the form of coefficients W_1, W_2, W_3, W_4 for consolidation of land in selected localities of the Podkarpackie and Świętokrzyskie voivodeships
Source: own research.

In villages where the road network index is negative, we observe the phenomenon of liquidation of unnecessary roads, which made it difficult for farmers to manage rationally. These are villages where the average area of an individual farm is about 3 ha. In the villages of Bystrowice, Tyniowice, Więckowice and Pantalowice, the indicator is 0%, which means that the density of the road network has not changed as a result of consolidation.

CONCLUSIONS

In this study, two adjacent voivodeships in Poland were compared: Podkarpackie and Świętokrzyskie. The analyzes were carried out for 19 villages covered by land consolidation with EU funding. The evaluation of the consolidation of land was made in the merged precincts in the years 2007–2020. For each of these objects in the state before and after consolidation, four indicators were calculated showing the effects of land consolidation. As part of this study, the following conclusions were obtained:

1. Index W_1 – the coefficient of reducing the number of plots as a result of consolidation in the examined objects indicated the result of 34.0% for the Podkarpackie voivodeship, and 28.8% for the Świętokrzyskie. In both cases, it is lower than the rate for Poland. This proves that in the analyzed voivodeships there is a very high fragmentation and many participants of land consolidation. It is very difficult to carry out consolidation and exchange of land with a large number of participants of consolidation and high fragmentation. In addition, a very unfavorable ribbon system does not facilitate this work [Balawejder, 2010a; Balawejder, 2010b].

2. Index W_2 – the coefficient of increasing the average plot area in the consolidation facility in the Podkarpackie voivodeship is 27.0%, and in the Świętokrzyskie voivodeship it is higher and amounts to 29.7%. Unfortunately, this is only a quarter of the possibilities. Such a low coefficient is not favorable for farming in the Podkarpackie and Świętokrzyskie voivodeships. Nowadays, in rural areas, min. therefore, the share of agricultural production is decreasing. The structure of registration plots limits the possibilities of developing various functions in rural areas [Delnicki et al., 2019].

3. Index W_3 – the coefficient of reducing the number of plots in an individual farm as a result of consolidation, which amounts to 39.4% of the aver-

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age number of plots in a farm in the Podkarpackie voivodeship and much higher, amounting to 46.6% in the Świętokrzyskie. This is half the full potential. In order to achieve better effects of land consolidation, i.e. to reduce the number of plots with a simultaneous increase in their area, additional criteria should be introduced. It would depend on them to grant EU financial aid, such as the factor of increasing the area of plots or reducing the number of registration plots.

4. Index W_4 – road network density indicator in the total area of the consolidated area for the Podkarpackie voivodeship, the road network indicator is +14.7%. However, for the Świętokrzyskie it is only +3.7%. This is a very low rate. In villages where the road network index is negative, we observe the phenomenon of liquidation of unnecessary roads, which made it difficult for farmers to manage rationally. These are villages where the average area of an individual farm is about 3 ha. It is disturbing that in some villages the indicator is 0%, so the density of the road network has not changed as a result of land consolidation. On the other hand, this indicator is often mentioned by communes as the most important consolidation effect. A very important of land consolidation effect is post-merger management, including the arrangement and modernization of "agricultural transport roads", which provide access to each registration plot and access roads to individual farm habitats. Perhaps on the legal basis, it is worth defining the basic technical parameters and standards for the construction and modernization of "agricultural transport roads" and include the existing municipal roads for post-merger development and simplify the provisions on construction works (culverts, road exits, etc.) in the land consolidation project.

Summing up, when comparing the effects of land consolidation in two voivodeships, attention should be paid to the preparation and selection of data for analysis. The study analyzed four indicators showing the effects of land consolidation. The results obtained for these two voivodeships were similar. However, unsatisfactory. Therefore, the question arises whether the hierarchy of performing land consolidation should not be carried out before submitting applications for co-financing of land consolidation by the EU. According to Balawejder and Leń [2016] or Stręk and Noga [2019] or Mika, Leń, Oleniacz and Kurowska [2019], prior to the land consolidation project, prioritization of the needs of land consolidation should be performed, divided into counties and municipalities, which can be used for objectively distributing financial assistance resources. This should be done because the money for co-financing land consolidation projects co-financed from the EU is not enough for all villages requiring land consolidation. According to Hartvigsen [2015], Poland has the status of an ongoing land consolidation program. This is related to the EU programs that have been implemented in Poland since 2004 until now, but there is still not enough land covered by land consolidation. It should be remembered that the greater the awareness of the inhabitants of villages selected for consolidation, the better the effect of land consolidation. It is noticeable that the level of knowledge of merge participants is related to the level of satisfaction with the mergers and post-merger management. Perhaps it is worth developing and implementing a training methodology in order to increase the knowledge of merger participants in the field of merging and replacement of land and post-merger management.

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SUSTAINABILITY OF URBANIZATION PROCESSES IN THE DIGITAL ENVIRONMENT: FOOD SECURITY FACTORS

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ABSTRACT

Motives: The article examines the potential of the digital environment in the sustainable supply of fresh food to the big city. Urbanization is a difficult process to manage, and adapting it to the demands of sustainable development requires the search for the new opportunities and ways. In this context, it is highly probable to use the opportunities provided by the digital environment through the Internet, digital technologies and devices, or other digital means. The place and role of ensuring food security in cities and the sustainability of urbanization processes have been little studied.
Aim: It is expedient to assess the role of the suburban zone and the zone of transportation of these products to the city in the provision of large cities with fresh food products in terms of sustainable development of urbanization zones.
Results: Research and calculations conducted on the example of the Baku agglomeration (Azerbaijan) have provided an opportunity to comment on the impact of food security factors on the sustainability of urbanization processes in the digital environment. To determine the changes in the transportation zone of fresh milk to this agglomeration, we calculated the proposed "weighted average distance of transportation" indicator. It was revealed that the formation of the digital environment in the agricultural production busines entities is faster in the areas located closer to the Baku agglomeration.

Keywords: urbanization, sustainability, food security, digital environment, Baku agglomeration

INTRODUCTION

The observed undesirable pace of intensification of urbanization processes increases the focus on its sustainability. Digitalization primarily affects the life of big cities [van Winden & de Carvalio, 2017; Kotsanis, 2018; Akindès & Yao, 2019]. In some countries, there is a rapid pace of digitalization in rural areas [Koolhaas, 2020]. This is especially desirable in light of the growing role of food security in sustainable urbanism. However, it is necessary to pay attention to the role of digitalization in the sustainability of urbanization processes.

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That the level of economic activity and activity integration is increasing both in the digital environment and in urban areas with a large urban center and intensive urbanization processes.

The sustainability of urbanization processes is directly related to the quality of life. It is particularly important to identify possible opportunities for the sustainability of these processes in the digital environment. To this end, first of all, it is necessary to assess all the main manifestations of urbanization. Food security factors for the sustainability of urbanization processes in the digital environment have been little studied [Hualin et al., 2021]. However, food security is a factor that has a determining influence on the sustainability of urbanization processes [Maitra & Rao, 2015].

Background

Sustainability of urbanization processes and sustainable development of big cities

The numerous manifestations of urbanization include, first of all, the concentration of the population in cities, the growing role of cities in all spheres of human life, the concentration of productive forces on an industrial basis, the complexity of functions in the settlement network and the integration of activities. Urbanization, despite all its contradictions, is a cost-effective option for the organization of the regional environment. For this and other reasons, urbanization, changes in urban and regional systems, as well as the issues of regional integration shall be examined collectively [Shen, 2018]. In order to assess the economic feasibility of sustainable development of urbanization processes in the digital environment, we believe that the following indicators can be used: agglomeration effect; minimization of displacements as a special case, side effects of co-financing; allocation effect.

Sustainable development must lead to a transition to a new level of quality in economic growth, inclusive society and the environment, with a concerted joint effort to build an inclusive, sustainable and secure future that will not be a problem for future generations. With regard to the sustainable urbanism, this means that the process of population concentration in cities is accompanied by sustainable urban development. The growing role of cities in all spheres of human life, the concentration of productive forces on an industrial basis, the complexity of functions in the network of settlements and the integration of activities – all this meets the basic requirements of indicators of sustainability.

Sustainability of urbanization processes and, as a result, sustainable urbanism can be achieved, first of all, due to the necessary level of living standards and quality indicators. The required level of these indicators is achieved at an acceptable level of human health indicators. In this context, the urban health initiatives should also contribute to the collection and structuring of necessary data [Urban Health Initiative, 2019]. In other words, this initiative contributes to the introduction of digital technologies in urbanization. Sustainable urbanism is notable for its ability to address the environmental impacts of urban development and meet the demand for the resources entirely at the local level [Douglas, 2007].

The management by sustainability criteria of urbanization processes, which take place in an uncertain environment and require the development of very complex mechanisms, increases the demand for joint action [Frantzeskaki et al., 2014, p. 415–416]. This kind of management may affect the interests of everyone in urbanization zones. Therefore, there is an objective demand for innovative approaches that would provide for direct participation of everyone with new ideas to solve the relevant urban problems [Galuszka, 2018]. Advantages of the digital environment expand the scope of perspective search for new forms of common efforts and active involvement to ensure the sustainability of urbanization processes. The inclusion of the urban population in innovative environmental experiments with professionals plays a practical role in promoting joint action for sustainable development [Nesti, 2017, p. 322].

At the same time, it should be noted that the environmental priorities of the sustainability of urbanization processes, no matter how important, can

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not always exceed its economic and social aspects. Otherwise, the environmental impact of job creation due to the economic attractiveness and integration of activities that shape urbanization processes may be overlooked. The relationship between the urban and knowledge economy, the use of the potential of the knowledge economy in cities, the study of the role of universities in this work is a manifestation of the growing attention to knowledge in the sustainability of urbanization processes [May & Perry, 2017].

The use of knowledge in urban management is more effective if it is introduced with the participation of all stakeholders. "The involvement of different players in knowledge co-production thus provides an opportunity for the City Management to leverage on this to enhance governance systems and have a greater impact from its interventions" [Onyango et al., 2021, p. 31]. The development of smart cities and sustainable urbanization take the priorities of the knowledge policy into account [de Hoop et al., 2018, pp. 33–52].

To determine the sustainability of urbanization processes, it is necessary to study the diversity of economic, social and environmental characteristics of rapid urban growth in the digital environment. In order to be ready in reality to choose the best option, research can be carried out mainly on the basis of digital technologies to identify opportunities for the sustainability of urbanization processes. In this regard, it is difficult to disagree with the position stated in the following source.

"Rapidly growing cities and towns are faced with a range of developmental choices that will shape their growth and long-term economic, social and environmental sustainability. Many of these are complex choices with differing short-term versus long-term cost and benefits. these choices are seldom determined by individual actors or agencies, but emerge out of the complex interplay of decisions made by a range of actors across national and local governments, investors and entrepreneurs in the private sector, and a range of local community and civil society voices" [Sustainable urbanization strategy UNDP's Support to sustainable, inclusive and resilient cities in the Developing World, 2016, p. 10].

It should be noted that situation with the inter-urban exchanges is becoming more objective than with the international ones. In other words, "globalization has resulted in both less regulation of industry and, in such areas as trade, investment, and intellectual property, more universal standards of regulation. As a result, location decisions depend less on the particular country and more on the comparative advantages of different cities" [Roberts & Kanaley, 2006, p. 17].

The issues of realization of technological opportunities in terms of supporting the sustainable development of the information society are on the agenda, especially in large cities and megacities. However, it is not appropriate to consider the sustainable development of a large city as an area of digitalization in isolation from the global context. The United Nations has added Goal 11 to its global goals for the sustainable development, "Ensuring the openness, security, resilience and environmental sustainability of cities and towns". In fact, this goal [Sustainable Development Goals], which aims to ensure sustainable urbanization until 2030, is aimed at improving the living standards and quality of life of the population by overcoming the consequences of the environmental crisis.

Research suggests that, from the point of view of sustainable development, the information society must constantly ensure that there is no alternative on the agenda for the joint solution of economic, social, technological and environmental problems, environmental regulation of technological development without exception, information security and preventive measures to improve it. Urbanization of the information society to achieve the goal of sustainable development [UN Azerbaijan. 2030 Agenda for Sustainable Development], which aims to ensure the openness, security, sustainability and environmental sustainability of large cities and other settlements as a residential environment issues of impact on the processes are relevant. In terms of supporting sustainable development, the technological capabilities of the information society, as is well known, are expanding through the integration of activities. The level of this integration is many times higher in large cities, which

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are an active economic zone, a primary testing ground for the formation of an information society and a material result of urbanization processes.

The information society is able to maintain an attentive and emotional approach of the population to socially significant problems in large cities and megalopolises, providing access to high-quality information. For this purpose, the information society, even in the absence of economic motives, "contributes to the transformation of information into public consciousness and its special type of public opinion, the existence of social institutions interested in this or that state of public opinion" [Braliev, 2008, p. 19] provides support.

At present, it can be said that it is necessary to reconsider the possibility of sustainable economic development of competitive economic activity in urban areas, as well as its adaptation to environmental requirements. In this regard, unfounded optimism about the potential contribution of the digital environment to the sustainability of urbanization processes is undesirable. It is no coincidence that the comparison gives some reason to say that the expectations of the information society in solving global environmental problems are higher than in the last century.

The cautious approach to the role that the digital environment will play in the sustainability of urbanization processes stems primarily from the existing inequality in the distribution of information resources and its increasing tendencies. This inequality is a serious problem that threatens the sustainable development of the digital economy. This growing inequality is hampering the narrowing of the gap between living standards in developed and developing countries. Such a situation, of course, does not meet the requirements of sustainable development. However, it can be agreed that the more we understand the vital importance of sustainable development, the more likely the trend towards increasing inequality will weaken [Picketti, 2016]. Moving towards the sustainability of urbanization processes, smart urban planning, as well as the urban planning through innovation and attention to the popular needs can bring the necessary benefits only through courageous and decisive action [Arsovski et al., 2018, p. 32].

Intensive urbanization and the digital environment

Observations show that both intensive urbanization and the technological habits of the digital environment, in some cases, oppose comprehensive intellectual development [Barykin et al., 2020]. In the initial approach, it can be said that in the digital environment, it is "scientific" to constantly follow what is technologically ahead. Such a situation is likely to lead to inertia of technological thinking and increase undesirable technological dependence. In the digital environment, cities are the primary testing ground for that "science". This is because the digital economy is developing in a centralized manner in cities, as shown in the following source. "Digital economies in a concentrated form are developing in cities where pressing problems can be very different: transport, environmental, deterioration of utilities, the need to move industrial production outside the city limits, or the development of an accessible environment for everyone, but they can only be solved in a complex" [Kupriyanovsky et al., 2016, p. 50].

In the near future, the scope of digitalization in urban areas is expected to expand faster. Such an expectation is due to the high rate of concentration of resources in the urban economy. At present, in terms of social criteria, it is difficult to unequivocally assess the economic consequences of the process of concentration of population and capital in large cities. This is due to the fact that the ecological crisis is becoming more and more noticeable in large cities. Therefore, when assessing the possibilities for sustainable development of a large city, environmental indicators come to the fore. However, under certain conditions, it would be wrong to ignore the following opinion. "To the extent that externalities such as pollution and congestion are not assessed in cities, the conurbations will be too large, but not much. Public concerns about the price of congested roads, as well as water and health investments to reduce the

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likelihood of an epidemic, are well founded. From this perspective, concerns about urban slums and substandard housing, which in themselves do not create any externalities, are less important" [Spens et al., 2009, p. 128].

Our research provides sufficient grounds to say that many changes in the geography of economic activity in the environment of intensive urbanization can be assessed in terms of the agglomeration effect [Balayev, 2007, p. 38].

The agglomeration effect as a complex factor of location is expressed in the fact that the coherent and compact placement of objects together is always more efficient than isolated and scattered placement. At the same time, it is believed that "agglomeration effects are considererd to attenuate with distance when a decreasing impact is orbained the further away the rings are from the location" [Behrens & Robert-Nicoud, 2014]. It is not difficult to see that the digital environment provides additional opportunities in terms of assessing the impact of the factor of distance from a large city on the agglomeration effect. The point is that the digital environment, being an environment formed by logical objects used to interpret other environments based on mathematical laws, expands the algorithmic and informational capabilities of quantitative assessment of different manifestations (types) of the agglomeration effect.

In the context of urbanization, it is more realistic to achieve economic benefits without digitalization. Digital technologies are expanding the possibilities for developing and implementing the necessary preventive measures in large cities. Creativity in the realization of these opportunities can provide a transition from the course of persistent imitation of the subject, which is considered advanced, to innovative modernization. Preliminary observations give grounds to say that digitalization has become a leading factor in ensuring harmony and efficiency in a day-to-day urban life and work.

The hypothesis that in the near future people will be mainly engaged in the production of materials and energy, as well as processing information to manage economic processes, does not provide sufficient grounds for optimism about the prospects for sustainable development. Since these are economically active areas, the amount of resources that need to be restored increases as the pace of development of cities and surrounding areas increases. Unfortunately, in many large cities around the world, these resources include the air we breathe.

Baku agglomeration

The urban agglomeration formed around the capital of Azerbaijan, Baku, was chosen as an object of study. Baku is the largest city in the Caucasus and this position is expected to remain unchanged in the near future. About 40% of the population of Azerbaijan and 70% of the available industrial potential are concentrated in the Baku agglomeration (Baku, Sumgait, Khirdalan and their environs), located on the Absheron Peninsula.

Historically, the urbanization process has been controversial in Azerbaijan [Zhongming et al., 2018]. In addition to boosting economic growth, this process has had a negative impact on the balanced regional development. The choice of Baku as a capital city was not because of the natural environment of the Absheron Peninsula, but due to its abundant oil and gas reserves and geographical location [Ashurbeyli, 1992]. Therefore, the urban development in Baku has always faced serious environmental problems. Absheron is an area with a negative balance of water resources.

Absheron is one of the oldest and largest regions in the world for oil production and processing. It was also the first in the world to host the industrial and offshore oil production. There are areas seriously polluted with oil. One billion tons of oil were produced in Absheron from the mid-19th century till the 1990s, when Azerbaijan regained its independence. Even a tenth of profits from the oil production has not been invested in the rehabilitation of oil-contaminated lands [Oil strategy, 2016]. Three state programs have been completed since Azerbaijan's independence to accelerate the socio-economic development of the country's regions, with the fourth one being

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in progress. A significant part of the oil-contaminated areas of the Absheron Peninsula has been cleared. This process is still underway [Guluyeva, 2020].

Attempts to regulate the urbanization processes in Azerbaijan have historically been limited to the monitoring of the situation. The first master plan of Baku developed back in 1897–1899 was aimed to serve this purpose. Baku has continued to expand over the past hundred years. The cities of Sumgayit and Khirdalan, which are part of the Baku agglomeration, were founded and developed in the 20th century. "There is now a master plan of Baku for 2020–2040. Sustainable development of the city is the first priority. Other priorities include the regeneration of the city and environment, the preservation of the city's architectural image and historical heritage, and the introduction of new elements" [General plan of Baku city 2040].

METHOD

Arthur Levis' model of economic development in the context of a labor surplus [Lewis, 1954] is relevant for oil-exporting countries. This issue is also being studied for Azerbaijan [Sadik-Zade, 2020a, pp. 51–98; Sadik-Zade, 2020b].

The object of research and the urbanization processes taking place here were observed to obtain data in the process of organizing the research. The issue of optimizing the structure of suburban agricultural production was considered to determine the role of food security factors in the sustainability of urbanization processes in the digital environment. The model presents a number of constraints based on characteristics resulting from the proximity to the city and the requirements of sustainable development. These conditions were checked in the contingent-regulatory database due to the difficulties in providing information [Balayev, 2007, pp. 262–265; Balayev et al., 2020, pp. 65–83].

The role of food security factors in the sustainability of urbanization processes in the digital environment needs to be reconsidered. In this regard, the issue of optimizing the structure of suburban agricultural production is relevant. Therefore, in the corresponding model, we will consider a number of conditions that take into account the peculiarities of proximity to the city and the requirements of sustainable development:

– on the use of the city's production resources (labor resources, technical means, etc.):

$$\sum_{j\in J_1} a_{ij}\, x_j + \sum_{j\in K_k} a_{ij}\cdot \sum_{k=1}^{3} x_k - x_i + \sum_{j\in J_2} a_{ij}\, x_j \le b_i$$

– on the use of urban food waste as fodder for livestock:

$$c_j x_j - x_j' = 0 \quad j \in J_2$$

$$\sum_{j\in J_2} v_j - x_{\mathrm{i}} - x_{ij} \le 0 \quad i \in I_2$$

$$d_j x_j' - x_{ij} \ge 0 \quad i \in J_3;\ j \in J_2$$

$$e_i x_j' - \sum x_i \le 0 \quad i \in J_2;\ j \in J_2$$

where,

j, J – is the index and abundance of suburban agricultural production, respectively. This set consists of the following non-intersecting subsets: J_1 – crop areas; J_2 – livestock areas;

K – is a set of agricultural products by purpose, consisting of the following non-intersecting subgroups: K_1 – personal consumption and industrial processing; K_2 – used as feed; K_3 – non-productive consumption of seeds and on-farm;

i, I – is the index and abundance of production resources, respectively. This set consists of the following non-intersecting sub-sets: I_1 – is the set of production resources (labor resources, technical means, etc.) involved in the city; I_2 – the majority of feed types; I_3 – the majority of types of food waste in the city.

Variable quantities:

x_j – intensity of development of j field;

x_i – the amount of production resources of the city involved;

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x_j ^' – total food needs of j area of livestock;
x_{ij} – is the quantity of optimal feed supplement of type i for area j of livestock.

Fixed quantities:

a_{ij} – special norms of resource consumption in agriculture. This does not include assembly and initial completion costs;
a_{ij} ^' – are special norms of resource consumption for harvesting and initial completion of agricultural products;
c_j – is the coefficient of feed unit demand per unit of livestock area j;
v_j – is the minimum specific weight of food waste per unit of feed ration per unit area j of livestock;
d_j – the difference between the maximum and minimum specific gravity of food waste in the feed ration per unit area of livestock j;
e_i – the difference between the total demand for feed (taken as a unit) and the sum of the minimum specific gravities of individual types of feed in the ration per unit area of livestock j;
b_i – is the amount of type i resource.

The model for optimizing the structure of suburban agricultural production was implemented in a system consisting of a number of simulation and optimal models of the agri-food sector in urbanization zones, sometimes, due to information difficulties, conditional and normative data were used. In a digital environment, especially in the context of rapid data generation, it is likely that the information issues under consideration will soon be resolved.

The Baku agglomeration has been offered the "average weighted distance of transportation" indicator (L) to monitor changes in the zone of transportation of fresh food products [Balayev, 2007, pp. 163–166]. In order to determine the changes in the zone of transportation of fresh milk to the Baku agglomeration, the indicator "average weight of transportation" was calculated on the basis of sales data for 1965–2019.

FINDINGS AND DISCUSSIONS

Manifestation of digitalization in big cities

Although radical steps are needed for sustainable development aimed at preventing the global environmental crisis, it is more realistic that this type of development can be achieved through evolution. In the modern world, the only way possible is to recommend countries to take many necessary steps to achieve the goals of the concept of sustainable development, including those related to climate change. However, it is already known that if the factor of climate change is ignored, the society will lose its achievements and will not be able to succeed even in the future.

The role of quantitative characteristics in the development of large cities as a condition and result of urbanization processes is growing. In our opinion, the city is, first of all, an economically active area, a landfill for development, a material result of urbanization processes, a promising standard of demographic development and territorial concentration of various forms of activity. For these and other reasons, the exchange of information is accelerating as urbanization intensifies. The information space of a big city is expanding faster than its borders. The level of application of digital technologies in urban infrastructure is usually several times higher than the national average. Therefore, the definition of the conditions and consequences of urbanization processes, the possibility of digitalization, is of methodologically important in terms of economic evaluation of the digitalization processes.

In the digital environment, the gap between the concepts of space and workplace is narrowing. This process is more visible in large cities. Such a situation does not remain unaffected by the competitive environment. In the digital environment, the speed of product distribution in urban areas has the potential to compete with quality (although this is not desirable in terms of food security). Thus, as the impact of a known quality on a manufacturer's market position decreases, the ability of a product to assert its own quality is limited. That is, the pace of realization

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of new production and technological relations is so high compared to areas with low levels of economic activity that the competitiveness of innovation depends on its introduction in the virtual environment, rather than its real presentation in the market.

As information becomes an economic resource and a product of mass consumption in the digital environment, its direct impact on the competitiveness of economic agents becomes stronger in large cities. Under certain conditions (taking into account the Internet of Things and a number of other areas and development technologies), the goal of digital economic activity is to increase the competitiveness of tangible and intangible products, as well as profit-oriented services.

Food security in urban areas in the digital environment

The food problem is one of the most important problems facing humanity. Among the factors aggravating the problem are population growth, environmental crisis and urbanization. Thus, these factors lead to a decrease in the area of arable land per capita on the planet. The link between urbanization and the food problem is derivative and not always obvious. However, new opportunities presented by the digital environment in terms of assessing the impact of food and food security factors on the sustainability of urbanization processes place an emphasis on optimizing the nexus between urbanization and the food problem.

Sustainable consumption and production are among the sustainable development indicators set by the Statistical Office of the European Union (Eurostat). In consumption models: food consumption per capita, in production models, the ratio of the area used for organic farming to the total cultivated area is indicated as indicators characterizing sustainable development [Indicators characterizing sustainable development, 2014, pp. 8–9].

In Azerbaijan, during the events dedicated to the issues identified in the "Transformation of our world: Agenda for Sustainable Development until 2030", there is a regular discussion on food losses, genetic resources of plant and animal origin for agriculture and food production, agricultural lands for sustainable development, food market issues of price anomalies, level of load on water resources, production and exchange of representative information on existing indicators for monitoring and evaluation in the field of sustainable forestry management.

The processes of urbanization and agricultural development are interconnected. However, these relations have not been sufficiently studied, especially in the post-Soviet countries. This situation can be considered as one of the reasons why the role of food security factors in the sustainability of urbanization processes is ignored. Attention should be paid to the role of the product of technical progress and, in a sense, conditional urbanization in the intensification of agricultural production, which is the main direction in solving the food problem. As is known, from the consumer's point of view, the price and quality of food are the main criteria. The cost of food production and the time of its delivery to the final consumer directly affect its price and quality. In other words, the relationship between urbanization and food security is relevant in terms of minimizing displacement. Thus, the centrifugal movement of the population, which is one of the main conditions and consequences of urbanization processes, leads to time savings due to the "squeezing" of the development space.

The role of regulatory actions in realizing the benefits of the digital environment in urbanized zones cannot be overlooked. In this regard, one can agree that "one of the problems of the development of digital technologies in agriculture is the lack of knowledge by users of digital technologies, the lack of funds for access to IT products and services, as well as the absence of government projects to support small businesses" [Kovaleva, 2019, p. 131]. Taking advantage of the digital environment, urbanization zones are likely to achieve significant positive results in solving the problem of food security. In this regard, we can share the optimism that the digitization and platforming of the entire value chain, from agricultural

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products to final consumption, will be more efficient, especially in the agricultural sector [Kenney et al., 2020, p. 38].

Sustainability of urbanization processes and development of the agro-food sector in the digital environment implies the achievement of an optimal level of employment. In this regard, the following position, in our opinion, deserves attention. "Sustainable agro-food systems must provide employment and decent incomes in rural areas and in all parts of the value chain, as well as wholesome and nutritious food, other goods and environmental services for the general population. All aspects of sustainability (economic, social and environmental) must be taken into account in order not to jeopardize the food security and nutrition of future generations" [Sustainable agro-food systems in Europe and Central Asia in the context of climate change, 2018, p. 6].

Fresh food transportation zone to the big city

Food security aspects of the sustainability of urbanization processes provide a solution to the problem of providing the urban population with fresh food products. Large cities, as a rule, can no longer be supplied with fresh food at the expense of their suburban agricultural zones. Modern logistics systems expand the supply of cities with fresh food products at the expense of areas outside the suburbs. As a result, large cities are supplied with perishable fresh food products from suburban areas (sometimes called fresh food transportation zones). Although this situation is not desirable in terms of food security, it is already observed in most capitals.

It is instrumental to determine the zone of delivery of fresh food products to the big city and its degree of compactness in order to determine and regulate the level of supply of the urban population with these products. The current system of indicators characterizing the transportation of distant- and time-sensitive food products prevents the analysis of the actual compactness of the delivery zone.

In order to study the changes in the zone of delivery of fresh food products to the Baku agglomeration, we have proposed the "average weighted distance of transportation" indicator (L).

$$L = \sum_{i=1}^{n} (m_i l_i) \Big/ \sum_{i=1}^{n} (m_i)$$

where,

n – is the number of production points;

m_i – is the mass of products produced at point i and intended for transportation to the city (i = 1, n);

l_i – indicates the distance from the i-point to the city (i = 1, n). The L index allows you to determine the degree of compactness of the transportation zone in the city of perishable foodstuffs that cannot be transported over long distances.

To determine the changes in the transport zone of milk (and a number of fresh agricultural products) to the Baku agglomeration, the indicator "average weight of transportation" was calculated [Balayev, 2007, pp. 233–234; Balayev et al., 2020]. Calculations were made for 1965, 1990, 2005 and 2019, based on sales data.

L_{1965}=163,0 km; L_{1990}=167,0 km;
L_{2005}=165,0; L_{2019} =163,0 km

As you can see, the "average distance of milk transportation" to the Baku agglomeration got its previous value after 54 years, that is, in 2019 and 1965 this figure was 163 km.

CONCLUSIONS

Despite inherent contradictions, urbanization is a cost-effective option for organizing the regional environment. Therefore, changes in urban and regional systems shall be examined collectively. The necessary level of sustainable urbanization is achieved at an acceptable level of human health indicators. Initiatives of the urban population contribute to the introduction of digital technologies in the

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urbanization process. The management by sustainability criteria of urbanization processes, which take place in an uncertain environment and require the development of very complex mechanisms, increases the demand for joint action. A creative approach has become an objective necessity. Advantages of the digital environment expand the prospects for joint efforts and the search for new forms of active participation in order to ensure the sustainability of urbanization processes. The use of the potential of the knowledge economy in cities can make a significant contribution to the sustainability of urbanization processes. To achieve this, smart cities and sustainable urbanization processes must take into account the priorities of knowledge policy and urban planning focused on the needs of the people.

In the agro-food sector, the speed of this process is not satisfactory, although the degree to which digital platforms facilitate exchange, including the replacement of intermediaries, is an important factor in increasing its attractiveness. In order to ensure the active use of these platforms, the formation of a database on the territories should be accelerated, and an appropriate incentive mechanism should be created for small farms.

Attempts by agricultural and food producers to use digital technologies, including in post-Soviet countries, often face financial problems. In our opinion, it is expedient to give priority to innovative development and use the opportunities of public-private partnership in order for these entities to get out of the "middle income trap".

The following should be noted regarding the factors, which contributed to the return of the "weighted average distance of milk transportation" indicator to its previous value after half a century due to the manifold increase in the population of the agglomeration. For more than half a century, a more cautious approach to fresh milk has been formed in the diet of the urban population. The transition from a centralized economy to a market economy led to the formation of new dairy farms, taking into account the proximity of a large city (market), while technology, including information technology and distance factors, came to the fore.

As we approach the Baku agglomeration, the pace of formation and development of the digital environment in the agrarian economy is steadily increasing. This growth is mainly observed in large farms. Thus, in large farms that provide the agglomeration with fresh products, the level of computer literacy of the manager and the degree of openness to digital innovations are higher than in others. Unlike large farms, there are few sustainable business models to enable small farmers to participate in the digital environment. The database for the decision support system using the technological capabilities of the digital environment in the relevant farms should be constantly updated to analyze the situation with the supply of fresh milk to the Baku agglomeration and to assess changes in supplies, climatic risks, productivity, etc.

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TRANSFORMATION OF THE PUBLIC ADMINISTRATION SYSTEM IN THE DIGITAL ECONOMY

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ABSTRACT

Digitalization is an objective and inevitable process, which is impossible to halt. The development of the digital economy should allow the Russian economy to integrate into the global context and legal aspects of this process need to be analysed. This paper aims to to study the influence of digitalization on public administration (especially in economic sectors) in Russia, to outline new requirements to public administration in digital era as well as to analyze new challenges caused by implementation of technical decision within global process of digitalization. The program "Digital Economy of the Russian Federation" dictates new requirements for the system of public administration. But despite the fact that the implementation of the Program requires serious simplification in the interaction of market operators and the state, interdepartmental interaction, it does not fully respond to the challenges of digital transformation of the public administration system. It should lead to a radical change in the approaches to the organization of the work of public authorities through the digitalization, reducing the "bureaucratic burden" when issuing electronic documents. It deals with the formation of conditions ensuring the development of information technologies and effective interaction of a state and business, which covers legal regulation, information infrastructure, personnel and information security, etc. As a result the authors came to conclusion that now it is not a primary task to set out new electronic systems in new fields as much as to improve already existing systems and the system of public administration itself in order to duly adapt it to new digital environments that was established. It is necessary to establish the limits for implementation of various electronic systems to ensure the proper protection of fundamental rights (for example, the right to the protection of personal data, the right to privacy, etc.) as well as to set up some limits for automated individual decision-making

Keywords: interaction of subjects of markets and economic sectors, public administration, a new level of quality of public administration, transformation of the public administration system, digitalization, digital technologies, digital economy

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INTODUCTION

In the post-industrial society digital technologies are gradually becoming an indispensable part of the Russian society. A man is changing, economy relationships and social institutions are changing, public administration is transforming in the era of digital economy.

Digitalization is an objective and inevitable process, which is impossible to halt. To the present date in Russia the basic legal framework and strategic documents are implemented. Order of President of the Russian Federation on "Strategy of the Information Society in the Russian Federation in 2017–2030" [Order of the President of the Russian Federation, 2017], Government of the Russian Federation Decree on adoption of the Program Digital Economy of the Russian Federation [Government of the Russian Federation Decree, 2020], Order of President of the Russian Federation on "National Goals of the Development of the Russian Federation Till 2030" [Order of President of the Russian Federation, 2020] define the direction of such the development.

The national program "The Digital Economy of the Russian Federation" is aimed at enhancing the efficiency of the main branches of the Russian economy, transformation of Russia into the global leader of the world economy and its way to the new quality level of public administration.

The program prescribes the creation of the legal regulation system for the digital economy in Russia via formation of the legal base and production of digital products necessary for achieving the goals thereof, for transformation of the public administration system.

What should the digital transformation of the public administration be like? The state should create conditions, which ensure development of information technologies and effective interaction between participates of markets and branches of economy. This covers legal regulation, information infrastructure, human resources and information security, etc.

The objective of this article is to study the influence of digitalization on public administration (especially in economic sectors) in Russia, to outline new requirements to public administration in digital era as well as to analyze new challenges caused by implementation of technical decision within global process of digitalization.

MATERIALS AND METHODS

Legal base of this study is Russian legislation currently in force as well as applicable sources of international law (including judgements of European Court of Human Rights). Starting from programmatic documents setting out basic approaches to digitalization of public administration the authors will proceed to legally binding acts establishing particular measures to be implemented in order to achieve goals stipulated in such programmatic documents.

As a methodological basis for this study, authors used both general scientific methods of cognition and special methods and techniques used in legal sciences: dialectical method, logical deduction and induction, system approach, statistical analysis, formal legal method (interpretation method). Deduction (including its basic laws), a comparative method and a systematic approach, should make it possible to identify the essence and main trends in digitalization of public administration (especially in economic sectors) in Russia. The use of the method of dialectics should allow identifying general patterns of development of the legal framework in order to analyze, classify and systematize modern approaches to the digitalization of public administration, in the legislation of the Russian Federation. The conclusions formulated by means of a logical analysis will need to be transformed using the formal legal method in order to prepare proposals for reforming the legal regulation of digitalization in the Russian Federation.

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RESULTS AND DISCUSSION

Digitalization of public administration: example of Russian "e-government"

Digital transformation is a complex of actions implemented by a government body which are directed to the reorganization of the public administration system and functions of government bodies, namely offering of governmental services and implementation of governmental functions with the usage of data in the e-form and implementation of information technologies into work.

For reorganization of the public institutions in Russia the decision was made to implement the concept of "e-government", which includes more effective and less expensive functioning of public authorities, enhancing the mechanism of interaction between public administration and people. The program is based on a number of legal acts: Federal laws on "E-signature" [Federal law, 2011], "Organization of Offering of Governmental and Local Services" [Federal law, 2010], Governmental Regulations of the Russian Federation adopting the State Program of the Russian Federation "Information Society (2011–2020)" [Governmental Regulation, 2014], "Federal State Information System ensuring the pre-trial appeal process of decisions and actions undertaken while Offering of Governmental and Municipal Services" [Governmental Regulation, 2012], etc.

The most effective direction of the transformation of the public administration system is implementation of the project "Open Government" on the federal and regional levels. For example, Moscow is a successful region within the project. Despite the fact that portals "Active Citizen", "Our City", "Portal of Open Data of Moscow Government" and "Portal of City Services" have been functioning for several years, they are enhancing constantly. It is worth noting technical and organizational abilities to file an e-petition to government and municipal bodies.

The e-government in the Russian Federation consists of several systems, which constantly interact with each other:

1. Uniform system of regulatory and reference information (USRRI);
2. Uniform identification and authentication system (UIAS);
3. Pre-trial appeal system;
4. Inter-agency electronic interaction system (IEIS);
5. The head certifying center information system (HCCIS);
6. Unified portal of public services (Gosuslugi);
7. Federal situation center (FSC).

We would like to dwell on each system in more detail as they complement each other performing clearly defined functions.

Uniform system of regulatory and reference information (USRRI) is the basic state information resource. The system acts as a single source of reliable regulatory and reference data for governmental bodies and local governments. USRRI is an integral part of Russian electronic government, as it contains accurate information, which can be relied upon.

Human interaction with authorities is carried out through the unified identification and authentication system (UIAS). Electronic government services provision begins with registration in this system. The main advantage of UIAS is its universality. Its account is used for virtually all governmental information systems.

The pre-trial appeal system is an important element in Russian electronic government. Every citizen using this system can file a complaint if public services failed to dully provide to him or her services in question. A more expeditious handling of complaints is the main advantage of the pre-trial appeal system over traditional court procedures.

The interaction of state and local bodies in state electronic services provision is ensured by the inter-agency electronic interaction system (IEIS). The main feature of IEIS is the interaction of bodies' and organizations' information systems through the technology of electronic message queues with the use of a single documented method. When the inter-agency interaction system is fully operational, all the necessary data will be obtained independently from a single database, which is already available today

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on the websites of the State Services, the Federal Tax Service of Russia and the mayor of Moscow Mos.ru.

The head certifying center information system (HCCIS) is aimed at increasing the efficiency of public administration by forming a uniform space of electronic signatures trustworthiness in the process of public services provision with the aid of certificates and electronic signature keys. The important functions performed by the system are the following: the production and issuance of qualified certificates for the electronic signature key, the maintenance of their registers, their storage, as well as other functions. It is thanks to the HCCIS that the use of electronic signature in the Russian Federation is possible.

The unified portal of public services (Gosuslugi) allows citizens to receive information about the state and local services, which ensures the transparency of government bodies. The key role of the portal is the opportunity to submit a request for the provision of a particular service, to pay for it and get a result.

The Federal Situation Center (FSC) deems to be the core of electronic government in Russia. Analytical statistics maintenance allows it to track the effectiveness of a particular system, as well as to understand whether it meets social needs. The center coordinates the activities of all electronic government systems through operational information and support. It also contains the basic documentation of the listed above systems. Anyone can get access to these documents free of charge, which makes their use extremely convenient and effective.

We would like to highlight the electronic government role during the COVID-19 pandemic. Since the system was sufficiently developed at that time, it helped prevent the deterioration of the epidemiological situation. Electronic government made it possible to exclude unnecessary contacts between people. Even during the exacerbation of the epidemic when almost all organizations were closed, the system kept working, albeit with some restrictions. The pandemic has provided invaluable experience to our electronic government, and now the number of services provided completely contactless is increasing.

In addition to state authorities, digitalization has also "came" into the sphere of judicial proceedings: through the State Automated System "Pravosudie" (justice) [Order of Judicial Department at the Supreme Court of the Russian Federation of 14.03.2014] and the service "Moi arbitr" (my arbiter) [Order of Judicial Department at the Supreme Court of the Russian Federation of 28.12.2016] it is possible to file suits and other forms of procedural documents to the relevant judicial authorities. Legal base for such electronic systems is established by federal laws "On providing access to information on the activities of courts in the Russian Federation" [Federal law of 22.12.2008] and "On Amending Certain Legislative Acts of the Russian Federation Regarding the Application of Electronic Documents in the Activities of Judicial Authorities" [Federal law of 23.06.2016].

It should be noted that this, in turn, opens up vast horizons for the further development of the system of justice administration in the modern digital environment. For example, the results of activities in the field of recognition of the digital evidence legal force are now in place. However, there is work to be done in this direction, whereby it is supposed to "systematize the available knowledge on this subject in the legal sciences, establish scientific links between existing theories and develop common points of view on the same subject in order to comprehensively solve the problems associated with obtaining, fixation and use of digital evidence" [Vehov, 2016].

The federal law "On a unified federal information register containing information on the population of the Russian Federation" [Federal law of 08.06.2020] should improve the quality of public services. The Unified Federal Information Register (EFIR) introduced by this federal law will help to identify groups of people in need of targeted government support more accurately. The unified register may appear as early as 2022, the transition period will continue until 2025.

The EFIR system containing personal data of citizens can complement the "safe city" system, which has already been introduced even in small towns.

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The next step will be the introduction of a face recognition system (a similar one is already operating in China) to provide services in a remote format.

However such face recognition systems should meet criteria established by European Court of Human Rights. Under Article 8 § 2 of the European Convention Human Rights, there shall be no interference by a public authority with the exercise of this right except such as is in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others.

Firstly, usage of such systems should not constitute covert surveillance which cannot be challenged by the applicant or other persons [Peck v. the United Kingdom, 2003].

Secondly, usage of such system should not violate privacy rights.

Under Article 8 § 2 of the European Convention Human Rights, there shall be no interference by a public authority with the exercise of this right except such as is in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others.

Private life is not only protected within private areas. As the Court of Human Rights noted there is a zone of interaction of a person with others, even in a public context, which may fall within the scope of "private life" [P.G. and J.H. v. United Kingdom, 2001, para 56]. Privacy issues may arise when pictures are taken by the police during a public demonstration in a public place [P.G. and J.H. v. United Kingdom, 2001, para 58]. In general, it is not the monitoring as such which is the most problematic, but the recording of the data and their processing which may create an unlawful interference with the right to privacy [Amann v. Switzerland, 2000, paras 65–66]. This interference will not be considered as intrusive as long as the data collected remain in an administrative file and are not put in a data system process in order to identify the persons [P.G. and J.H. v. United Kingdom, 2001, para 58].

At the same time right to privacy is not an absolute one. In accordance with Article 8 § 2 of the European Convention Human Rights in order to be lawful, a limitation of the right to private life must meet the following criteria: be prescribed by law, be necessary in a democratic society and pursue a legitimate aim. The European Convention Human Rights has decided that Article 8 § 2 of the Convention does not require as a legal basis an act emanating from the legislator in the formal sense [Opinion on Video Surveillance in Public Places, 2007, para 51]. The Court has developed rather high standards as to the quality of the legal basis of such an interference with the protected rights. Where domestic law does not indicate with sufficient clarity the scope and manner of exercise of the discretion conferred on the domestic authorities to collect and store in a surveillance database information on persons' private lives – in particular, where it does not set out in a form accessible to the public any indication of the minimum safeguards against abuse – this amounts to an interference with private life as protected by Article 8 § 1 of the Convention [Shimovolos v. Russia, 2011, para 66]. The necessity in a democratic society requires that the kind of measures amounting to the interference must not be such that they have a deterrent effect on the exercise of human rights and other legitimate behaviour [Goodwin (Christine) v. UK, 2002, para 39]. Thus, the measure endangering greatly other fundamental rights fails to meet the necessity criterion.

Digitalization and data protection

A wide range of bodies will have access to personal data of Russians. State bodies, notaries, public services portal will be able to use the information. Ensuring the security of citizens' personal data is a task of supreme importance today. The protection of personal data can be facilitated not only by the installation of anti-virus programs, but also by the increase in the cyber literacy of the population. The more the users are notified

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of threats to their personal data, the more security their personal data will be provided. The set goals are being fulfilled with some discrepancy from the target dates. Nevertheless, the result of the implementation of these measures is important.

The need to protect biometrics will only grow in the future as some of biometrics is already in use. For example in 2018 a Unified Biometric System was launched in Russia [Governmental Regulation of 14.07.2018]. This system allows credit institutions to open bank accounts, deposits or approve an application for a loan without one's personal attendance. Data security in this case is ensured through distributed storage of such data. At governmental level were adopted rules of procedure [Ministry for Digital Development, Communications and Mass Media order, 2018] for processing of the parameters of biometric personal data for identification purposes, for posting and updating them in the System as well as requirements for information processing technologies and technical facilities used for data processing during personal identification. Relying on these provisions, banks ensure the correct collection and protection of biometric personal data of individuals.

Also should be mentioned Bank of Russia Guidelines [Bank of Russia Guidelines, 2019] on elimination of security threats relevant to the processing of biometric personal data. This Guidelines stipulates *inter alia* such measures as exclusion of the possibility of storing biometric data in an automated working station after the completion of their registration, implementation of security features against computer attacks, elaborating memos for clients providing information on the features of the software for remote customer identification using biometrics, integrity control and message authentication for messages sent by electronic means and containing biometric personal data of individuals.

Also information technology providing for data security should be mentioned, e.g. systems of security fetch protection, information security facilities against malicious codes (virus-protection programs), facilities for firewalling (restricting access for external users to internal resources of enterprise area network, access control of internal users to external resources), intruder detection systems (against cyber attacks). We believe that these technologies should be installed along with antivirus solutions (which are already subject to binding installation) if not in all devices that can be exposed to unauthorized tampering, then at least in those that contain a large amount of personal data of individuals, for instance, in state bodies' computers processing personal data.

Additionally Russian Federal law on information, information processing technologies and information security [Federal law, 2006] provides for compulsory use of data encryption equipment ensuring data security while channeling for identification purposes.

It is also desirable to establish a legal framework for various mechanisms ensuring personal data security. These could be acts stipulating requirements to software to be installed in governmental bodies responsible for data processing. Such software can include full scan tools for illegal data storage, monitoring system for information transmission within network channels and to external storage devices, employee activity monitoring systems and at last investigation tools (the latter are necessary to indemnify an organization concerned in case of leak of data and impose liability for such leak to a certain official but not an organization itself). It should be noted that implementation of such technologies does not imply complete autonomy, but requires a certain level of training and ability to work with technologies. And this brings us back to the problem of cyber literacy and necessity of improving the skills of safe data processing since it is human beings who are responsible for system management and control irrespective reliability of an automation system itself.

CONCLUSIONS

As was demonstrated above digital systems were implemented in almost all spheres of public life. The COVID-19 pandemic has proved necessity of reforms introduced in the field of public administration digitalization.

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Thus, now it is not a primary task to set out new electronic systems in new fields as much as to improve already existing systems and the system of public administration itself in order to duly adapt it to new digital environments that was established.

It is necessary to establish the limits for implementation of various electronic systems to ensure the proper protection of fundamental rights (for example, the right to the protection of personal data, the right to privacy, etc.) as well as to set up some limits for automated individual decision-making (as it is done in the EU, for instance) [General Data Protection Regulation, 2016, Art. 22].

The development of digital public administration implies a number of serious changes in order to simplify the interaction of individuals and legal entities with the governmental authorities and state bodies among themselves whereas regulation in force does not allow to solve all the current problems of inefficiency of public authorities and does not fully respond to the challenges of digital transformation.

The authors argue that the digital transformation of the public administration system should lead to fundamental changes in approaches to workflow management in state and local authorities via using digital technologies and algorithms.

For governmental bodies, the role of digital transformation is not yet obvious. They have no need to compete against privately owned companies while rendering public services, administrative costs have no impact on their competitiveness and ineffectiveness of state owned IT-services cannot bankrupt state body at hand.

Large-scale digitalization is impossible in the absence of systemic transformation of management processes, cardinal reforms of government machinery operational patterns. These requires:

– to balance the system of allocation of state powers, the institutional framework and interactions between state bodies;
– to increase the efficiency of budget expenditures for the maintenance of the state apparatus and its functioning;
– to increase performance efficiency in executive branch agencies (this also will allow to decrease redundant staff);
– to raise the level of modern digital competencies and professional qualifications of civil servants;
– instill in the state apparatus a commitment to values such as efficiency, accountability, serving the public interest.

For the digital transformation of a public administration system, in authors' view, it is necessary:

– to apply a platform approach (including using of mobile apps, banking, various digital services) to develop public digital sectors;
– to set up an effective digital platform for standard IT solutions applied in public administration, based on the effective allocation of state powers in conjunction with the functions assigned to them and the material, human and financial resources allocated to them;
– proceed to a centralized model aimed at centralizing digitalization costs, including the development of a unified methodology for determining the cost of developing and implementing information and communication technology solutions for the public sector. Such a technique should be based on an objective assessment of the cost of individual characteristics of a potential product (software code size, data volume in a system, data access rate, number of users in a system, cyber security requirements etc.).

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AN OVERVIEW OF URBAN RESILIENCE: DIMENSIONS, COMPONENTS, AND APPROACHES

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ABSTRACT

This paper investigates the theoretical and research literature on urban resilience. It examines various definitions of the concept and explores its social, economic, and institutional dimensions as components of a dynamic system. The study design was a descriptive review of relevant material collected from high quality scientific databases using the purposeful sampling method. The results indicated that the social ecology model of urban resilience provided a coherent and dynamic approach to the study of urban resilience. This model comprises economic, social, and institutional dimensions, the components of which have different functions in relation to urban resilience in the face of changes and pressures. To be effective, the system must be flexible and contain a variety of resources and functions to make predictions, deal with adverse events, and make provision for possible failures. System stability and balance require active and knowledgeable actors and institutions that enable appropriate communication between them. In this approach, a resilient city not only has the ability to absorb and withstand disasters, but also contains a variety of internal and external resources to regain balance. Resilient systems are the result of a series of decisions and actions at different times. The necessary capacities must be developed in the economic, social, and institutional dimensions to create economic stability, increase awareness and public cooperation, and develop efficient institutions to legislate for and implement urban resilience programs.

Keywords: urban resilience, resilience components, resilience approaches, economic resilience, social resilience, institutional resilience

INTRODUCTION

Urban communities are highly vulnerable to natural and man-made hazards [Lang, 2011]. Cities are complex systems that affect individual and social well-being along many dimensions – economic, social, institutional, and environmental. The physical expansion of cities and increase in the urban population have exposed citizens to a variety of stresses, including industrial and structural changes (e.g., relocation or proximity to large industrial companies), economic crises (e.g., the financial crises of 2007–2008 and the European debt crisis of 2009), population movements, natural disasters (e.g., severe earthquakes, floods, and storms), disruption of energy supply, and changes in urban management.

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Large cities are particularly vulnerable to natural hazards and any kind of shock can have significant economic, social, environmental, and institutional consequences for such a complex system. For example, in 2005 Hurricane Katrina in New Orleans killed more than 1,800 people and cost the US economy $125 billion. The devastating 2011 earthquake in eastern Japan caused extensive damage, as tsunami waves devastated coastal areas and triggered a major nuclear accident at Fukushima. The estimated cost of the damage was $210 million, and more than 17,000 people died [Chadha et al., 2006].

Cities are responsible for 60–80% of energy consumption and generate 60–80% of greenhouse gas emissions [Galderisi, 2014]. This issue is especially important in developing countries, where rates of population growth and poverty are high.

In this context, cities play a dual role, in that they are both vulnerable to and responsible for these threats which, given their scale and scope, have emerged as a global issue. Hence, it is vital that urban policies pay attention to resilience and that appropriate planning is undertaken to manage crises [Coghlan & Norman, 2004]. The present study was driven by the expectation that embedding resilience in the urban management system will enhance a community's response to risk. The aim was to investigate the social, economic, and institutional dimensions of resilience via a critical review of the research and theoretical literature on urban resilience.

MATERIALS AND METHODS

The method of narrative review was adopted to present a comprehensive analysis of the current knowledge in the field of urban resilience. The following databases were searched for relevant articles, books, and specialized reports: IEEE Science Direct, Scopus, Springer, Web of Sciences, and Google Scholar. The initial keywords applied in the search were "Resilience", "Urban resilience", "Institutional resilience", "Economic resilience", and "Social resilience". Following preliminary analysis, the keywords "Urban system", "Resilient city", and "Resilience dimensions" were added, which helped to identify other relevant publications. No time limitation was imposed in selecting the articles, but recent texts were prioritized, and items not in line with the research goals were omitted from subsequent analysis. Our continuous search yielded 145 articles and books. When duplicates and documents with thematic and content mismatch were removed, a final total of 97 articles was selected. After initial review of the documents, parts of the shortlisted publications that related to the dimensions of urban resilience were extracted and collated in a dictionary. These collected notes guided the creation of an architecture of a resilient urban community. The shortlisted papers were then re-assessed against the proposed architecture to verify its representativeness of the resilience dimensions discussed in the selected literature. Finally, as an essential success

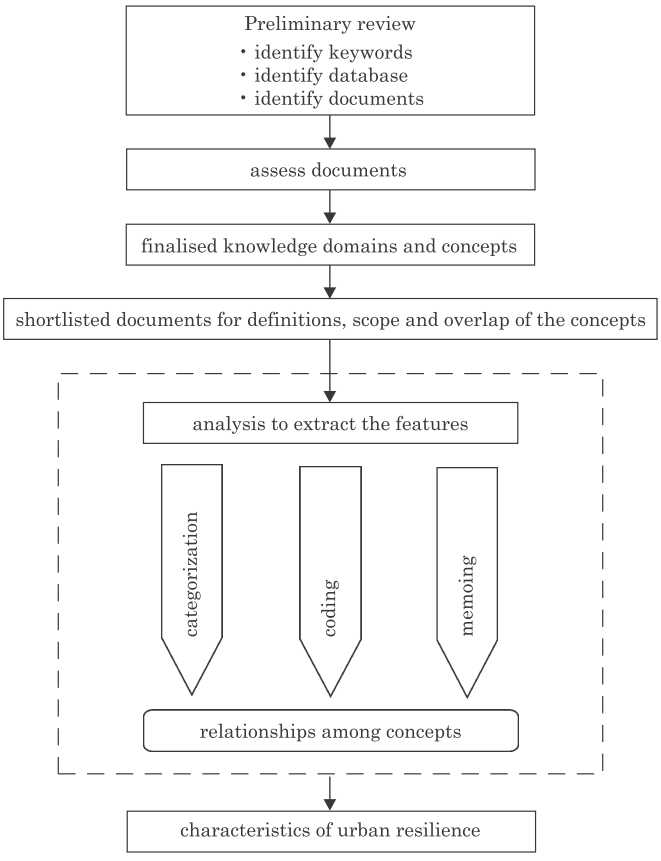

Fig. 1. Study process
Source: own preparation.

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element for emergence of resilient urban community, the cooperation of the system components identified in this study were analysed. The study procedure is represented graphically in Figure 1.

THE NOTION OF URBAN RESILIENCE

As a scientific concept, the meaning and origin of the word 'resilience' is ambiguous [Adger, 2000; Friend & Moench, 2013; Lhomme et al., 2013; Pendall et al., 2010; Porter & Davoudi, 2012]. In this, it is similar to the concepts of sustainable development and governance. The lack of consensus on a specific meaning of resilience creates difficulties for researchers seeking to measure and apply the concept [Gunderson, 2000; Gunderson & Holling,2002; Pizzo, 2015; Vale, 2014]. Nonetheless, it continues to be used by all stakeholders [Brand & Jax, 2007; Rose, 2007].

The difficulty in defining resilience is partly related to the diversity of stakeholders and the application of the concept in a range of disciplines, including physics, psychology, and ecology [Sharifi & Yamagata, 2014, 2015; Galderisi, 2014; Leichenko, 2011; Zhou et al., 2010]. In psychology, resilience refers to behaviors and characteristics that help people get along and be socially successful [Pendall et al., 2010]. In the physical and engineering sciences, it refers to the ability of a substance to return to its original situation or maintain balance after withstanding pressure. The amount of resilience of a material depends on its structure and how it operates under undesirable conditions. Therefore, resilience implies adaptability after disturbance as well as the ability to improve and correct the situation [Adger 2000; Holling, 1996].

The term 'urban resilience' refers to the adaptation of complex systems in cities [Batty, 2008; Godschalk, 2003]. In urban planning, resilience is used to refer to the urban system's capacity to manage natural and man-made hazards [Bosher & Coaffee, 2008]. Accordingly, urban resilience is discussed in studies of the urban environment from the perspective of systems theory. In a systemic approach, resilience is mainly defined as the urban ecosystem [Rogatka et al., 2021]. Sharifi and Yamagata [2015] consider resilience as one of the dimensions of urban sustainability that maintain human-environment interactions over time. Such interactions, they propose, include social, economic, and environmental dimensions. Alberti et al. [2003] define urban resilience as the ability of cities to withstand change, create new structures, and rebuild after change. Similarly, Norris et al. [2008] define it as a set of adaptive capacities that can maintain the system's compatibility and function after a crisis [Chelleri, 2012; Resilience Alliance, 2010].

Rose [2004] distinguishes between inherent and adaptive resilience. Inherent resilience refers to performance in non-crisis periods (e.g., the market's ability to redistribute resources in price signals), while adaptive resilience relates to the system's flexibility, ingenuity, or ability to deal with critical situations.

Some researchers argue that resilience is related not only to systemic capabilities but also to human interactions with the environment. If such interactions are appropriate, they can provide long-term urban sustainability and resilience over generations [Van Andel et al., 1990; Redman, 1999]. Others emphasize that resilience not only an independent issue, but also a part of the vulnerability and urban sustainability studies [Miller et al., 2010; Turner, 2010]. Weichselgartner and Kelman [2014, p. 10] have proposed that the concept of resilience carries a positive semantic load, which has made it more attractive than other similar concepts. The Rockefeller Foundation defines urban resilience as the resilience associated with the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow despite various chronic shocks and stressors [Spaans & Waterhout, 2017].

The unifying element in these concepts of resilience is the ability of an urban environment to recover from disaster and return to its previous condition. In other words, resilience refers to the system's capacity to absorb risks and reorganize itself after exposure to risks. From this perspective, a systemic approach is required to better understand the mechanism of urban resilience. In this approach, the urban system has important capacities to absorb, adapt, reconstruct,

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and learn in relation to withstanding change and return to normal conditions of the past [Carpenter et al., 2001]. Table 1 summarizes the key definitions of resilience.

Table 1. Definitions of Resilience

Author	Definition
Sharifi & Yamagata [2015]	Resilience is considered as one of the dimensions of urban sustainability that aim to maintain human-environment interactions over time
Alberti et al. [2003]	Capability of cities to absorb changes, create new structures, and reconstruct after change
Norris et al. [2008]	A set of adaptive capacities that can maintain system compatibility and function after a crisis
Rose [2004]	Distinguishes between natural resilience (related to normal conditions) and adaptive resilience (ingenuity or effort of the system to deal with critical situations)
Cote & Nightingale [2011]	Resilience arises from system characteristics that may be positive or negative and turn into a normative viewpoint
Godschalk [2003]	A sustainable network of physical systems and social relations
Campanella [2006]	The capacity of a city to escape destruction
Lamond et al. [2009]	Includes the idea that cities and towns should be able to recover from major and minor disasters quickly
Hamilton [2009]	Ability to recover and maintain the core tasks of life, business, industry, government, and social groups in the face of disasters and other hazards
Romero-Lankao & Gnatz [2013]	The capacity of urban populations and systems to withstand a wide range of hazards and stresses
Spaans & Waterhout [2017]	The capacity of urban individuals, communities, institutions, businesses, and systems to survive, adapt, and grow despite chronic shocks

Source: own preparation.

These definitions have some important commonalities. All consider resilience as a positive attribute that can be constructed or acquired by cities, communities, households, organizations, or businesses. This capacity includes specific activities such as resistance, absorption, adaptation, transformation, change, recovery, and preparedness for specific events (shocks, stresses, hazards, and disasters).

Although there is semantic overlap between the concept of resilience and those of risk exposure and vulnerability, there is a lack of agreement on the relationships among them [Berkes, 2007; Gallopin, 2006; Klein et al., 2003]. Systems with less resilience are vulnerable to stressors and shocks. In this sense, it can be said that increased resilience reduces vulnerability [Folke, 2006]. The concepts of resilience and vulnerability have different origins: resilience is derived from positivist biophysical science approaches, while vulnerability is derived primarily from structuralist frameworks in social sciences and political ecology [Miller et al., 2010]. According to Gallopin [2006], vulnerability is a broader concept than resilience and is closer to the idea of "adaptation capacity". Most scholars consider risk exposure to be part of vulnerability, arguing that vulnerability only makes sense in relation to a particular risk [Klein et al., 2003]. Resilience is an internal or emergency aspect of complex socio-ecological systems [Folke, 2006], which makes sense in the face of stressors, shocks, recovery, and reorganization. However, its hidden characteristic is within the system and independent of risk.

CHARACTERISTICS OF RESILIENT SYSTEMS

In the systemic approach, systems must be able to perform their tasks under different conditions or create new functions for new conditions. In this context, resilience, as one of the main components of a system [Lang, 2011], provides different opportunities to respond to the dual forces of needs and pressures in abnormal situations. These opportunities can protect the system in critical situations that it has not previously encountered. The system must

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also be able to absorb sudden shocks, or the cumulative effect of small stressors will eventually lead to catastrophic failure. The system should also be able to take precautions against and be prepared for possible failures. Little [2002] proposes that a city's performance in different dimensions is related to its systemic capabilities. According to Kirshen et al. [2008], connection and cooperation between the components of a system is necessary for human well-being and economic order. In resilient systems, the strength, flexibility, and functional dependence of individual systems are sufficient to maintain equilibrium in the face of disruption and return to normal conditions.

Resilient systems should be reflective, robust, redundant, flexible, resourceful, inclusive, and integrated [ARUP, 2014]. In addition to these characteristics, Galderisi [2014] identifies adaptability, diversity, learning capacity, efficacy, networks, innovation, rapidity, knowledge, and self-reliance. Suárez et al. [2016] identify the following key characteristics of urban resilience:

- Diversity of urban system components;
- Modularity in the relationship between different components of a system. A modular system consists of subgroups that have a strong relationship with each other, but a weak relationship with other subgroups;
- Tightness of feedback: The mechanisms that control the ecosystem should enable strong, rapid and effective responses to shocks;
- Social cohesion. Trust, social networks, and leadership increase individuals' capacity to deal with disorders collectively;
- Innovation: Learning and cumulative experience provide new ways to deal with change.

Other authors identify flexibility, diversity, redundancy, modularity, and safe failure as the main components of a resilient urban system [Ernstson et al., 2010; Leichenko, 2011; Liu et al., 2007; Tyler & Moench, 2012; Tabibian & Movahed, 2016].

RESILIENCE APPROACHES

Resilience approaches are strategies that seek to deploy the adaptive resources and capacities of a society to overcome the problems caused by change. These approaches focus on the internal capacity of a society to overcome harms rather than on external interventions. Resilience can be assessed on various scales: national, regional, urban area, urban, local, or household. Such a distinction is important for policymakers because resilience assessment scales can be useful in determining activities and decisions.

Pendall et al. [2007] identify four approaches to urban resilience: equilibrium, systems perspectives, path dependence, and long view. The equilibrium approach is based on the assumption that urban systems, like all other systems, have states of equilibrium that may be disrupted by internal or external factors. In this approach, the main premise is that disturbance in the system's equilibrium can bring it to a new equilibrium, provided that the system has the ability to absorb and adapt to the external changes and fluctuations.

The systems perspective involves a process of continual adjustment with four phases, each of which has a varying relationship to the three dimensions of change, namely: the availability of accumulated resources to the system; the internal association among actors or variables of the system; and resilience, which is defined as the system's vulnerability to stresses and shocks. High resilience is related to the phases of creative and flexible responses.

The path dependence approach focuses on the effects of decisions and plans on phenomena and events. In this view, equilibrium or imbalance is the result of accidental events and the actions of agents.

The long view approach addresses the issue of resilience over time. Equilibrium or imbalance in a system is seen to result from not only current events and actions, but also a series of decisions and actions at different times. Therefore, in order to better understand the subject, one must adopt a historical approach to the phenomenon.

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Sharifi and Yamagata (2015) discuss resilience in relation to its application in engineering, ecological, and socio-ecological systems. In engineering, resilience refers to the robustness and resilience of a system against external disturbances and the ability to return to equilibrium. This is closely related to the engineering concepts of stability, efficiency, constancy, predictability, and reversibility to the previous status [Holling, 1996]. In this approach, a stable equilibrium exists, namely stable equilibrium [Berkes et al., 2002].

The ecological approach emphasizes the unpredictability of a system and its ability to absorb disturbances so that its basic functions are preserved. The system uses a multiple-equilibrium model to create a new state of equilibrium by absorbing fluctuations or hazards and adapting to them, which leads the system to a better state [Holling, 1996; Folke, 2006]. In this approach, resilience is considered as an indicator of a system's ability to deal with environmental shocks and stresses; hence, capacities should exist within the system to control and manage these shocks. System resources and assets can determine the adaptive status and future of the system [Holling, 2001]. The ecological approach emphasizes uncertainty, nonlinearity, and self-organization of the system [Leichenko, 2011; Alberti et al., 2003]. In other words, this approach emphasizes the system's ability to self-organize and learn from disasters to improve the situation.

In the socio-ecological approach, the system must be able to adapt to disasters through absorption, learning, and repair [Roege et al., 2014; Cutter et al., 2013; Linkov et al., 2013; Gibson & Tarnat, 2010]. In this approach, human beings are the main force in changing the world and affect the formation of ecosystem dynamics in the local environment and in the biosphere as a whole [Folke, 2006; Kirch, 2005; Folke & Gunderson, 2010; Chelleri, 2012; Chelleri et al., 2015]. According to Gunderson & Holling (2002), the adaptive system has four periods: rapid growth and exploitation; a long phase of accumulation, monopolization, and conservation of structure; a rapid breakdown or release phase; and a short phase of renewal and reorganization.

In her summary of the theoretical literature, Galderisi [2014] distinguished four approaches: ecology and sustainability (the ecosystem's capacity and social ecology); risks and disasters (the resilience of local regions and areas against risks and disasters); economy (the resilience of the city's economic systems at the regional level and its production capacity); and climate change (the ability of cities to cope with climate change).

Another approach considers resilience as the ability of a system to plan, absorb, repair, and adapt to known and unknown threats [Cutter et al., 2013; Hollnagel et al., 2012].

Figueiredo et al. [2018] proposed a three-pronged approach to resilience (Table 2). In this model, each of the three approaches (socio ecological, disaster risk reduction, and sustainable livelihood) is preferable over the others. These approaches are complementary; meaning that activities conducted at the local level must be complemented by national policy frameworks.

The disaster risk reduction approach focuses on actions and programs at the national level. National governments must make the necessary plans and investments to produce and acquire resources that can improve the resilience of cities.

The socio-ecological approach emphasizes the urban scale and considers the city as an ecological social system. This systemic approach is based on a holistic view of the city and deals with the mechanisms of change and the relationships among various components of the system. In this approach, cities are adaptable social and technical systems consisting of different components; an appropriate combination of these components can improve individuals' quality of life. Changes are systematic (changes in one element may cause changes in other elements) and dynamic [da Silva et al., 2012, p. 5]. In other words, the analysis of urban resilience requires a holistic approach.

The sustainable livelihood approach introduced by Oxfam and the Food and Agriculture Organization (FAO) emphasizes resilience at the household level [Jennings & Manlutac, 2016]. In this approach, the well-being of individuals and families is a key component of resilience. This approach is appropriate for countries with high rates of poverty and

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Table 2. Three Main Approaches to Resilience

Approach	Sample Definition of Resilience	Typical Scale of Analysis	Most Common Concepts
Disaster risk reduction	The ability of a system, community, or society exposed to hazards to resist, absorb, accommodate to, and recover from the effects of a hazard in a timely and efficient manner through the preservation and restoration of its essential basic structures and functions [United Nations,2017]	Global and national	Hazard Disaster Disaster risk
Socio-ecological	The amount of change the system can undergo while still retaining the same controls over function and structure; the degree to which the system is capable of self-organization; and the ability to build and increase the capacity for learning and adaptation [Holling & Walker, 2003]	Cities and communities	Shocks Stresses
Sustainable livelihoods	A capacity that enables households and communities to maintain a minimum threshold condition when exposed to shocks and stresses [Frankenberger et al., 2014]	Households and communities	Vulnerability

Source: Figueiredo et al. [2018].

social inequality. Available research indicates that personal wealth is one of the most important sources of human vulnerability [Jennings & Manlutac, 2016]. Poor households live in vulnerable areas, have less access to disaster protection equipment, and have very low levels of health, employment, and access to infrastructure services. These factors increase the level of vulnerability and justify attention to improving the residents' living conditions.

Other approaches focus on the level of neighborhood. This is based on recognition that spatial social discrimination and inequality create different levels of vulnerability and resilience [Cutter et al., 2014; USAID, 2016].

DIMENSIONS OF RESILIENCE

The basic concept in urban resilience is stability or a balanced combination of different components such as social, spatial, infrastructural, environmental, and cultural factors. These components stabilize the urban system and create the necessary capacity to recover followed by facing external threats [Rogatka et al., 2021].

One of the first hybrid models of urban resilience was developed in 2006 by the Multidisciplinary Center for Earthquake Engineering Research. The model was based on four dimensions of resilience: technical, organizational, social, and economic [Patal & Nosal, 2016]. Four years later, the Center proposed a model with seven dimensions: demographic resilience, environmental/ecosystem resilience, organized government services, physical infrastructure, lifestyle and social competence, economic development, and socio-cultural capital, abbreviated to PEOPLES [Renschler et al., 2010, Patal & Nosal, 2016]. Following a systematic review of models of social resilience against disasters, Ostadtaghizadeh et al. [2015] suggested that five dimensions were paramount: social, economic, institutional, physical, and natural resilience. The institutional and social dimensions and their interrelationship have been emphasized in the literature [Agudelo-Vera et al., 2012].

ECONOMIC RESILIENCE

The economic dimension emphasizes the economic conditions of cities and neighborhoods, including employment, variety of occupations and economic resources, number of businesses, and household income. The economic dimension also reflects the situation of a city or neighborhood in relation to the global economy. Resilient cities have diverse economies, high innovative capacity, reliable infrastructure and a skilled workforce.

The most important factors in economic resilience have been identified as economic growth, sustainable livelihoods, access to housing, physical capital, health services, access to schooling, and employment opportunities [Godschalk, 2003; Pfefferbaum

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et al., 2008]. The amount and diversity of economic resources are particularly important. For example, Adger [2000] showed how dependence on limited economic resources created inequality in income distribution and reduced resilience.

The effect of a disaster on well-being is not solely related to physical damage or direct adverse effects on people's lives and property. The effects on well-being also relate to the ability of an economy to cope, rebuild and, thus, minimize the economic losses. This ability, referred to as macroeconomic resilience, has two components: instantaneous resilience, or the ability to prevent large losses, and dynamic resilience, or the ability to rebuild and repair. Well-being is also affected by microeconomic resilience, which is reflected in the distribution of failures, household vulnerability, pre-disaster income, and ability to cope with shocks [Hallegatte, 2014].

The economic dimension of resilience refers to the structure of an economy as well as the level of economic security and stability. These structural elements include job skills, job opportunities, and employment rates [Burton, 2014]. Cities with strong and diverse economies survive better in a crisis than cities with weak economies [Campanella, 2006]. Consequently, creating a conducive environment for business and increasing the capacity for production, industry, and trade contribute to the development of resilience [Localize, 2009]. Domestic investment and economic diversity are evidence of a community's ability to attract and retain jobs and prevent the negative effects of recession [McAllister , 2015]. High tax revenues and strong economic networks that can attract and maintain a local workforce have also been identified as important indicators of economic resilience [Localize, 2009]. The presence of large industries and businesses can increase the capacity of a society to withstand economic crises [Sherrieb et al., 2010]. Other important factors include integration into the regional economy, economic cooperation with other regions and countries, participation of the private and public sectors in business development, and encouragement of collective action [CARRI, 2013].

Other researchers emphasize the importance of sustainable incomes and equitable distribution of income as key factors in economic resilience. Norris et al. [2008], for instance, consider economic development as a dimension of social resilience. They suggest that the equitable distribution of resources, along with mitigation of disaster risk and vulnerability and the level and diversity of economic resources, are key factors in economic resilience. However, dependence on limited natural resources may prevent cities from achieving sustainable incomes [Adger, 2000].

Rose [2004, 2009] argues that economic resilience is the result of natural resilience and resilience at the micro, meso, and macro levels of economic systems in times of crisis. He further proposes that economic resilience depends on market resilience. The capacity of the economic system to manage the risk of economic equations can increase the resilience of microeconomic actors in the market and re-empower them towards economic participation. Resilient economic systems also have the capacity to mitigate risk and support economic actors in emergencies.

SOCIAL RESILIENCE

The fact that some communities are resilient to disasters, while others are not, suggests that, other factors being constant, social capacities play an important role. Various capacities and characteristics help communities to rebuild following a disaster. Therefore, social structure should be considered as an important aspect of resilience [Drabek et al., 1981]. Social resilience refers to the dynamic system of human-environment interaction [Folke, 2006] that influences how a society can survive disasters such as hurricanes and floods [Paton & Johnston, 2006]. It recognizes that communities are ecologically, socially, and psychologically diverse. A resilient community has the ability to cope with change and maintain its core functions in the face of pressure.

The distribution of resources impacts on the vulnerability of communities. In societies where environmental damage is unevenly distributed, the social bonds that develop are too weak to mitigate

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the risks [Godschalk, 2003]. Poor communities are not only at risk of death and serious injury, but are also unable to deploy facilities and support following a disaster.

Social capital is another important concept in social resilience. From the results of several case studies, Aldrich [2010, 2011] concludes that social capital plays the main role in disaster recovery; other factors, such as physical harm, population density, socio-economic status, and economic inequality, are less effective.

Disasters, as observable events in time and space, cause physical damage and disrupt day-to-day functions and populations in neighborhoods, communities or regions [Kirschenbaum, 2004]. The extent of the impact is also related to social structure, because such events disrupt the social order, potentially leading to social unrest and conflict. Therefore, it is necessary to understand the role of social networks and relationships before and after a disaster. Although natural disasters destroy all types of capital (physical, human, and social), social capital is the least affected. Accordingly, emergency efforts should primarily target social capital by treating community members as active agents for cooperation and assistance, rather than passive victims [Dynes, 2002].

Trust is an essential component of social capital [Paraskevopoulos, 2010; Shimada, 2015]. Trust has been shown to play a key role in reconstruction following a disaster. Familiarity and strong community ties strengthen trust among network members and facilitate cooperation during and after the event [Shimada, 2015]. For example, the cooperation between volunteer urban organizations, government agencies and local people in India and Japan was reported to strengthen trust and facilitate post-disaster reconstruction in India and Japan [Nakagawa & Shaw, 2004].

The criteria introduced for well-being include demographics of the city or neighborhood (age, gender, poverty, etc.), health status, amount of social capital, civic participation, and effective social connections. Social resilience has a variety of sources, including social ties and social capital, information and communication, ability to learn, problem solving, collective action, and transformation [Berkes & Ross, 2013; Chandra et al., 2011; Pfefferbaum et al., 2017; Pfefferbaum et al., 2013; Norris et al., 2008]. In other words, it reflects the amount and diversity of available human resources [Sherrieb et al., 2010]. Other suggested social indicators of resilience include: social capital, social trust, citizens' commitment and responsibility and their participation in social networks [Chelleri et al., 2015]; attachment to place [Norris et al. 2008]; access to a safe and healthy environment [Chandra et al., 2011]; and Elimination of social inequalities by considering local culture and values.

In summary, a wide range of indicators of social resilience have been identified, namely: a culture of cooperation, a balanced demographic distribution, intergenerational relations, cultural diversity, social cohesion, self-organization, education, level of awareness, face-to-face interaction, poverty rate, social networks, income rate, population aging, place attachment, language proficiency, religious affiliation, ethical behavior, health systems, health coverage, and access to health.

Ecological adaptive social systems without the presence and proper function of agents and institutions will not have the necessary efficiency neither in maintaining the internal coherence nor in inter-systemic connections. The capacity for learning and innovation enhances the resilience of an urban system by contribution of activist and influential institutions in the system [Leichenko, 2011]. Learning involves not only transferring and sharing knowledge, but also developing and accessing education. These factors have been shown to be important contributors to resilience following accidents [Twigg, 2009].

Agents include individuals (such as farmers, consumers), households (as units of consumption, social reproduction, education, capital accumulation), as well as private and government organizations (government offices and departments, private companies, civil society organizations). They have distinct interests and can change their behavior based on strategic decisions, experience, and learning.

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To understand the impact of agents, we need to take account of their advantages and limitations as well as the needs they meet. Agents' behavior can be changed but, depending on the circumstances, this change can be as difficult as changing the system's infrastructure.

Agents have access to a variety of financial, physical, natural, social, and personal resources, which are the basis of their power of action [Moser, 2006]. With more resources, the resilience capacity of the city system increases, especially in terms of social resilience. Not only individual agents, but also local governments and community organizations play significant roles in urban resilience, as they are central to planning, prevention, and coping [Satterthwaite, 2009]. In short, responsible and capable agents with high learning capacity are necessary to create a resilient city.

INSTITUTIONAL RESILIENCE

Recent resilience approaches have focused on understanding, managing, and guiding the socio-ecological system [Walker et al., 2006; Pickett et al., 2013]. This approach evokes a self-sufficient system in which human-natural and socio-ecological systems are intertwined. In this view, the urban system has internal regulating forces that protect it from external shocks and pressures. Institutional capacity is one of these important systemic capacities. The concept of institution refers to the rules that shape human behavior and economic and social interaction and exchange [Hodgson, 2006]. Institutions may be formal or informal, overt or implicit. They reduce uncertainty and create social patterns and that make behavior predictable and facilitate interaction [Campbell, 1998; North, 1990; Ostrom, 1990]. In relation to dealing with environmental stressors, institutions determine how agents and systems interact. Institutions define and regulate access to urban systems, make decisions related to urban management, and facilitate the flow of information among households, employers, local organizations, and other agents [Huntjens et al., 2012].

Weakness of the urban management and governance systems leads to functional, cognitive, and political disturbances that put obstacles in the path of sustainable urban development [Grabher, 1993]. Adequate institutional capacities promote adaptive efficiency [North, 1990] and internal control of the urban system [Holling, 2001]. Institutions underpin relationships and processes in the urban development management system [Lowndes, 2001; Keck & Sakdapolrak, 2013]. They determine local decision-making frameworks, policies, and urban plans. Institutional planning capacity, especially planning for critical situations, is a crucial factor in creating urban resilience [Campanella, 2006]. In this context, Coaffee and O'Hare [2008] identify four steps in what they refer to as generic preparatory planning for emergencies: preparing, mitigating, recovering, and responding.

Sharifi and Yamagata [2014] propose that planning and leadership are two important institutional factors in designing a resilient city. The associated powers include: zoning regulations (the acceptable rate of development in at-risk areas); identification of requirements based on assessment of risks and vulnerabilities; human habitation in high-risk areas; risk analysis and risk mapping; control of unauthorized development; scenario-based planning; use of pressure factors; common planning; collective memory; active planning; degree of flexibility; and land ownership. They conclude that good urban governance and management includes: a focused government approach; public participation; accountability and independence; interpersonal and inter-organizational trust; inter-organizational cooperation; political stability; leadership capacity; emergency evacuation and management practices; urban networks at different levels (regional, national, transnational); and transparency.

Thus, planning capacity is an important institutional factor in this approach, which conceptualizes a city as an open, coherent, and multifaceted system, in which community stakeholders are considered as the centre of planning, and planners are seen as innovative and creative players [Collier et al., 2013].

Although governance and institutional capacity are independent dimensions, they are associated with other dimensions of resilience. Hence, the quality and efficiency of communication between and within organizations is important. Effective

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leadership promotes resilience by strengthening the connections between various components of the system and developing social capital [Frankenberger et al., 2013]. Public participation in decision-making can help to legitimize and increase acceptance of urban managerial decisions and plans. Decentralization and attention to local creativity can reduce the complexities of organizational bureaucracy and make organizational activities more effective. Fostering popular participation, mobilizing local and regional forces, and facilitating the exchange of ideas, opinions, and experiences increases the community's preparedness to manage a crisis [Renschler et al., 2010; Norris et al., 2008]. The creation of a cohesive network of individuals and organizations increases the public capacity for trust and learning, and strengthens citizens' willingness to participate, maintain readiness, and cope with critical situations [Chandra et al., 2011].

Good governance is essential for the resilience of cities. To achieve such a goal, it is highly important to have a responsive city in which citizens can use technology to play an active role in urban planning processes. In order to design responsive cities, changes are needed in the role of policymakers, government experts, urban designers, and architects [Klein et al., 2016].

Ziervogel et al. (2017) consider justice and rights to be essential values for achieving resilience. They argue that resilience depends on: creating a framework based on justice and rights for vulnerable people; identifying the reasons for discrepancy between ideal justice and justice in real life and protecting the rights of all social groups; and empowering vulnerable communities and facilitating their access to rights and justice.

CONCLUSIONS

The concept of urban resilience has come to be widely deployed in academic literature and public policy. Its emergence reflects the expansion of urbanization and vulnerability of cities as a result of overpopulation, excessive consumption of natural resources, environmental degradation, economic problems such as poverty and unemployment, and natural disasters such as floods and earthquakes. Resilience refers to the ability of a system to absorb natural and man-made pressures and stresses and return to pre-crisis conditions. A sustainable urban system must have the capacity to withstand stressors at multiple levels – individual, household, neighborhood, urban, and cross-border. Accordingly, different approaches are required.

The risk reduction approach focuses on urban resilience at the national and global levels, and considers it to be the result of macro decisions and policies at these levels. The intermediate-level socio-ecological approach addresses resilience at the level of cities and urban areas from a systematic and dynamic perspective which sees cities as adaptable social and technical systems in which the appropriate combination of components can improve individuals' quality of life. The sustainable livelihood approach addresses the issue of resilience at local and small-scale levels, such as urban households. In this approach, lack of access to beneficial urban services makes certain groups vulnerable to risks, and social inequality and poverty are decisive concepts. To create resilience capacity in cities, it is essential to provide sustainable livelihoods and meet the basic needs of vulnerable groups.

Resilience has economic, social, environmental, and institutional dimensions. Economic resilience requires a diversity of economic and industrial opportunities and the capacity to create wealth and prosperity for all members of society. Social resilience requires that citizens are active and have access to opportunities, reflecting the focus on social action within the dynamic system of human-environment interaction. Social forces, social structure and social capital are considered to be vital factors in resilience, and resource distribution is seen to have a (positive or negative) impact on vulnerability.

Economic growth, sustainable livelihoods, access to housing, physical capital, health services, education, and employment opportunities are the most important factors in economic resilience. The environmental dimension of resilience emphasizes the balance between development and environmental resources, appropriate human interaction with the environment, sufficient and reliable infrastructure,

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and sufficient natural resources. The institutional dimension of resilience focuses on the quality of urban leadership and management. Resilient cities have strong leadership and long-term vision. They also have the institutions that are necessary to create effective cooperation between different sectors of urban management. Resilient cities are also characterized by various indicators of good governance, including transparency, accountability, and responsibility.

Because the performance of cities is linked to the performance of other systems, it is necessary to adopt a systematic approach to understanding the mechanisms of urban resilience. Urban systems must have the necessary variety, flexibility and redundancy to replace functions in the face of change and external pressures, and must be able to absorb sudden shocks or the cumulative effect of small stresses to prevent major catastrophes. The relationship between system components can compensate for shortcomings in one or more of these components.

Figure 2 presents a comprehensive approach to urban resilience based on our review of relevant

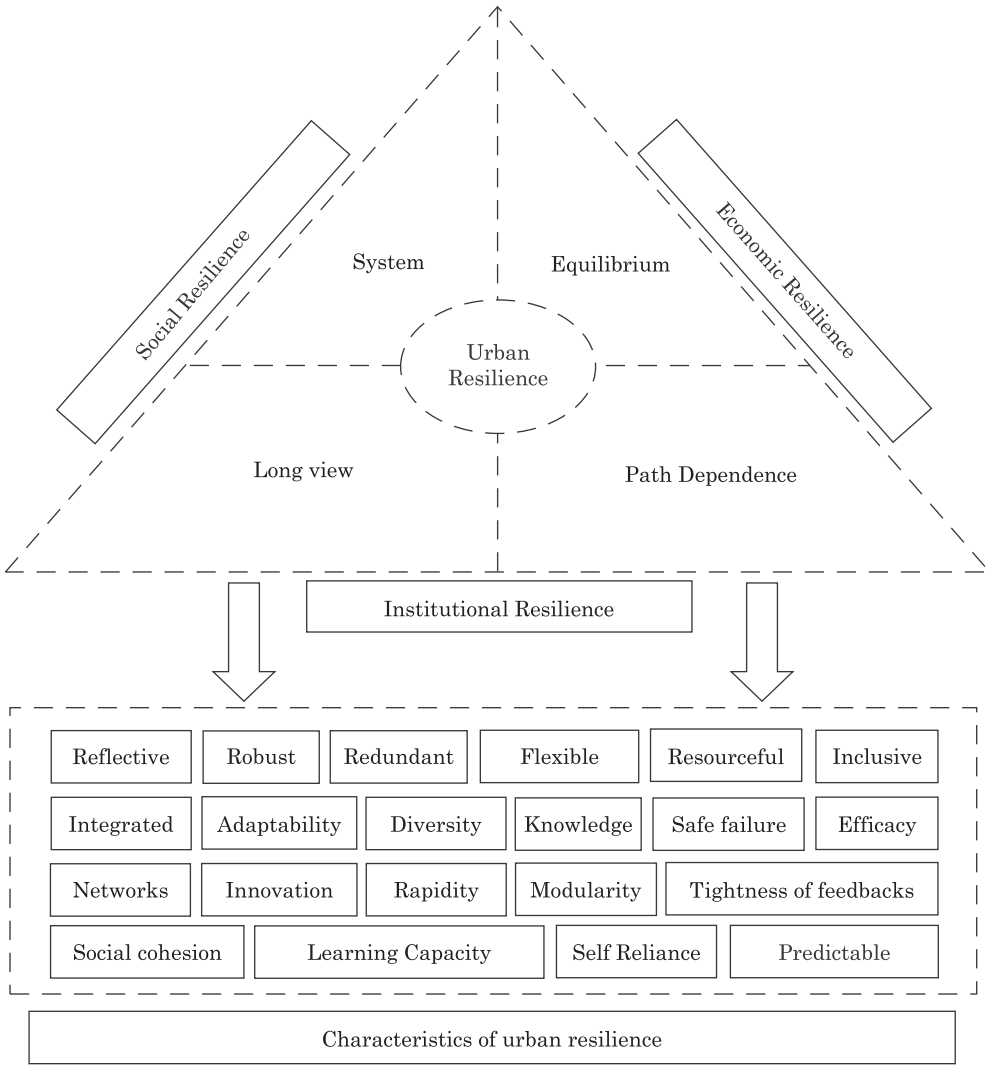

Fig. 2. Approaches, characteristics, and dimensions of urban resilience
Source: own preparation.

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literature. As can be seen, urban resilience has been examined using different approaches – equilibrium, systemic, path-dependent, and long-term – and in relation to social, economic, and institutional dimensions. Our analysis suggests that the achievement of resilience goals in all dimensions is a function of the characteristics and features of a resilient system. In other words, a resilient city is characterized by its possession of resilience strategies and characteristics such as stability, flexibility, redundancy, and resources, among others. These types of strategies are evaluated through clear and precise quantitative and qualitative research procedures. Resilient cities have sufficient capacity to respond to various events and hazards; in other words, their existing strategies are sufficiently flexible that they can be applied whenever similar circumstances occur, and are regularly evaluated and updated. The strategies of a resilient city include having sufficient resources, adopting innovative measures to overcome constraints, learning from experience, applying evidence-based information, and continuously evaluating its performance. Such systems are inclusive and able to attract stakeholders who accept responsibility for providing services to different social groups. These strategies increase the capacity of cities to absorb, adapt to, and recover from hazards.

A robust and dynamic system is necessary but not sufficient for urban resilience, since free agents can have a positive or negative impact through their choices and decisions. These decisions and actions largely reflect their social position, preferences, opportunities, and limitations, but their behavior can be influenced by rational, emotional, and past experience-based choices can influence their behavior and interactions. Knowledgeable, active, aware, and capable agents are social and cultural assets who can play a significant role in increasing urban resilience.

Urban systems and agents need efficient institutions to maximize each other's capacities and strengths. Institutions are fixed and continuous rules of behavior that enable interaction between different sectors of a society. Institutions can serve urban resilience by strengthening agents' ability to learn and innovate, while good governance increases the capacity of the urban system to deal with risks.

In summary, building a resilient city requires the following:

- Strengthening systems to reduce their vulnerability to environmental phenomena and decrease the effects of catastrophic hazards;
- Building capacity for social agents to access and maintain supportive urban systems;
- Strengthening institutions that prevent system fragility and increase agents' capacities.

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IMPLEMENTATION OF MUNICIPAL ADAPTATION PLANS TO CLIMATE CHANGES: CASE STUDY OF POZNAŃ

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ABSTRACT

The adaptation of cities to climate change is becoming an increasingly pressing need. The choice of optimal adaptation solutions for cities is difficult as it requires an individual approach. One way of avoiding poor decisions is to use the experience of cities which have already implemented adaptation solutions. The aim of the work was to identify measures conducted as part of implementation of the municipal plan of adaptation to climate change for Poznań and to evaluate if the conducted measures complied with the adopted strategic goals specific for the research area. It was found that Poznań undertakes measures on each of the four specified strategic goals, but to a different degree. Hard measures and measures of the types: mitigation, physical infrastructure, and green infrastructure prevail. Most measures are performed in the sectors of transport and biodiversity. In addition, single cases of actions which have a negative impact on the natural environment have been identified.

Keywords: city, measures, midwestern Poland, mitigation, strategic goal, vulnerable sector

INTRODUCTION

Cities as open systems are exposed to both external and internal negative phenomena. In the face of new climatic challenges, attempts at the development of resistance are made, including city adaptation to climate change [Leichenko, 2011; Szewrański et al., 2018; Wieteska-Rosiak, 2018]. Growing interest in adaptation to climate change in cities has been observed in the world since the beginning of the 21st century [Gill et al., 2007; Charlesworth, 2010; Reckien et al., 2018]. Main research topics focus on strategies for adaptation planning, and the advancement of climate action plans in particular countries [Carter, 2011; Reckien et al., 2014, 2015; Hughes, 2015; Araos et al., 2016; Karunathilake et al. 2020]. The latest challenge is to search for solutions for the post-pandemic time [Moraci et al., 2020].

Additionally, the research focuses on determining a specific character or typology of planned actions [Tompkins et al., 2010; Fidelman et al., 2013; Biagini et al., 2014; Kalbarczyk & Kalbarczyk, 2020]. On the other hand, studies on the advancement of adaptation implementation, due to a relatively early stage of adaptation planning in most cities, are comparatively rare [Heidrich et al., 2013; Olazabal & Gopegui, 2021].

In Poland, an increased interest in urban adaptation to climate change has been witnessed only recently. The first national planning documents directly addressing adaptation to climate change were created at the beginning of the 2010s [A strategic plan for the adaptation, 2013]. Thanks to the project

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coordinated by the Ministry of Environment, "Development of plans of adaptation to climate change in cities of population of more than 100 thousand" (www.44mpa.pl), until 2020 a total of 37 Polish cities of population of more than 100 thousand and 7 cities of a lower population prepared their own plans of adaptation.

Poznań started to prepare its municipal plan of adaptation to climate change in 2017 [Climate adaptation plan, 2019]. This document indicates necessary actions in response to forecast negative weather phenomena such as: heavy rains, floods, and droughts. Adaptation measures are planned to be implemented by 2030. The plan also takes into account the need of verifying the effectiveness of the implemented changes and a possible modification of the existing plan of adaptation while the document remains in force.

Information on the implemented measures can be useful not only in the determination of new directions of current activities, but also may be used to develop a catalogue of good adaptation practices. It is assumed that in the case of urban adaptation to climate change there are no ready-made solutions and each city by itself has to search for optimal actions. An important role is played here by the exchange of experiences [Guide for cities to adapt, 2015; EEA, 2016; Nowak et al., 2020]. One of the ways of avoiding wrong decisions is taking advantage of the experiences of the cities which have already implemented adaptation solutions. Therefore, there is a need of filling the gaps in the knowledge about adaptation planning and, when it is already possible, about the progress of implementation of the planned adaptation measures [EEA, 2016]. The need of tracking the progress of climate change adaptation does not raise any doubts. However, there are no adopted indices that could be used to evaluate if and how adaptation occurs [Ford et al., 2013].

The aim of the work is to identify measures conducted as part of implementation of the municipal plan of adaptation to climate change for Poznań and to evaluate if the conducted measures complied with the adopted strategic goals specific for the research area.

MATERIALS AND METHODS

Research material included the document "Climate adaptation plan for the City of Poznań until 2030" [Climate adaptation plan, 2019], approved by the City Council of Poznań in a resolution of 16th April 2019 (https://bip.poznan.pl/), as well as the content of local websites devoted to municipal investments.

The research was based on the monographic method and a review of publications in local websites: "Codzienny Poznań" (https://codziennypoznan.pl/) and "Poznańskie Inwestycje Miejskie" (PIM) (https://pim.poznan.pl/) in the period of 1st Sep. 2020 – 31st Mar. 2021, supplemented with a field inventory performed in the period from the 4th quarter 2020 to the 1st quarter 2021. The full list of identified actions is available from the corresponding author. Information about investments obtained by means of field observation was later confirmed through a thematic search of websites, which was reflected in the list of websites being a part of the list of identified measures.

The character of the planned and implemented adaptation measures was first determined based on a general division into hard and soft measures (http://www.future-cities.eu/). Soft adaptation measures include such ones which do not require big financial outlays and which relate to the development of skills and policies, behavior, education and planning, etc. [Ford et al., 2013]. Hard measures include mainly technological actions, such as infrastructural investments. In the next step, the planned and implemented measures were classified in accordance with the typology proposed by Biagini et al. [2014], later modified by Kalbarczyk & Kalbarczyk [2020]. According to this classification, planned actions can be assigned to the following types: Capacity building, Management and planning, Practice or behavior, Policy, Information, Physical infrastructure, Warning or observing systems, Green infrastructure, Financing, Technology, Health programs and Mitigation.

Moreover, being part of sectors vulnerable to climate change was determined according to the catalogue of vulnerable sectors and areas specified in the

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document of the Ministry of Environment [A strategic plan for the adaptation, 2013]. The document indicates sensitive sectors such as: Water management (WM), Biodiversity (B), Forestry, Energetics (E), Agriculture, Transport (T), Spatial Management (SM), Construction (C), Health (H) and areas: the coastal zone and mountain regions.

The identified implemented measures were then assigned to particular strategic goals mentioned in the document "Climate adaptation plan for the City of Poznań until 2030" [Climate adaptation plan, 2019]: Mitigating the negative impact of extreme thermal phenomena, including concentration of pollutants; limiting the effects of heavy rainfall and urban flooding, drought, storms and strong winds; informing about and raising awareness among urban communities of the effects of climate change; institutional and organisational improvement of urban resilience to climate change or extreme climatic phenomena.

Each of the actions was identified individually by each of the researchers and next, after comparison of the results, it was ultimately decided how to assign them to the examined types of actions, sensitive sectors, and strategic goals.

RESULTS

The progress of planning for adaptation to climate change in Poznań

The City of Poznań officially joined the project "Development of plans of adaptation to climate change in cities of population of more than 100 thousand" by the Ministry of Environment on 30th June 2015 by virtue of an agreement signed by the President of Poznań and the Minister of Environment (https://www.poznan.pl/mim/main/). Formal works began in January 2017 [Climate adaptation plan, 2019]. The City Team was appointed to work on the project. It consisted of 24 members, including representatives of the City Hall responsible for particular municipal sectors and representatives of city residents, NGOs, academic bodies, and universities, non-combined administration (e.g., RDOŚ, PGW Wody Polskie) and combined administration (WIOŚ, KM PSP). The works of the City Team were supported by a 12-member team of experts. During work on the adaptation plan, in the period from 23rd February 2017 to 17th September 2018, 8 consultation meetings and workshops occurred. The final project of the document was subjected to an open public consultation which occurred in the period of 7th – 28th December 2018. As part of the consultation, 14 residents of Poznań and two community organizations submitted comments and proposals [Report on public consultations, 2019]. The document was adopted by way of resolution of the City Council on 16th April 2019 [Resolution No. X/144/VIII/2019 of the Poznań City Council]. It can be assumed that that moment started the period of implementation of the planned measures.

Strategic goals and planned adaptation measures

The plan of adaptation to climate change for Poznań [Climate adaptation plan, 2019] aims to conduct 32 measures divided into technical, organizational, and informational educational by 2030. These measures are intended to serve the main goal, specified as "consistent implementation of the assumptions of the adaptation plan for a continuous increase in awareness, safety, and quality of life of city residents, in the conditions of climate change" and four strategic goals, described in detail later in the text.

Based on the analysis of the measures from Climate adaptation plan [2019], it was found that out of 32 planned measures, 52% could be regarded as hard; soft measures constituted 48% respectively. In the analysed document, the planned actions were classified as follows: organizational (7), informational-educational (1), technical (7), and organizational-technical (12) and educational-organizational (5).

According to the modified typology of adaptation measures [Biagini et al., 2014, Kalbarczyk & Kalbarczyk, 2020], the measures of Climate adaptation plan [2019] are concerned: capacity building (4 measures), management and planning (1), practice or behavior (0,5), policy (2), information (2), physical infrastructure (6), warning or observing systems (2), green infrastructure (4,5), health programs (5) and mitigation (5).

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Identification of implemented measures

Based on a review of local news websites, it was stated that from 1st September 2020 to 30th March 2021, reports on the actions which fit into the scope of the planned adaptation measures occurred nearly 190 times. It is noteworthy that a direct reference to adaptation to climate change could be found in four articles, a general reference to climate change in 10. The largest share (40%) among the analysed reports was that of information about work related to the mitigation of climate change. They included: construction of a tramway, bike path, and park-and-ride car park, and a change of traffic management. Next in terms of frequency (approx. 20% each) were the actions for green and physical infrastructure. The reports mainly concerned new tree plantations along Poznań's streets, regeneration of parks, greenery maintenance, and reconstruction or extension of water supply, sewage, and storm water drainage systems, construction of storage reservoirs and pavements, etc. Finally, among the most frequently reported actions, there were "capacity building" (approx. 7%). Such measures as practice or behavior, health programs, financing, information, management, and planning were referred to sporadically. Moreover, two reports concerned issues which could be classified as environmental maladaptation [Magnan, 2014] – interventionist articles about damage to trees during performed investments.

Evaluation of the progress of measures implementation in relation to the plans was made by comparing the structure of planned and implemented measures in different categories. The analysis of the structure of soft and hard measures showed a clear prevalence of infrastructural measures (76%), that were the hard ones. Moreover, the analysis of the types of planned and implemented measures revealed that the first works to be performed in the city were the ones related to climate change mitigation and green infrastructure (Tab. 1). The least advanced in relation to the plan were measures: information, warning or observing systems, policy, practice or behavior, and health programs.

Table 1. Types of planned and implemented measures in Poznań as part of municipal adaptation to climate change

Type of measures	Planned measures (in %)	Identified implementations (in %)*
Capacity building	12,5	8,2
Management and planning	3,1	1,6
Practice or behavior	1,6	0,8
Policy	6,2	0,5
Information	6,2	0,8
Physical infrastructure	18,8	19,8
Warning or observing systems	6,3	0,0
Green infrastructure	14,1	23,6
Financing	0,0	3,7
Technology	0,0	0,0
Health programs	15,6	1,3
Mitigation	15,6	38,1

* 1,6% measures were identified as maladaptation (not listed)
Source: own preparation, types of measures based on Kalbarczyk & Kalbarczyk [2020].

The comparison of the structure of planned and implemented adaptation measures in Poznań by sectors vulnerable to climate change (Tab. 2) showed that the tasks in such sectors as transport and biodiversity were performed first, and in such sectors as water management and health implementation was relatively slow.

Table 2. The structure of planned and implemented adaptation measures in Poznań by sectors vulnerable to climate change

Vulnerable sector (symbol)	Planned measures (in %)	Identified implementations (in %)
Water management (WM)	34,6	7,1
Biodiversity (B)	**15,4**	**26,1**
Energetics (E)	9,6	7,6
Transport (T)	**11,6**	**43,4**
Spatial Management (SM)	3,8	7,6
Construction (C)	1,9	0,0
Health (H)	23,1	8,2

Source: own preparation, vulnerable sectors based on A strategic plan for the adaptation [2013].

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Implementation of strategic goals

The analysis of the content of local websites and field observations confirmed the implementation of measures for the four strategic goals of the adopted Climate adaptation plan [2019] (Tab. 3).

Measures implemented under Goal 1 are among the most frequently observed in the city. Goal 1 encompasses 10 groups of measures, including 3 groups in the transport sector, 3 groups of the power sector, and 4 groups of the biodiversity sector. Transport sector tasks are implemented, e.g., through construction of bus lanes, development of intelligent transportation systems, construction of integrated transportation interchange points, further development of P+R and P+G car parks, public transport fleet replacement for higher comfort vehicles, modernization of interchange infrastructure through introduction of facilities for waiting passengers, extension of tramways, development of the metropolitan railway, introduction of solutions reducing car traffic. Another group of measures fitting into Goal 1 but referring to the power sector is represented by the continuation of the exchange of cooling and heating systems for more efficient and nonemission solutions, connecting buildings to district heating networks and reducing urban low emission, and thermal insulation of buildings. The final group

Table 3. Examples of implementation of adaptation measures corresponding to the adopted strategic goals in Climate adaptation plan for the City of Poznań [Climate adaptation plan, 2019]

Strategic goal	The number and name of an measure in Adaptation plan: – an example of implementation	Sector*
1	2	3
1. Mitigation of the negative impact of extreme thermal phenomena, including the concentration of pollutants	1.1 Introducing solutions in the organization of traffic to increase its flow: – implementation of bus lanes, https://www.poznan.pl/mim/info/news/dwa-nowe-buspasy,153133 .html [18.09.2020]; https://tenpoznan.pl/poznan-nowe-buspasy-i-nowa-jakosc-transportu-publicznego-mariusz-wisniewski-chcemy-zeby-poznanska-komunikacja-byla-najlepsza-w-polsce/ [23.05.2021]	T
	1.2 Introducing solutions to improve the functioning of public transport: – construction of new connections for tram lines, https://codziennypoznan.pl/artykul/2021-01-29/tramwaj-na-os-kopernika-coraz-blizej-jest-decyzja-rdos/ [29.01.2021] – expansion of P+R and P+G car parks, https://www.poznan.pl/mim/komunikacja/news,1185/nowe-parkingi-park-ride,160307.html [04.03.2021]; http://metropoliapoznan.pl/aktualnosci,2579,jak-korzystac-z-parkingow-parkuj-i-jedz-(p&r).html [06.05.2021] – construction of integrated transfer junctions, https://www.transport-publiczny.pl/wiadomosci /poznan-budimex-zbuduje-wezel-grunwaldzka-przy-przystanku-kolejowym-junikowo-jest-umowa- 67953.html [11.03.2021] – construction of green stops, https://www.mtp.pl/pl/aktualno%C5%9Bci/zielone-przystanki-w-poznaniu/ [23.05.2021] – fleet replacement, https://www.transport-publiczny.pl/mobile/poznan-kupuje-piec-autobusow- klasy-mini-67912.html [08.03.2021] – development of the metropolitan railway, https://koleje-wielkopolskie.com.pl/od-stycznia-2021-r-poznanska-kolej-metropolitalna-na-linii-poznan-koscian/ [23.05.2021]	T
	1.3 Continuation of changes in heating and cooling systems to be more efficient and less – or emission-free: – furnace replacement program, https://powiat.poznan.pl/dotacja-na-wymiane-piecow/ [18.01.2021] – expansion of the heating network, https://zdm.poznan.pl/pl/web/aktualnosci/view/ id/budowa-sieci-cieplnej-i-zwezenia-na-gorczynie [05.03.2021]	E
	1.4 Creation of a coordinated energy management system in public utility buildings; continuation of thermo-modernization of buildings: – thermo-modernization of buildings in Poznań, https://puls.edu.pl/projekty-ue/termomodernizacja-budynku-wtd [23.05.2021] – modernization works – raising the standard of nursery buildings, https://pim.poznan.pl/ inwestycje/w-trakcie-realizacji/prace-modernizacyjne-podniesienie-standardu-budynkow-zlobkow [11.05.2021]	E

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cont. Table 3

1	2	3
	1.5 Increasing energetic safety (modernization of the power grid, diversification of energy sources) – the program 'Słoneczne Dachy (Solar Roofs)', https://globenergia.pl/program-sloneczne-dachy-winogrady-oze-fotowoltaika-energetyka/ [28.01.2021] – modernization of the kindergarten, https://www.poznan.pl/mim/oswiata/news/energetyczna-metamorfoza-przedszkola,153931.html [06.10.2020]	E
	1.6 Development and implementation of the concept of introducing green and blue infrastructure to urban space: – https://zdm.poznan.pl/pl/web/aktualnosci/view/id/zielen-na-chwaliszewie-i-nie-tylko [01.12.2020]	B
	1.7 Introducing solutions reducing car traffic in Śródmieście: – construction of new pedestrian and bicycle routes and bicycle paths, [02.03.2021] – reorganization of traffic in terms of limiting and calming car traffic in Śródmieście, https://mapadotacji.gov.pl/projekty/746909/ [23.05.2021]	T
	1.8 Revalorization of park greenery in the city; creating new parks: – restoration of the Tysiąclecia Park, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/rewaloryzacja-parku-tysiaclecia [08.04.2021]	B
	1.9 Recreating street trees: – revalorization of the existing ones and creation of new squares in degraded places, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/przebudowa-ul-kwiatowej-na-odcinku-od-ul-polwiejskiej-do-ul-rybaki [02.11.2020] – reconstruction of Jarochowskiego Street, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/przebudowa-ul-jarochowskiego-na-odcinku-od-ul-chociszewskiego-do-ul [02.03.2021]	B
	1.10 Development of a strategy for the development of green areas – not inventoried (n.i.)	B
2. Limiting the effects of heavy rains and urban floods, droughts, storms and strong winds	2.1 Preservation and revalorization of existing watercourses and reservoirs: – reconstruction of the Górczynka watercourse, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/przebudowa-cieku-gorczynka [23.05.2021]	WM
	2.2 Undertaking joint actions to protect the catchment area of urban watercourses and lakes within the Poznań metropolis – n. i.	WM
	2.3 "In situ" rainwater management in the city; use of "clean" rainwater on the property – n. i.	WM
	2.4 Creating a system of retention and pre-treatment reservoirs: – construction of a retention reservoir in Łacina, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/budowa-zbiornika-retencyjnego-na-lacinie [18.01.2021] – construction of a retention reservoir in the Kiekrz estate, https://pim.poznan.pl/inwestycje/wspolfinansowane-ze-srodkow-ue/budowa-zbiornika-retencyjnego-na-osiedlu-kiekrz [18.01.2021]	WM
	2.5 Installation of sedimentation and flotation devices, settling tanks and separators for rainwater flowing from facilities and areas with high pollution – n. i.	WM
	2.6 Development and promotion of municipal drainage system standards; preparation of a catalog / guidelines of good practices in rainwater management: – program 'Moja Woda (My Water)', https://codziennypoznan.pl/artykul/2021-03-22/mozna-juz-skladac-wnioski-w-ramach-ii-edycji-programu-moja-woda/ [22.03.2021]	WM
	2.7 Creation of surface drainage of rainwater from the roadway to the belts of infiltrating areas, in areas with less intensive development: – construction of a rainwater drainage system in Miastkowska Street, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/budowa-jezdni-i-chodnika-w-ul-gryfinskiej-i-wyszomierskiej-oraz [28.04.2021] – extension of the Moraski Collector, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/budowa-ulicy-nadwarcianskiej-rozbudowa-kolektora-moraskiego [18.01.2021]	WM
	2.8 Reconstruction of surface water systems, including the construction of a comprehensive municipal drainage system for 20 catchments using, inter alia, natural retention methods, in particular in the "Bogdanka" catchment: – reconstruction of the Bogdanka watercourse, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/przebudowa-cieku-bogdanka [22.04.2021]	WM

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cont. Table 3

1	2	3
	2.9 Development of a hydraulic model and creation of an automatic monitoring / control system for the operation of the rainwater sewage system – n. i.	WM
	2.10 Program of inventory and assessment of the condition of tree stands in terms of their threat in the event of strong winds, gradual removal of trees that pose a threat in the event of strong winds – trees removal, https://poznan.naszemiasto.pl/wycieto-kilkadziesiat-sosen-w-poznaniu-wiekszosc-z-nich/ar/c1-8143793 [18.02.2021]	H
3. Informing the local urban community and awareness raising on the effects of climate change	3.1 Conducting a social campaign promoting good adaptation practices: – 'Moja Woda (My Water)' program, https://codziennypoznan.pl/artykul/2021-03-22/mozna-juz-skladac-wnioski-w-ramach-ii-edycji-programu-moja-woda/ [22.03.2021]; 'Odmień swoje podwórko (Change your yard)' program, https://codziennypoznan.pl/artykul 2021-03-20/ostatnie-dni-na-zgloszenie-do-akcji-odmien-swoje-podworko/ [20.03.2021] 3.2 Conducting educational activities on legal regulations in the field of environmental protection – n. i. 3.3 Improving and extending the system of warning residents against climate hazards – n. i. 3.4 Building and maintaining a platform for the exchange of knowledge about good practices in adaptation to climate change: – Poznań citizens' assembly, https://www.poznan.pl/mim/wos/news/poznanski-panel-obywatelski-za-nami-pierwsze-spotkanie-edukacyjne,160469.html [08.03.2021]; https://www.poznan.pl/mim /main/temat-panelu,p,51691, 51696.html? wo_id=344 [23.05.2021] 3.5 Strengthening and expanding cooperation with the Technology Park, universities, other research institutions in Poznań, and non-governmental organizations – n. i. 3.6 Creation and management of a database of threats and effects of extreme climate phenomena – n. i.	
4. Institutional and organisational strengthening of city's resistance to climate change or extreme climatic phenomena	4.1 Modernization of the infrastructure of social welfare facilities: – comprehensive modernization along with the expansion of the MOPR headquarters, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/kompleksowa-modernizacja-wraz-z-rozbudowa-siedziby-mopr [14.04.2021] – the new seat of the Nursing Home at Bukowska Street in Poznań, https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/dom-pomocy-spolecznej-przy-ul-bukowskiej-w-poznaniu-nowa-siedziba [02.11.2021]	H
	4.2 Organizing systemic care for seniors – creating day homes for seniors and extending the scope of their activities – n. i.	H
	4.3 Successive improvement of the standard of medical services in health care facilities in the city: – modernization of the building of the Poznań Center for Specialist Medical Services https://pim.poznan.pl/inwestycje/w-trakcie-realizacji/modernizacja-budynku-poznanskiego-osrodka-specjalistycznych-uslug [29.01.2021]	H
	4.4 Construction of watchtowers and retrofitting of equipment for the State Fire Service (SFS) and Volunteer Fire Brigade (VFB), https://pim.poznan.pl/inwestycje/zrealizowane/budowa-budynkow-na-potrzeby-miejskiego-magazynu-przeciwpowo-dziowego-oraz [23.05.2021]	H
	4.5 Organizing and conducting joint training of services as part of the cooperation of the SFS and the VFS – n. i.	H
	4.6 Preparation of spatial development guidelines in planning documents, concepts, projects, etc. Successive preparation of local plans to increase the city's resilience – n. i.	SM

* marking of sectors vulnerable to climate change as in Tab. 2, n. i. – not inventoried.
Source: own preparation.

of strategic Goal 1 is a group of biodiversity development measures. It includes regeneration of park greenery, recreation of street greenery, and development of new garden squares. No information was noted about the concepts of introducing blue-green infrastructure to urban space or strategies for development of green areas.

Strategic Goal 2 includes 10 groups of measures; 9 out of 10 are connected with the water management sector. The most often recorded tasks encompass:

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construction of storm water drainage systems, water collection systems and a storage reservoir, and redevelopment of watercourses. No actions regarding the development of standards for drainage systems, a catalogue of good practices, cooperation within the metropolis, or development of a hydrological model were recorded. The last of the measures of Goal 2 is related to the biodiversity sector. It encompasses greenery maintenance works and removal of trees posing a threat to pedestrians. For the 4 groups of actions (assigned to the water management sector), information about the start of implementation was not recorded.

Goal 3 primarily covers informational, educational, and promotional actions in 6 groups of multisector measures. In this regard, the Citizens Panel devoted to adaptation to climate change was launched. Furthermore, information about programs which promote water retention and green courtyards was distributed. Compared to the previous goals, a shortage of actions for Goal 3 is noticeable. In the case of as many as 4 out of the 6 considered groups, information about the start of implementation was not recorded.

The final strategic goal, Goal 4, includes the implementation of 6 groups of measures. Most of them, namely, 5 out of 6, are connected with the health sector; one of the groups of measures relates to spatial management. The health sector measures concern, e.g., modernization and construction of social services and health care centers, construction of warehouses, and provision of equipment for the needs of emergency services. To date, there have been no records of construction of new daycare centers, organization of joint training courses for emergency services (measures from the health sector), or development of spatial management guidelines (a measure from the spatial management sector).

DISCUSSION

The conducted analysis of implemented adaptation measures in Poznań showed a prevalence of measures in the transport and biodiversity sectors. It results from the research by Reckien et al. [2014] those tasks of adaptation plans for European cities most frequently come from the following sectors: urban planning and development, water management, health, flood protection, forestry and agriculture. A significant proportion of measures related to transport, in addition to urban infrastructure and natural environment measures, was noted in the research covering 100 cities worldwide carried out by Castán Broto and Bulkeley [2013]. In the study by Reckien et al. [2014] for European cities, transport was most often considered in mitigation plans, right after efficient energy use and renewable energy. Concentration of action on the transport sector was typical of the cities of Central and South America [Hardoy & Lankao, 2011].

Out of the types of measures implemented in Poznań, the most prevalent are the following: mitigation, green, and physical infrastructure. Co-occurrence of mitigation and adaptation measures in cities was noticed, e.g., by Charlesworth [2010], Reckien et al. [2014], and the necessity of integrating both types of measures was highlighted, e.g., by Walsh et al. [2011], Ayers et al. [2014]. Planned measures are marked by a bigger balance between the types, as in five types of measures they are planned in the proportion of 12–19% each, in another five – 2–6%; the two types were not included in the plans. The planned soft and hard measures are almost balanced. It is recommended that measures of different character (mitigation and adaptation) be balanced and complement each other [Rosenzweig et al., 2015; EEA, 2016; Gajewska et al., 2019]. Planned measures should be adjusted to the needs and conditions of a particular city [Implementing climate change, 2012]. Therefore, each city may have a different structure of planned and implemented measures. In the study by Biagini et al. [2014], adaptation measures were most frequently classified as the types: capacity building, management and planning, and practice or behavior. According to Hunt and Watkiss [2011], most of the undertaken adaptation measures could be included in the "awareness-raising" type. In Poznań, the majority of measures included the following types: physical infrastructure, green infrastructure, health

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programs, and mitigation, which slightly differed from the average structure of planned adaptation measures in other Polish big cities [Kalbarczyk & Kalbarczyk, 2020]. There were reports about damaged trees during the conducted investments. They occurred sporadically, but indicated a real threat of environmental maladaptation [Ford et al., 2013]. Damage to and removal of trees in Polish cities are not always balanced by replacement plantings [Ziemiańska et al., 2019]. It would be advisable to recognize that a badly planned and performed adaptation of one system may result in negative results in other systems [Ford et al., 2013].

According to the guidebook of adaptation [Guide for cities to adapt, 2015], each of the municipal adaptation plans should undergo verification and the planned measures should be modified depending on the speed of implementation and changing climatic conditions. Evaluation of the progress of implementation of planned tasks in Great Britain was a subject of research by Heidrich et al. [2013]. The authors showed that despite a widespread occurrence of adaptation and mitigation plans, the degree of implementation is highly diverse. Based on the analysis of the recorded actions undertaken to implement particular strategic goals, it can be noticed that the implementations of Goal 3, connected with information, education, and promotion regarding adaptation to climate change, are the least advanced. The second of the least frequent goals is Goal 4, related to institutional and organisational improvement of urban resilience to climate change. Actions undertaken to implement Goals 3 and 4 can be classified as soft, which as a rule generate lower costs than hard measures. Their relatively low advancement is fairly surprising.

According to the Climate adaptation plan [2019], the commune self-government is responsible for the implementation of adaptation measures in Poznań [Climate adaptation plan, 2019]. In the Climate adaptation plan [2019], the importance of Poznań residents' participation is also highlighted as well as the involvement of community organizations, infrastructure management units, and entrepreneurs. In some plans of the Polish cities, the entity responsible for the implementation of planned actions is not clearly indicated [www.44mpa.pl]. Such a wide and diverse group of responsible entities causes that the evaluation of the progress and, above all, the effectiveness of implementation may be a difficult task. To date, the research on the implementation of adaptation to climate change has mainly used the method of interview with the entities responsible for planned actions in a given unit [Dannevig et al., 2012; Implementing climate change, 2012].

CONCLUSIONS

The conducted research on Poznań allows confirming the implementation of measures connected with four strategic goals of the adopted Climate adaptation plan [2019]. The biggest advancement can be observed in the actions reflected in Goal 1: "Mitigation of the negative impact of extreme thermal phenomena, including the concentration of pollutants". A considerable number of implementations were also recorded regarding the actions of Goal 2: "Limiting the effects of heavy rains and urban floods, droughts, storms, and strong winds". There is a prevalence of implementation of hard measures as well as of actions of the types: mitigation, physical infrastructure, and green infrastructure, in the transport and biodiversity sectors. Among the recorded works, there are both actions which continue tasks from earlier years, that is, from before the adoption of the plan of city adaptation to climate change, and new measures which respond to the challenges caused by climate change. Single cases of action resulting in environmental maladaptation have also been identified. The conducted review of thematic and city websites does not exhaust the list of all introduced actions. However, it may point to these measures which are most visible in the urban fabric, arouse the biggest interest of residents, and/or constitute a reflection of the communication policy of Poznań's authorities. The presented method evaluating implementation of adaptation plans enables the recording of actions performed by very diverse entities. While the identi-

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fication of measures fitting into the planned strategic goals may be satisfactory, a real evaluation of the effectiveness of implementation remains a big challenge for future researchers. The presented research results may contribute to creating improved methods which verify the implementation of plans of adaptation to climate change. Assessment of implementation of particular types of actions and sensitive sectors is important in terms of effective coordination while implementing urban adaptation plans.

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SUPPORT FOR RESTRICTING THE POSSIBILITY OF AFRICAN SWINE FEVER SPREAD UNDER THE RURAL DEVELOPMENT PROGRAMME 2014–2020

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ABSTRACT

Of the many measures under Polish Rural Development Programme (RDP) 2014–2020, the aid instrument entitled "Support for investments in preventive measures aimed at reducing the effects of probable natural disasters, adverse climatic phenomena and catastrophes" is the focus of this publication. This mechanism is intended to support, inter alia, agricultural producers at risk of damage caused by natural disasters such as African swine fever (ASF). The aim of the article is to attempt to analyse whether, and to what extent, this form of support ensures the sustainability of an agricultural producer's business by restricting the possibility of African swine fever spread. The author focuses on an analysis of normative solutions contained in the instrument to support investments aimed at preventing the destruction of agricultural productive potential, offered by RDP 2014–2020. The aid form concerned encourages agricultural producers to initiate preventive measures arising from the biosecurity programme aimed at restricting the spread of African swine fever. These are preventive in nature and enable making specific investments to prevent the destruction of agricultural productive potential due to the emergence of specific epizootic events.

Keywords: Polish Rural Development Programme 2014–2020, financial aid, African swine fever, biosecurity programme, investment, farm

INTRODUCTION

Financial assistance through the European Agricultural Fund for Rural Development is implemented in Poland under a single aid scheme entitled "Rural Development Programme for 2014–2020 (RDP 2014–2020)". It implements the general objective [Czechowski, 2019] and specific objectives corresponding to the mission and objectives of the Common Agricultural Policy as well as to the European Union rural development priorities [Giemza, 2017]. These objectives include instruments to support investments aimed at preventing the destruction of agricultural production potential. Of the many measures under RDP 2014–2020, the aid instrument entitled "Support for investments in preventive measures aimed at reducing the effects of probable natural disasters, adverse climatic phenomena and catastrophes" is the focus of this publication [Mickiewicz & Mickiewicz, 2015]. This mechanism is intended to support, *inter alia*, agricultural producers at risk of damage caused by natural disasters such as African swine fever. Even

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though the issue of production risk in agriculture has been addressed by both lawyers and economists [Jeżyńska, 2008; Rembisz, 2013], the matter concerned has been the subject of research conducted by only a few authors [Lipińska, 2019] and has not been analysed at length.

The aim of the article is to attempt to analyse whether, and to what extent, this form of support ensures the sustainability of an agricultural producer's business by restricting the possibility of African swine fever spread. The author focuses on an analysis of normative solutions contained in the instrument to support investments aimed at preventing the destruction of agricultural productive potential, offered by RDP 2014–2020. According to the assumptions, this measure is intended to promote preventive measures aimed at reducing the effects of probable natural disasters, adverse climatic phenomena and catastrophes. The lack of adequate protection for an agricultural producer can, in extreme cases, contribute to the cessation of agricultural activity.

The study applied a dogmatic method for analysing regulations as well as a descriptive method. Moreover, the study used the literature on the subject as well as statistical data through access to public information, derived from the Agency for Restructuring and Modernisation of Agriculture (ARMA) and presenting the level of agricultural producers' use of public aid offered. Based on the indicated research material, final conclusions will be presented.

Support as part of preventing the destruction of agricultural productive potential

The protection of sustainability of an agricultural producer's business often involves the need to commit specific financial resources. This primarily concerns activities aimed at reducing the risk of conducting agricultural activities to eliminate its possible adverse effects. In the preamble to the Basic Regulation (EU) No. 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No. 1698/2005 (O.J. L 347), the legislator pointed out that the agricultural sector, more than other sectors, was subject to damage to its productive potential caused by natural disasters. Accordingly, to support farms' profitability and competitiveness in the face of such disasters or phenomena, support should be granted to help farmers protect agricultural production potential. This is precisely what the financial support through the European Agricultural Fund for Rural Development, implemented in Poland under a single aid scheme, is intended for [Litwiniuk, 2018].

RDP 2014–2020 was developed based on European Union regulations, in particular, the already mentioned Regulation (EU) No. 1305/2013 of the European Parliament and of the Council of 17 December 2013, and on delegated and implementing acts of the European Commission. In accordance with European Union regulations, RDP 2014–2020 is integrated into the overall system of national development policy, particularly through the Partnership Agreement mechanism. This Agreement sets out a strategy for the use of EU funds to achieve the common EU objectives as set out in the EU's growth strategy "Europe 2020: A strategy for smart, sustainable and inclusive growth", taking into account the development needs of a particular Member State [Błażejczyk & Kazimierczuk, 2018]. RDP 2014–2020 offers instruments to support investments aimed at preventing the destruction of agricultural productive potential by the effects of a natural disaster [Stankiewicz, 2008].

The tasks related to the implementation of RDP 2014–2020 have been granted, pursuant to Article 5 of the Act of 20 February 2015 on supporting rural development with funds of the European Agricultural Fund for Rural Development under the Rural Development Programme for the years 2014–2020 [Journal of Laws of 2015, item 349], to the Minister of Agriculture and Rural Development who acts as the Managing Authority. The intermediate body responsible for a safe electronic system for recording, storing and reporting statistical information on the programme and its implementation is the Agency for Restructuring and Modernisation of Agriculture (ARMA) [Jarosiewicz et al., 2011]. Pursuant to Article 4(2) of the Act of 9 May 2008 on the Agency for

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Restructuring and Modernisation of Agriculture [Journal of Laws of 2016, item 1512, as amended], the Agency's task is, in particular, to support undertakings related to the resumption of production on agricultural farms, and special sections of agricultural production in which damage caused by natural disasters has occurred within the meaning of regulations on the insurance of crops and farm animals. Total public funds allocated for the implementation of RDP 2014–2020 amount to more than 13.6 billion EUR, including more than 8.6 billion EUR from the European Union budget and more than 4.9 billion EUR of national contribution [Stoksik, 2013]. The main objective of RDP 2014–2020, which is consistent with the mission and objectives of the Common Agricultural Policy [Spychalski, 2004], includes an improvement in the competitiveness of agriculture, sustainable management of natural resources and climate action and sustainable territorial development of rural areas [Wigier, 2011].

Aid increasing the sustainability of an agricultural producer's business takes both *ex post* and *ex ante* forms [Kazimierczuk, 2021]. The first form of aid is triggered by the occurrence of a specific event resulting in damage [Litwiniuk, 2016]. On the other hand, an example of financial support taking the *ex ante* form, i.e. that granted prior to the occurrence of a risk of natural disasters, is the measure under RDP 2014–2020, set out in Regulation of the Minister of Agriculture and Rural Development of 14 July 2017 on detailed conditions and procedures for the granting and payment of financial aid for operations "Investments preventing the destruction of agricultural productive potential" under the sub-measure "Support for investments in preventive measures aimed at limiting the effects of probable natural disasters, adverse climatic phenomena and catastrophes" [Journal of Laws, item 1478, as amended]. It is implemented as part of two operations, i.e. restricting the possibility of African swine fever spread and the protection of agricultural production against the effects of adverse weather phenomena.

There are several reasons for taking the indicated direction in both cases. Primarily livestock safety and health protection issues. The emergence of ASF in a herd leads to considerable drops in production and usually results in 100% mortality of animals. The outbreak of the disease entails considerable financial losses due to the costs of its eradication on the farms where it has been found. This justifies the initiation of preventive measures arising from the biosecurity programme pursuant to Regulation of the Minister of Agriculture and Rural Development of 29 July 2016 amending Regulation on the introduction of the "Biosecurity Programme aimed at the prevention of African swine fever spread" for the years 2015–2018 [Journal of Laws of 2016, item 1153, as amended] aimed at limiting the spread of this disease. As regards the second type of support, it is the climate change considerations that are decisive. Water excesses or deficits are the main determinants of an increase in crop yields for a large part of the country's agricultural land. The scale of these weather phenomena can be systemic in nature and, thus, affect many agricultural producers over vast areas. To this end, the legislator envisages support directed to water companies for the improvement and maintenance of water and drainage systems [Rakoczy, 2018; Paczuski, 2006]. Pursuant to Article 195 of the Water Law Act of 20 July 2017 [Journal of Laws of 2018, item 2268], these measures involve the regulation of hydrographic conditions to improve the productive capacity of soil and facilitate its cultivation and the protection of agricultural land against flooding.

Support is granted to a beneficiary based on the agreement on the granting of assistance, concluded with the Director of ARMA regional office. A relation under civil law enables proper control of the use of the aid. One should agree with Stanisław Prutis [2009] who points out that an agreement is a flexible instrument which enables, under the principle of freedom of contract, individualised determination of the manner of use of the funds, which is particularly important when the aid is granted for investment purposes. The civil procedure safeguards the control of the fulfilment of conditions for applying for aid and gives beneficiaries the right to be granted aid in a situation in which specific conditions have been met.

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Support for biosecurity to prevent the spread of African swine fever

The reason for the implementation of the second type of operation under the measure "Support for investments in preventive measures aimed at limiting the effects of probable natural disasters, adverse climatic phenomena and catastrophes" is related to the fact that currently, the greatest problem to animal production is African swine fever which affects Eastern European countries, including Poland. ASF is an infectious viral disease to which pigs, boar-pig hybrids and wild boars are susceptible. In the event of an ASF outbreak in a herd, considerable drops in production occur. It should be stressed that this disease is not treated due to the lack of a proper vaccine and only combated on farms where it has been found. Another major problem is the restriction on the sale and export of pigs or their meat, both domestically and abroad which undermines the producers' economic position.

The issues related to biological security in Poland are governed by the Act of 11 March 2004 on the protection of animal health [Journal of Laws of 2016, item 1605]. Specific solutions in this regard were introduced in 2015 to reduce the number of farms with low biosecurity standards to restrict the spread of infectious diseases of susceptible animal species housed on farms [Litwiniuk, 2017]. It should be added that the addressing of biosecurity issues by the legislator resulted from the intensification of problems related to the ASF virus outbreak in 2014 in the north-eastern part of Poland. The Act in question sets out the principles for the control of infectious animal diseases in a synthetic manner by primarily conferring competencies on competent state authorities as regards the development and implementation of the programme. On the other hand, detailed issues are contained in implementing regulations. Accordingly, the methods and procedure in the event of suspected African swine fever or the confirmation of the disease, as well as the conditions for determining the protection, surveillance and polluted areas and the measure applied to combat the disease, the method for cleaning and disinfecting and the conditions and method for reintroducing pigs on a farm are set out in Regulation of the Minister of Agriculture and Rural Development of 6 May 2015 on controlling African swine fever [Journal of Laws of 2015, item 754].

In order to implement the assumptions of the aforementioned Act, based on Article 57e, the Minister of Agriculture and Rural Development introduced, under Regulation of 3 April 2015 on the introduction of the "Biosecurity programme aimed at preventing the African swine fever spread" for the years 2015–2018 [Journal of Laws of 2015, item 517, as amended], the "Biosecurity programme aimed at preventing the African swine fever spread" for the years 2015–2018. It is aimed at limiting the spread of the ASF virus from wild animals to pig livestock, and between pig herds kept on farms. On this basis, the detailed requirements to be met by farms were adopted. Accordingly, they refer to appropriate safeguards, including fences and buildings, the implementation of a programme for rodent monitoring and control, carrying out periodical pest control treatments, keeping a register of means for transporting pigs and appropriate procedures followed by persons having contact with animals.

The measures aimed at controlling the African swine fever, taken by the European Union, resulted in the European Commission approving amendments to the Rural Development Programme for the years 2014–2020 by Commission Implementing Decision No. C(2016)8568 of 9 December 2016 approving the amendment of the rural development programme of Poland for support from the European Agricultural Fund for Rural Development and amending Implementing Decision C(2014) 9783. The amendments concerned the introduction into the Rural Development Programme for the years 2014–2020 of measures to support limiting the effects of the emergence of cases of African swine fever in Poland in the operation type "Premiums for the start-up of non-agricultural activities" and in the operation type "Restructuring of small farms", and in the sub-measure "Support for investments

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in preventive measures aimed at limiting the effects of probable natural disasters, adverse climatic phenomena and catastrophes" [Lipińska, 2017].

Under the recent measure of RDP 2014–2020, which is the subject of analysis of this article, aid is also granted (except the previously mentioned water companies) to a farmer who is either an autonomous or dependent possessor of a property located in the territory of the country in which he/she rears or breeds no fewer than 50 pigs and is planning to carry out an operation aimed at the prevention of African swine fever spread by means of the fencing a pig house along with the area necessary for the handling of pigs; constructing or improving a covered disinfection trough; the purchase of disinfection equipment; the reconstruction/repair of rooms to ensure that pigs are kept on the farm in separate, closed rooms [Kazimierczuk, 2020].

Aid is granted in the form of a refund of a part of incurred and documented eligible costs of the operation in the amount of up to 80% of eligible costs. Support is granted based on the agreement on the granting of assistance, concluded by the Director of the ARMA regional office. The aid is granted and paid up to the limit amount which, during the period of programme implementation, amounts to a maximum of 100,000 PLN per beneficiary, for a farmer who is either an autonomous or dependent possessor of a property located in the territory of Poland and rears or breeds no fewer than an average of 50 pigs per annum on a property located in the territory of Poland.

The order in which farmers are eligible for aid is determined based on the data contained in the register of marked farm animals and the locations of these animal herds, referred to in the Act of 2 April 2004 on the system of identification and registration of animals [Journal of Laws of 2004, No. 91, item 872, as amended]. The number of pigs is determined by dividing the total number of pigs kept by the farmer on the last day of each of 12 months preceding the month in which the date of commencement of the period for applying for aid falls, by the number 12. The data are extracted from the above-mentioned register as of the date of commencement of the period for applying for financial aid.

The use of offered public aid by agricultural producers

The offered public aid leads to the reconstruction of certain relationships and dependencies occurring between conducting production activities and unexpected changes taking place due to the spread of African swine fever. The analysed support, of a strictly investment character, may indirectly contribute to the improvement in farm profitability, competitiveness and economic sustainability. Analysis of the data obtained through access to public information from the Analysis and Reporting Department of the Agency for Restructuring and Modernisation of Agriculture indicates significant interest in this measure, particularly in Wielkopolskie, Kujawsko-Pomorskie, Łódzkie, Mazowieckie and Warmińsko-Mazurskie Voivodeships. It should be noted, however, that the first call for applications for financial assistance, held in 2017, attracted relatively little interest. Swine producers submitted applications for financial assistance in only four voivodeships in which the first ASF outbreaks occurred, i.e. in Lubuskie, Podlaskie, Mazowieckie and Warmińsko-Mazurskie. However, the subsequent calls for proposals indicate a significant increase in the number of applications submitted to the ARMA. The reason for this state of affairs was the rate of African swine fever spreading in the territory of Poland and the resulting need to limit it by implementing a biosecurity programme aimed at preventing the spread of ASF. This resulted in the actual submission of applications for support to control the spread of African swine fever in sixteen Polish voivodeships.

In all calls for proposals held in 2017, 2018, 2019, and 2020, a total of 5,700 beneficiaries in Poland applied for aid in an amount of 296,000,000 PLN. The great interest in this form of aid is undoubtedly influenced by the 80% level of refund of eligible costs incurred, while under other RDP 2014–2020 measures, the level of aid is usually 50%. The analysed form of support significantly contributed to an increase in the protection of farmer's business. Detailed characteristics are provided in Tables 1 and 2.

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Table 1. Data concerning the level of assistance used as part of controlling the spread of African swine fever in 2017 and 2018

Voivodeship	2017		2018	
	number of applications	total amount applied for [PLN]	number of applications	total amount applied for [PLN]
Dolnośląskie	0	0	13	845,835.69
Kujawsko-Pomorskie	0	0	375	23,420,110.89
Lubelskie	93	5,549,919.57	181	10,486,714.37
Lubuskie	0	0	24	1,522,946.00
Łódzkie	0	0	233	10,811,837.19
Małopolskie	0	0	47	3,269,385.01
Mazowieckie	39	1,622,532.21	243	14,302,840.76
Opolskie	0	0	77	3,554,180.54
Podkarpackie	0	0	55	3,138,761.15
Podlaskie	56	3,744,105.81	90	5,950,292.23
Pomorskie	0	0	159	10,565,624.15
Śląskie	0	0	57	3,505,076.21
Świętokrzyskie	0	0	48	2,347,162.50
Warmińsko-Mazurskie	7	563,624.00	152	9,252,473.22
Wielkopolskie	0	0	727	40,009,314.33
Zachodniopomorskie	0	0	2	132,952.00
Total	195	11,480,181.59	2483	143,115,506.24

Source: own study based on the data obtained from the Analysis and Reporting Department of the Agency for Restructuring and Modernisation of Agriculture.

Table 2. Data concerning the level of aid used as part of controlling the spread of African swine fever in 2019 and 2020

Voivodeship	2019		2020	
	number of applications	total amount applied for [PLN]	number of applications	total amount applied for [PLN]
Dolnośląskie	30	1,601,124.96	10	516,350.60
Kujawsko-Pomorskie	359	18,492,047.94	232	11,259,246.60
Lubelskie	77	3,422,685.20	29	2,090,330.40
Lubuskie	5	338,088.00	8	493,833.20
Łódzkie	337	12,942,971.14	137	5,288,443.04
Małopolskie	40	1,761,708.20	14	730,807.00
Mazowieckie	170	8,866,356.23	88	4,564,108.48
Opolskie	61	2,386,745.00	22	974,186.40
Podkarpackie	23	1,039,707.20	11	748,805.44
Podlaskie	34	1,531,415.40	22	756,185.96
Pomorskie	116	6,257,527.80	48	2,638,207.40
Śląskie	48	2,020,034.40	16	834,612.00
Świętokrzyskie	34	1,294,466.10	17	933,944.00
Warmińsko-Mazurskie	174	8,571,863.40	52	2,508,600.60
Wielkopolskie	462	18,617,594.75	368	16,529,857.75
Zachodniopomorskie	14	1,094,248.00	6	455,104.00
Total	1984	90,238,583.72	1080	51,322,622.87

Source: own study based on the data obtained from the Analysis and Reporting Department of the Agency for Restructuring and Modernisation of Agriculture.

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CONCLUSIONS

The above considerations result in several conclusions. Financial support through the European Agricultural Fund for Rural Development is implemented in Poland under a single aid scheme RDP 2014–2020 [Litwiniuk, 2018], which offers instruments to support investments preventing the destruction of agricultural productive potential prior to the effects of a natural disaster [Czechowski, 2019]. As regards the measure "Support for investments in preventive measures aimed at limiting the effects of probable natural disasters, adverse climatic phenomena and catastrophes", this aid has a narrow substantive scope and is a response to the emerging need for state intervention in connection with epizootic and land improvement hazards. In view of the scale of the occurring phenomena, their possible effect and impact on the safety of (not only) the rural environment and their cost-intensity, the legislator incorporated them into the area of aid being granted. Appropriate support is granted *inter alia* as part of the operation to control the spread of African swine fever. The aid form concerned encourages agricultural producers to initiate preventive measures arising from the biosecurity programme aimed at restricting the spread of African swine fever. These are preventive in nature and enable making specific investments to prevent the destruction of agricultural productive potential due to the emergence of specific epizootic events. In view of the increasing area of the ASF disease occurrence in Poland (which contributes to increasingly stringent requirements for the protection of livestock health) it appears reasonable that the legislator should include the discussed instruments to support agricultural producers in the future financial perspective for the years 2021–2027.

It can be assumed that the analysed form of *ex ante* support, i.e. the "Support for investments in preventive measures aimed at reducing the effects of probable natural disasters, adverse climatic phenomena and catastrophes" effectively protects agricultural producers and ensures the sustainability of their business in relation to specifically indicated risks. The establishment of favourable financial conditions in these cases, as well as the introduction of clear regulations, contribute to an increase in farmers' interest in adopting specific attitudes towards active risk management of agricultural activities and, thus, increasing their resilience to emerging crises.

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CITIES AFTER PANDEMIC: ENABLING SOCIAL DISTANCING AS A NEW DESIGN STANDARD TO ACHIEVE URBAN IMMUNITY

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ABSTRACT

Motives: COVID-19 pandemic has caused worldwide implementation of unprecedented measures of physical distancing to decrease the potential of the COVID-19 infection. As cities respond to closure measures in order to flatten the infection curve, the challenges associated with the spread of the epidemic and the increasing numbers of infected and deaths that compel us to fundamentally rethink the formation of our cities, especially their streets, the research presents an urban review of the impact of the pandemic on cities and find solutions to recover, achieve a safe and sustainable healthy environment, and prepare better for any pandemic that may occur in the future, the research seeks to strengthen the theory of prevention, which the research proposes to call (urban immunity) by including social distancing as a design criterion in the city that has proven effective in flattening the curve.
Aims: This paper focuses on the mechanisms related to sustainable mobility after COVID-19 in shaping urban mobility and initiating a green transformation in urban transportation rapidly by decarbonizing and promoting cycling and walking across all over the city.
The research methodology depends on identifying the most important urban problems that Al-Dhubat Street suffers from and proposing solutions that reduce dependence on private transportation and move towards sustainable mobility as an important step in strengthening urban prevention against any epidemics that may occur in the future, and then testing indicators on the Al-Dhubat Street to identify effective indicators.
Results: The research concluded that social distancing is the way back to active mobility by relying on walking and bicycles and works to restore the right of pedestrians in the streets and sidewalks instead of cars and thus achieve sustainable urban development, which enhances the urban immunity of the city against any other epidemics may occur in the future. With the proposed interventions on Al-Dhubat Street we can keep car use low and promote walking and cycling for a sustainable, equitable, habitable, and healthy community after the pandemic.

Keywords: physical distancing, urban immune system, hyper POD, 15-minute city, sustainable, COVID-19

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INTRODUCTION

Unprecedented measures of physical distancing have been considered since the appearance of the Coronavirus pandemic to prevent and restrict the outbreak of COVID-19. These measures include the closure of schools, placed people under curfew to remain indoors between specified hours or specified days, and focusing on reducing the number of physical interactions between people [Karl et al., 2020]. Especially since the health and economic repercussions of the epidemic have greatly affected countries [Barbarossa, 2020] the pandemic is expected to reduce global GDP by 5 to 10 percent [Avetisyan, 2020]. Social distancing is seen as one of the most effective methods of containing the virus and protecting public health that has taken from physical distancing as a key policy measure to contain the Pandemic [Honey-Rosés et al., 2020].

Cities grew in a way that promotes the idea of social interaction and thrive in it, but epidemics stand against that and exploit our drive to gather, today and after the epidemic has become a part of life everywhere [Avetisyan, 2020] and with the continuous increase in the number of infections and deaths caused by the COVID-19, that reveals us that our cities are not prepared for fending off such epidemics [Gupta et al., 2020] the infectious diseases that appeared in the past reveal the ability of architecture, design and urban planning to demonstrate the strength of the post-crisis development of our built environment [Megahed & Ghoneim, 2020] therefore, urban thinking must develop in a way that accommodates the infected population and considers the psychological and social ramifications produced by the epidemic to create safe healthy environments [Salama, 2020].

Our streets are the key to our physical, psychological, and immune health. They are an important tool of public health. Streets are places of rest, especially for people who do not have balconies or gardens and provide spaces for sports and playing near their homes, especially in compliance with the guidelines of physical distancing. Therefore, the streets must meet the needs of the people by moving safely, freely, and efficiently around the city, and support walking and cycling to restore the economic recovery and go beyond a return to the unfair and unsustainable patterns of the past [NACTO & GDCI, 2020]. The outbark give an opportunity to reconsiders the principles used to design streets by providing spaces for pedestrians and cyclists, achieving the principle of social distancing, and preventing cars from some streets to create a healthier, sustainable, and green city [Eltarabily & Elghezanwy, 2020] therefore, cities now invited to reconsider their approach to dealing with crises and implement new design strategies capable of dealing with health crises by creating an anti-virus environment [Barbarossa, 2020].

One of the Post-Pandemic design strategies is the model of 15-Minute City that was invented by Carlos Moreno as substitute planning approach during the circumstances of Pandemics [Moreno et al., 2021]. While Paris works with Carlos Moreno idea from the concept of the 15-min approach promotes for planning that takes into consideration the neighbourhood-level urban, Sweden is following a hyper-local twist that endorses to create a new design for each street in the country cites [O'Sullivan, 2021].

This paper proposed a strategy to include social distancing as a new design standard, especially regarding urban mobility, and explain how physical distancing supports safe mobility and access to achieve urban immunity to recover from the current pandemic and prepare for any future pandemic that may occur.

SOCIAL DISTANCING

The term Social Distancing is a precaution procedure to reduce the physical interaction among people by keep safe distance to limit the potential of infection. It is an important strategy and non-pharmaceutical intervention for mitigation spread of infectious diseases that works to delay the spread of infectious diseases and gain time for producing vaccines and drugs [Mishra & Majumdar, 2020]. The World Health Organization (WHO) has explained that the social distancing refers to the distancing physically to keep people in contact, for this the term has changed to physical distancing [Friedland, 2020].

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Social distancing practice promotes the common good and changes the behaviour of people around the world by protecting others as much as a commitment to protect ourselves [Mishra & Majumdar, 2020]. Price and Holm conclude "That the number of state-level COVID-19 infections decrease with respect to our measure of individual social distancing. Our estimates also appear to be practically significant and consequential, suggesting that each minute of social distance lowers COVID-19 infections by approximately 1000 across the states. This would translate into approximately 480,000 less COVID-19 infections across the states if the typical individual were to social distance for 8 hours" [Price & Holm, 2021].

Social distancing is a societal mitigation strategy that works to prevent the spread of an infectious disease or slow down its spread locally, nationally, and internationally by maintaining a physical distance between people in indoor and outdoor spaces and avoiding large gatherings, this distance varies from time to time and from country to country.

URBAN IMMUNITY

Immunity

Urban physical environment of Cities has been affected by the intangible changes that influence to those cities, which represents the receptors of disturbance or the immunity sensors of the urban system. Therefore, designers and planners need to apprehend the mechanism work of immunity of urban systems to discover the value of the inveterate immunity in cities [Chen & Hsu, 2015]. Immunity is the body's ability to distinguish the substances of the original body (itself) and eliminate foreign substances (non-self). The protection from infectious diseases provides by the ability of discriminatory as the immune system identified most microbes as foreign by the immune system and usually Immunity to the microbe is indicated by the presence of the antibody to that organism [Cohen & Bordin, 2015]. Antigens are foreign substances that are recognized by the immune system that stimulate the immune response and restore homeostasis [Pier, 2004].

Antigens to cities

The city is associated with types of risks, which range from minor stresses to sudden disasters, and cities possess immunity only from the risks that are expected to act in way like organisms gather to gather antibodies against the antigens face in the same way that organisms amass antibodies against the antigens they confront [Bristow & Mohareb, 2020].

The way that immunity work by the urban system begins when antigen attacks the urban system of the city, and cities' antigens basically divide into two main sorts: first unexpected. Second expected discord. The unexpected discord such as fires, epidemics, earthquakes, floods, and inappropriate urban designs plans. The expected discord refers to urban plans/designs appropriate new planning knowledge and the appearance of new human activities [Chen & Hsu, 2015].

Urban Immune system

From the perspective of biological immunity, the comparison between the components of biological immunity and parts of the city can show how the city deals with unexpected and unwanted events. For example, the skin may act like a flood barrier while the response for the new emergency and construction can be considered like the aspects of the lymphatic system and T cells that are like the dangers that are activated for Emergency response to pathogens [Bristow & Mohareb, 2020]. The immune cell receptors within the immune system can detect external disturbances and then trigger a chain reaction towards them. As for the immune-based urban system, the physical urban form is the factor that senses the disturbances and then triggers the response to counter the system change [Chen & Hsu, 2015].

According to Reith, the form of physical complex Urban with variety of scales has variety levels of stability, where city plans can be more stable than the texture of the building and the presence of a building texture may be more stable than a single building unit. The pattern of land use and urban buildings is the smallest unit that can be observed, and it can be

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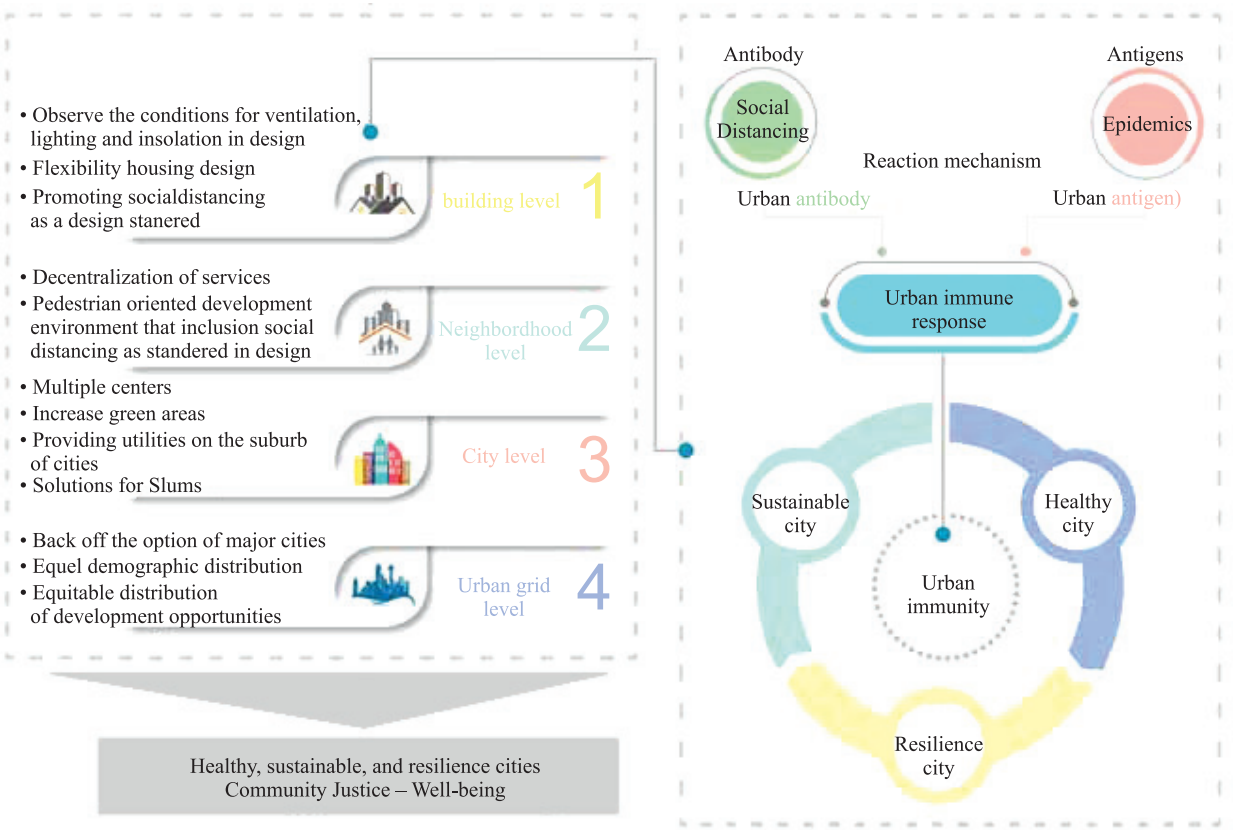

Fig. 1. The urban immunity mechanism
Source: own elaboration.

considered as the basic unit for expressing the change of the city, and it is possible for a transformation to occur at this level easily. As for the second level of the urban form, it is building the fabric level, and at this level, the possibility of interaction of urban form with a group of activities because it consists of different types of buildings, construction pattern, land use, street system [Conzen, 2009].

Cities can improvement by the immune system to adjust for the changing happened in the world and formed as resilient systems. When urban system reached a critical point of urban system influenced by the disturbances, a series of transformation in each level of complex form will be triggered. Whenever, the urban system effected by the disturbance that interfere with the context in spatial temporal specifically. The Urban Form works as corresponding process for the reaction, also the memory of immune response kept in the form of the physical urban. Collect immunity reaction memories for an assigned event make more easier and give ability to eliminate same disturbance in the future. Physical Form will identify the action of people for a certain extent. Accordingly, the system of immune system may take the same routing direction unless the area context changed for a reason [Chen & Hsu, 2015].

Based on the mechanism of urban immunity that will occur through the interaction of the antigens (risks facing cities) and that attacks the urban system of the city with the antibodies to make an adaptive urban response through a mechanism (urban antibody – urban antigen) via an urban immune reaction.

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Considered that the antigen (epidemics) and the antibody produced by the urban immune system of the city against this antigen is (social distancing) and thus will achieve adaptive immunity with the ability to change and adapt in the face of those disasters to become the urban immunity as a strategy in dealing with any future pandemics. Accordingly, urban immunity can be defined as the immunity that the city possesses through the ability to resist and the ability to change and adapt by the mechanism of urban immunity through the interaction of the urban antigen (risks that cities face) with the urban antibodies (any emergency response to pathogens in cities such as a new building or Amendment or creation of a new design standard etc.) with the aim of restoring balance to the body of the city.

SOCIAL DISTANCING AS A NEW DESIGN STANDARD

Paul Lewis and others introduced a visual graphic to the challenges of living in the time of COVID-19 with a particular attention to a range of scales, from classrooms to urban areas. With social distancing protocols now in place and a better understanding of the virus's transmission through aerosol particles there is an increased insistence for outdoor public space, particularly along the commercial corridors that endure a community's everyday needs. Measures like Open Restaurants allows businesses to more rapidly expand into nearby sidewalk and parking zones to provide outdoor dining space. A more equitable division of street space can be distributed amongst pedestrians and vehicles. The widening of sidewalks allows more space for business frontage, creating a more permeable storefront that better engages the sidewalk and community. Bike lanes could gain greater prioritization through widening and added protection with the installation of their own curb [Lewis et al., 2020].

Among the most common measures that adopted by frontline cities against pandemic: removing vehicle traffic from residential streets, the sidewalks close to shops, schools and parks extended to anticipated more safe streets and give priority for the public transit, cycling raiders and walkers. Eventually, the previous procedures work to support local economies and enable the communities to participate in the process. Furthermore, providing safe spaces for public and green spaces across neighbourhood and take actions to prevent roads and squares used for the traffic motorization [NACTO & GDCI, 2020].

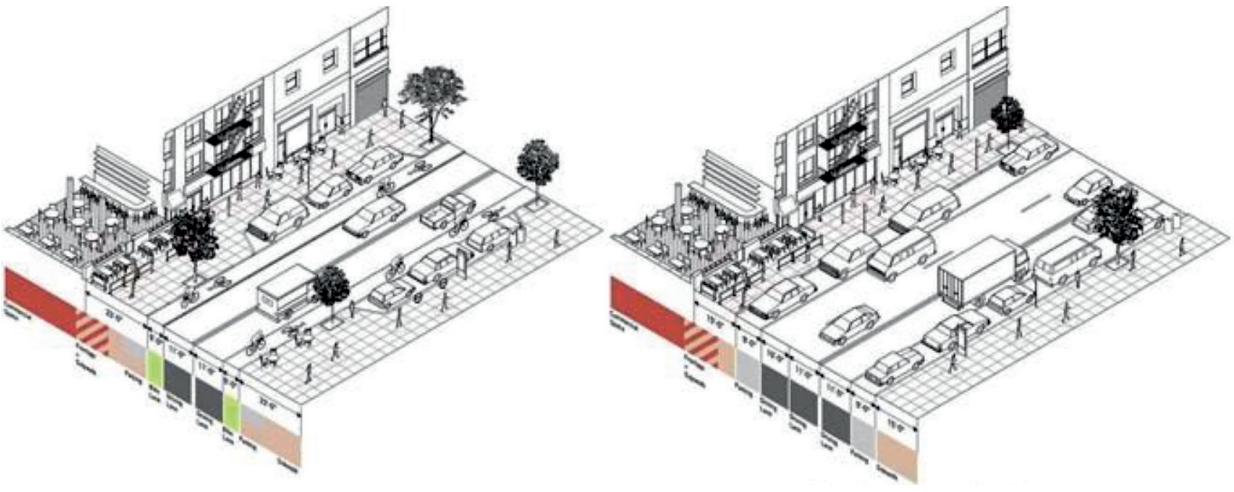

Fig. 2. Existing Condition for tow way commercial street and suggested best practices for Future Streets Condition to Many of New York's streets
Source: Lewis et al., 2020.

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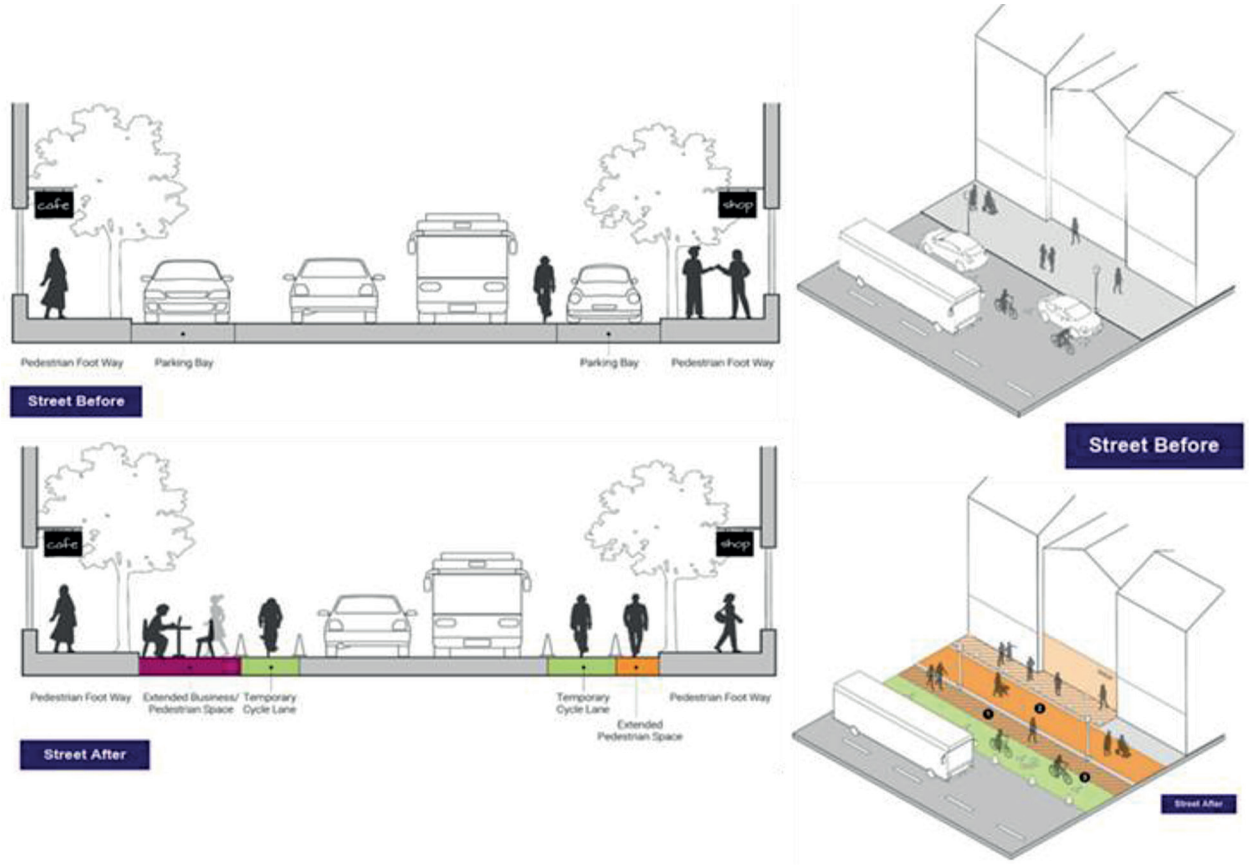

Fig. 3. Temporary active travel infrastructure/Extended Pedestrian Space and Clear Footways
Source: Government, 2020.

Programs Post COVID urban mobility recovery that set up by main Italian cities included: temporary bike lanes, permanent bike lanes, new pedestrian areas, public spaces renewal, sharing mobility programs, public spaces renewal [Barbarossa, 2020].

Scotland launched the Spaces for People initiative to enable better physical distancing, as the Scottish government funded an infrastructure program for walking and cycling roads in addition to temporary improvements to existing roads and this is supported by a package of improvements such as Extended Pedestrian Space and Clear Footways. The number of car trips has decreased due to the restrictions of the Corona pandemic. Many cities have responded to this shift by reallocating road space better and making it safer for people who choose to walk or cycle for essential commutes or for physical activity. The expansion of pedestrian areas and corridors included measures such as utilizing existing transport corridors to expand pedestrian paths, which provides additional spaces for queuing, maintaining a clear and free-of-obstacles road with ease of entry and exit for pedestrians to commercial areas, with special consideration for the needs of persons with disabilities and ensuring that appropriate safety measures are in place. For clear separation between traffic lanes, bicycle lanes, and pedestrian areas [Government, 2020].

15-MINUTE CITY – ONE-MINUTE CITY

The 15-Minute City one of the important ideas in urban planning to mitigate the global warming gasses and reinforcements the style life of the major

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cities particularly Paris, Mayor Anne Hidalgo adopted the model as a blueprint for recovery in the French capital after COVID [O'Sullivan, 2021].

A 15-minute city drifted from the neighbourhood of Jane Jacobs which is based on the concept of (chrono urbanization) which shows that the quality of urban life is inversely proportional to the amount of time invested in transportation more using cars. This concept originated from Carlos Moreno who advocated an urban creation where local people would be able to reach their needs at distances of no more than 15 minutes on foot or by bike to become closer, engage and interact more in activities that ultimately strengthen social bonds, building character and confidence, which ultimately leads to building healthier urban landscapes. Four significant dimensions were determined after watching the challenges that different cities across the world faced during the height of widespread cases of COVID-19. Includes (1) The Density, (2) The Proximity, (3) The Diversity and (4) The Digitalization that Contributed to mitigate the spread the virus [Moreno et al., 2021].

While Paris mechanisms deal with a 15-minute radius. Sweden straggling to create hyperlocal variation, in scale that cover the nation by Swedish national innovation body Vinnova and design think tank ArkDes. The project calls the one-minute city Sweden's operates at the single street level, pay interest for the space outside your door – and your neighbours' adjacent and opposite space Called Street Moves the initiative allow the local communities to participate and be a co-architect of their own street's layouts. Residents can organize how much space of the street they need for parking or public activity through workshops and consultations. street furniture kits developed and designed to suit the standard dimensions for car space parking. Inserted into dock space, these units can be fitted as needed with seat planters, bike or scooter racks, children's play areas or electric vehicle charging stations attached. Deck panels can be clearly connected, either as stand-alone units, or configured to fit an entire street [Ali, 2021].

The design of every single street is based on workshops and discussions with local including schoolchildren. Streets close transit stops might prefer more bike parking, while those with cafés could choose for more seating. Some units emerge planters full of trees, also playgrounds. Piece by piece. This configuration can change the street into social area, mixing and leading directly to neighbourhoods where the space used daily by residents which extends bigger and bigger in the open air [Hill, 2020]. Here, we can point out the importance of the role of tactical urbanism in the development of city streets by restore and revive the urban spaces to activate positively impact local communities [Hussein & Abrahem, 2019].

Fig. 4. Sweden's Street Moves project
Source: Hill, 2020.

According to the above, this project allows local residents to have direct control over their surroundings and transform their streets into healthy, safe, and sustainable places where the streets represent the basic unit of the city and all systems converge in it, so the street space is the starting point for change, spreading culture, enhancing identity, and building sustainable societies. Urban proximity, social cohesion, and democracy in community decision-making during the COVID-19 pandemic are more important than ever. If 15 Minute City promotes a pedestrian oriented neighbourhood-level development, then 1 Minute City is highly dependent on local street-level development. We suggest that the development of the level of the one-street which adopted by One Minute City is Hyper pedestrian-oriented development (Hyper POD).

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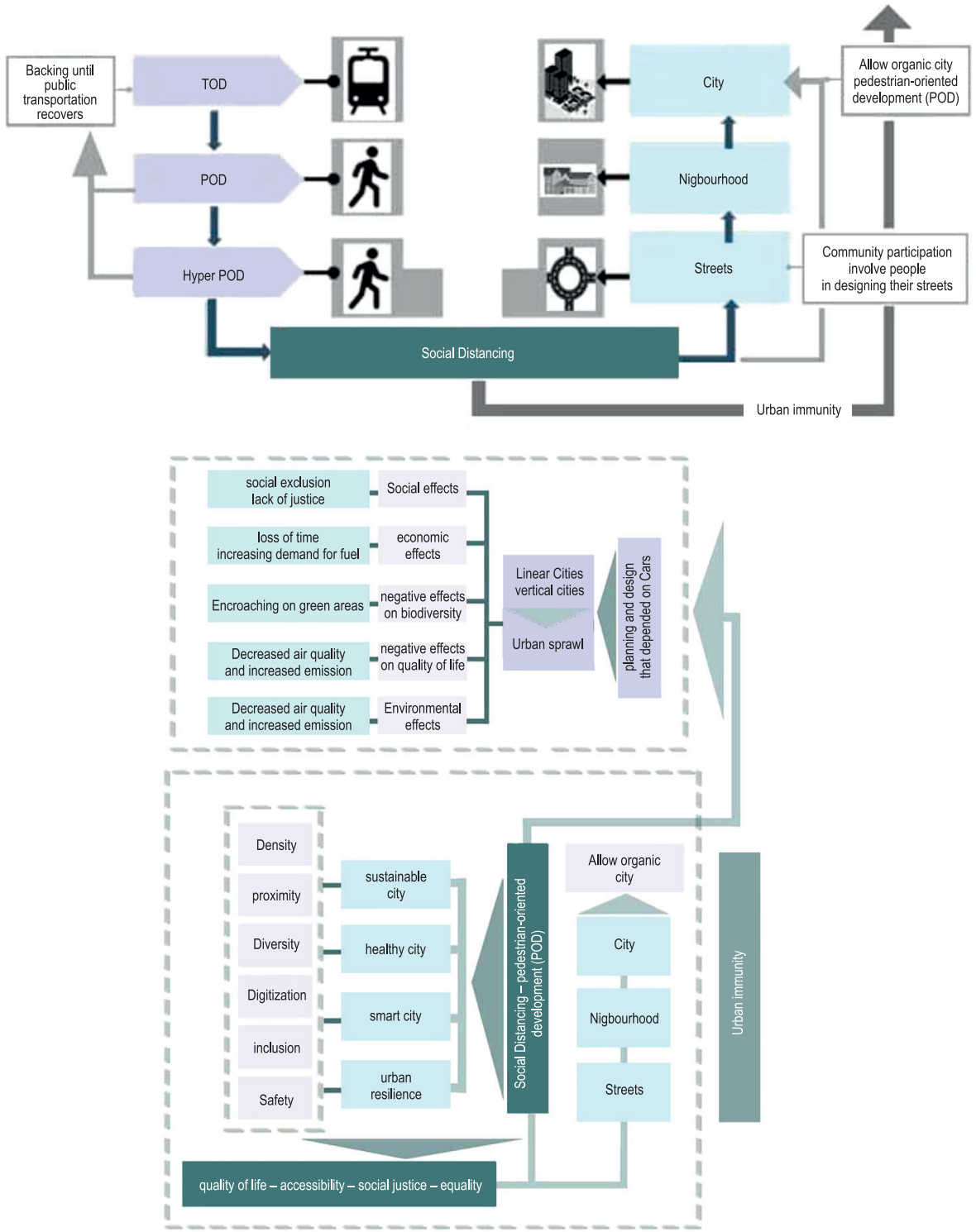

Fig. 5. Illustrates how social distancing contributes to sustainable urban development from the bottom up
Source: own elaboration.

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Table 1. Indicators of the theoretical framework

Indicators	Sub-dimension			
1	2			34
Movement system in main streets and city centers	Pedestrian movement level (People-first approach)	Expanding and creating pedestrian paths to walk safely and maintain physical distancing		X1-1
		The possibility of queuing safely in front of the shops		X1-2
		Priority is given to narrow streets		X1-3
		Allow restaurants and cafes exploiting the parking lot on the street for external service		X1-4
		Use signage to remind pedestrians of distance requirements		X1-5
		Cleaning and sterilization systems for streets and public spaces		X1-6
		Provide separate entrances and exits and make movement one-way directions		X1-7
		Amendment to the traffic to give priority to pedestrian		X1-8
		The zero separation between the sidewalk and the right of way in the street creates a sense of plaza		X1-9
		Wide sidewalks accommodate both pedestrian and retail activity		X1-10
		Accessibility for people specially for disabilities people		X1-11
		Safe pedestrian paths		X1-12
	Transport movement level (pedestrian right-of-way recovery approach)	Transport paths can be one-way, partially closed, or completely closed for pedestrians		X1-13
		Making car parks on the outskirts of the city helps reduce congestion from the streets		X1-14
		Provide signage on changes that happen road plans		X1-15
		Establishment of bicycle paths and bicycle parking		X1-16
		Safety measures to separate the paths of cars, bicycles, and pedestrians		X1-17
		Reduce the capacity of parking spaces as much as possible		X1-18
		High connectivity between active transmission lines and major transportation routes		X1-19
	Restructuring of street infrastructure services	Safe and level crossings and removal of obstacles		X1-20
		Sterilization and clean water in urban streets		X1-21
		Street furniture and seating areas equipped with social distancing signs sustainable sanitation		X1-22
		Providing streets and squares with lighting		X1-23
Land use	Proximity	Diversity of land use	Activating the laws of mixed uses	X2-1
			Providing health services	X2-2
			Enhancing flexibility in use and adaptation by reusing buildings	X2-3
	Inclusion	Mixed use to improve physical activity	Supporting community activities to develop the place	X2-4
			Encourage local activities	X2-5
	Diversity		Activities close to parks and green spaces to reduce stress	X2-6
			High permeability for parks	X2-7
			Affordable housing	X2-8
Urban balcony	Urban balcony capacity			X3-1
	Adaptation of the design to a more flexible space			X3-2
	The facades of buildings are open and provide a view			X3-3
	Support the balcony as a garden or landscape to bring nature closer to home life to improve health factors			X3-4

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cont. Table 1

1	2	34
Green areas	It is possible to set up an outdoor theatre for entertainment and social activity, with social distancing requirement	X4-1
	Provider of urban furniture	X4-2
	Signs about social distancing	X4-3
	Places to share and use bicycles	X4-4
	Expansion of pedestrian paths near park entrances	X4-5
	Expansion of pedestrian paths into the park	X4-6
	Ease of access, especially for disabilities people	X4-7
Integration of health in the design	Compact design for a walkable environment	X5-1
	Improved local marketability and streets that improve local economic value to promote self-sufficiency and reduce outbound travel	X5-2
	The vitality of the neighborhood that allows the citizen to be more active	X5-3
Empowerment for health (Participatory design)	Developing and distinguishing the local community, enhancing the role of activities with physical activity, and promoting health awareness	X6-1
	Pedestrian and bicycle opportunities and improved access to local food shops	X6-2
	Empowering community members and taking a bottom-up approach	X6-3
	Leadership comes from the community, not just the government	X6-4
	Building trust between groups during participation and work	X6-5
	Engaging in health activities and programs	X6-6

Source: own elaboration.

METHODOLOGY THE CASE STUDY AND DISCUSSIONS

Al-Adhamiya, which is an important functional, social, and economic part of the city of Baghdad it is one of the nine sectors that make up the city of Baghdad and is in the northeastern part of Al-Rusafa side and along the eastern bank of the Tigris River, which is linked to the rest of the city's sectors by a network of main streets and bridges. The Adhamiya sector was elected because it complies with the requirements of the study and provides a residential environment that is characterized by the diversity and multiplicity of public spaces (gardens and parks) because it has an important role in addressing the epidemic in protecting mental health and psychological health, as well as the presence of commercial streets and squares, in addition to containing an especially important recreational public space it is the Adhamiya Corniche.

Al-Dhubat Street in Al-Adhamiya

Al-Adhamiya, is a district with a cohesive social fabric distinguish by special social customs and traditions, including gathering on sidewalks, exchanging information, walking, and shopping especially as it contains important streets such as Imam Al-Azam Abi Hanifa Street, Omar Bin Abdulaziz Street and other. Al-Dhubat Street is one of the most important commercial streets which is 1763 meters long that are crowded with pedestrians and cars, and it contains mixed uses represented in commercial, health and industrial activities in addition to residential.

Spatial design problems of Al-Dhubat Street

Iraq has come to the top of the list of countries in the Arab world most affected by the emerging corona virus, as infections exceeded the threshold of one

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Fig. 6. (a) Refers to the path of Al-Dhubat Street within Adhamiya city (source: Adhamiya municipality) (b) Shows the activities in Al-Dhubat street during the night.
Source: Real life shots from social media. https://www.facebook.com/138370926818778/posts/708449716477560/.

million infections, amid a terrible outbreak of the disease in various Iraqi regions, which is raising the alarm that things will escalate more and more and get out of control completely. This is what prompted the authorities and public health officials to apply closure measures, whether at the level of complete closure or partial closure of the country, and these measures negatively affected the shops in Baghdad.

Al-Dhubat, being one of the most vibrant commercial streets in the Adhamiya area. Shop owners have suffered from the deterioration of the economic reality due to the closure of shops. With the gradual lifting of the closure measures, the people's fear of contracting the virus and the spread of infection remains due to the lack of a safe environment for the street with design standards that accommodate prevention measures, the most important of which is social distancing. The research seeks to diagnose the most important problems that the Al-Dhubat suffers from and then proposes a model for urban reorganization of the street to provide a healthy, safe, and sustainable environment.

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Problems identified based on Al-Dhubat street survey

Through a visit to the site, the following problems were identified:

- The absence of urban organization represented in organizing the spaces between pedestrian and car movement due to Auto mobile controlling the street and the exploitation of a large part of the street as parking spaces, and this in turn causes air pollution that negatively affects people's health;
- The sidewalks do not provide lanes for queuing, in addition to the lack of outdoor seating;
- Lack of signs of social distancing and prevention guidelines;
- The sidewalks do not provide fully secure, flat places along the road due to the difference in levels, which adversely affects the safe movement of people, especially for the handicapped and the elderly;
- Lack of dedicated lanes for cycling.

The urban environmental transformation of Al-Dhubat Street

The proposal seeks to re-design Al-Dhubat street in the time of social distancing for people to move safely in the street and becomes better and safer options for all in the street, by facilitating the movement of pedestrians and cyclists to contribute to the recovery the economy and avoid traffic congestion of the street. The re-design proposal provide street more than flexibility of movement and provide safe spacing distances so that people can safely access services, and the street should contain spaces for res-

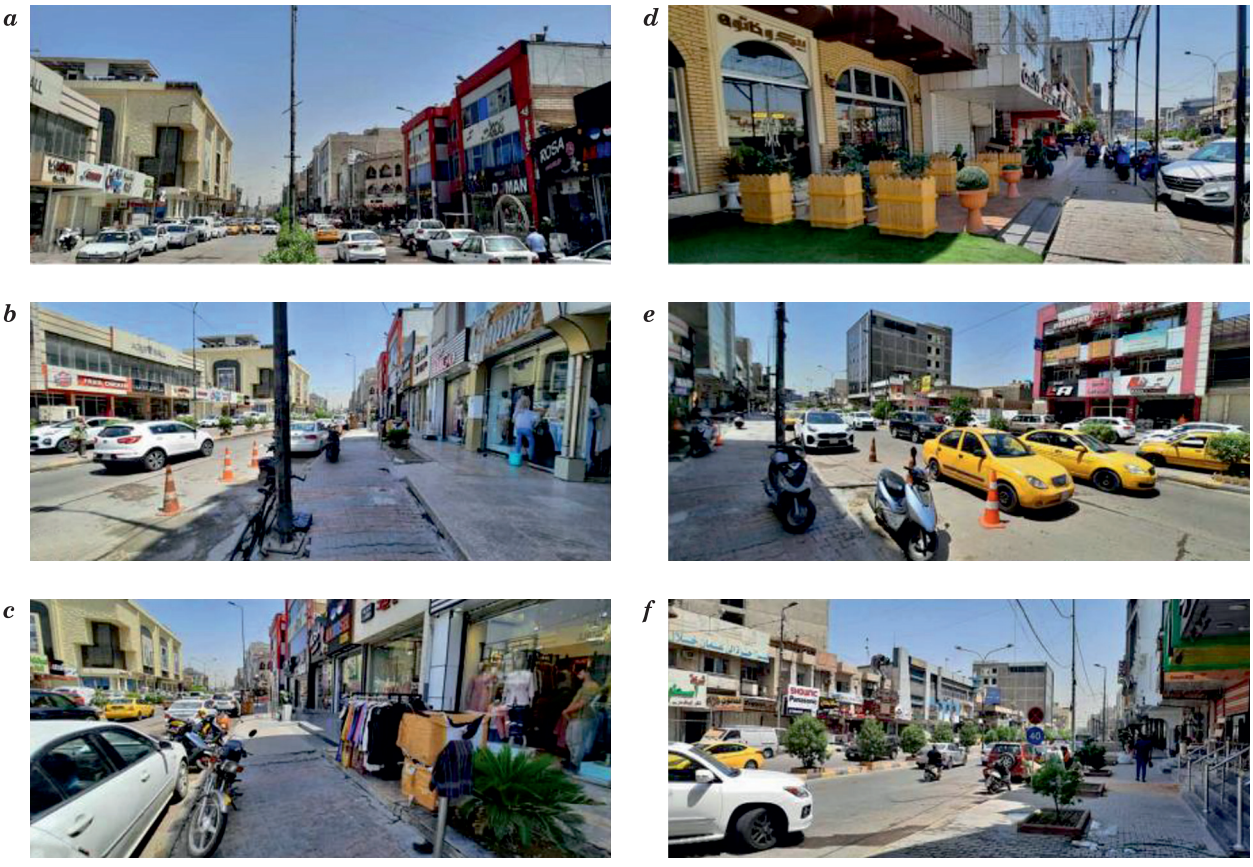

Fig. 7. Illustrates the problems of Al-Dhubat Street (a) Street view (b) Pavement level difference (c) The sidewalks do not provide lanes for queuing (d) lack of outdoor seating (e) Auto mobile controlling the street (f) Lack of dedicated lanes for cycling
Source: own elaboration.

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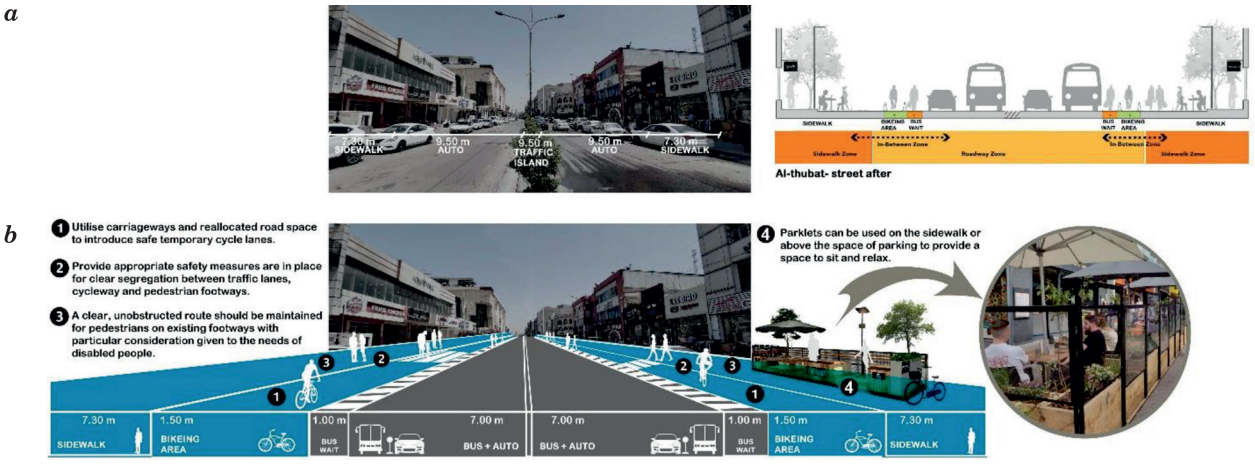

Fig. 8. Al-Dhubat Street (a) Before (b) After
Source: own elaboration.

taurants, vendors, and shops to serve outdoor work, especially with use of (parklets) that provides places for Safe seating.

The research aims at a process of change towards sustainable urban mobility for the city of Adhamiya by respecting the rules of social distancing and introducing non-motorized means of transportation, currently absent, in the urban mobility habits of a city characterized by high rates of cars ownership to improve public spaces and promote walking and cycling by revisiting and reorganizing streets, squares, parks and other public spaces on a humanization and giving more space to people by increasing more sustainable and unpolluted transportation, redefining urban streets for recreational, cultural or retail uses by Respecting social distancing requirements. The Suggested interventions for Al-Dhubat Street:

- Promote active transport as the main way of transport for short trips;
- Reducing streetcar lanes with two (or more) lanes per road to accommodate bike paths and wider sidewalks for pedestrians;
- Preparing cycling and walking lanes parallel to vehicle lanes especially that cycling, which ensures social distancing and does not pollute, is the most effective means of transportation for post pandemic urban commuting, solidly establishing real cycling cities soon;
- Closing streets to vehicles in more residential areas to open them to pedestrians and cyclists;
- Reduce the speed of traffic on the streets;
- Reducing parking spaces;
- Exploitation of parking spaces by restaurants and cafes for the purpose of external service.

Maintaining the shift towards non-motorized transportation has the potential to contribute to active lifestyles that improve personal health and reduce carbon dioxide emissions. Improvements to sidewalks, bike paths and other infrastructure can increase road safety by reducing conflicts between different modes of transportation such as cars and bicycles. This in turn creates an enhanced pedestrian-oriented development that supports the local economy, is self-sufficient and flexibility to accommodate the spatial distances of any epidemic that may occur in the future.

Table 2. Test the effective indicators to Al-Dhubat Street

Indicators	Sub-dimension	Symbol
1	2	3
Movement system in main streets and city centers	X1-1	✓
	X1-2	✓
	X1-3	
	X1-4	✓
	X1-5	✓
	X1-6	✓

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cont. Table 2

1	2	3
	X1-7	✓
	X1-8	✓
	X1-9	✓
	X1-10	✓
	X1-11	✓
	X1-12	✓
	X1-13	
	X1-14	
	X1-15	✓
	X1-16	✓
	X1-17	✓
	X1-18	✓
	X1-19	✓
	X1-20	✓
	X1-21	✓
	X1-22	✓
	X1-23	✓
Land use	X2-1	✓
	X2-2	✓
	X2-3	
	X2-4	
	X2-5	✓
	X2-6	
	X2-7	
	X2-8	
Urban balcony	X3-1	
	X3-2	
	X3-3	
	X3-4	
Green areas	X4-1	
	X4-2	
	X4-3	
	X4-4	✓
	X4-5	✓
	X4-6	
	X4-7	
Integration of health in the design	X5-1	✓
	X5-2	✓
	X5-3	✓
Empowerment for health (Participatory design)	X6-1	✓
	X6-2	✓
	X6-3	
	X6-4	
	X6-5	
	X6-6	

Source: own elaboration.

CONCLUSIONS

Social distancing is the way back to active mobility by relying on walking and bicycles and works to restore the right of pedestrians in the streets and sidewalks instead of cars and thus achieve sustainable urban development, which enhances the urban immunity of the city against any other epidemics may occur in the future.

Social distancing works as a health standard for cities is ready to act as an urban antibody against any antigens that threatens cities and saves time to give full opportunities to the medical field to produce vaccines and treatments. The COVID-19 pandemic has touched the fragile limits of the designs of our cities and indicated the absence of societal justice, and because social distancing promotes pedestrian-oriented transport, it provides support for the recovery of poor communities and the recovery of retail stores, thus contributing to urban development from bottom – up and allows the community to participate in decision-making to shape the lifestyle of their cities. Yes, it can be said that calls for sustainable transportation have been emphasized previously, but the COVID-19 pandemic has forced cities and their leaders to consider these problems and social distancing forced about using sustainable transportation and push the button on urban reset.

Physical distancing measures will remain in place for the foreseeable future, so with the proposed interventions on Al-Dhubat Street we can keep car use low and promote walking and cycling for a sustainable, equitable, habitable, and healthy community after the pandemic. Walking and cycling are the healthiest,

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sustainable, equitable options that ensure social distancing, especially as the rules of social distancing renew the importance of urban life. The ways in which the residents of Adhamiya are used streets must change, refocus social, economic, and cultural activities at the neighbourhood level and enhance the value of life Compact local areas that contribute to the well-being of their residents. By testing the indicators on the study area (Table 1), the results showed that the effective indicators in Al-Dhubat Street (Table 2) achieved 60%, and this shows the importance of adopting sustainable mobility as an important principle for achieving urban immunity.

Social distancing acts as (urban antibody) to any epidemic (urban Antigen) that may spread in the future through urban reorganization of the built environment and promotion of Hyper pedestrian-oriented development (Hyper POD) to achieve urban immunity.

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DISPERSED PRIVATIZATION OF COUNCIL HOUSING: SOME STRUCTURAL EFFECTS IN THE MUNICIPAL HOUSING STOCK IN OLSZTYN, POLAND

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ABSTRACT

Council (public) housing privatization, as the basic instrument for transforming housing systems, has significantly affected the tenure structure and created millions of new owners across Europe. In Poland, the concept of the dispersed privatization was adopted and implemented in the long term primarily through preferential sales of council dwellings from the municipal housing stock to sitting tenants.
The aim of the study was to analyze the effects of the dispersed privatization of municipal dwellings in the spatial and ownership structure of the municipal housing stock of the city of Olsztyn in Poland. The results showed that poorly controlled processes of the dispersed privatization of municipal housing caused unfavorable structural effects in the surveyed housing stock. The stock has shrunk significantly, losing buildings in better locations and conditions and the undesired fragmentation of municipal ownership and its mixing with private ownership has increased. The results and proposals are important to other cities and countries facing the challenge of slow privatization of public housing.

Keywords: housing privatization, council dwellings, municipal housing, public management, cities

INTRODUCTION

Council housing privatization in Poland primarily involves transferring the ownership rights to dwellings held in municipal housing stock (MHS) to private entities. Through the market-based housing reallocation mechanism, it was intended to play a key role in shaping local housing markets and provide an opportunity to alleviate significant public housing problems from the previous system that emerged after this stock was taken over from the State Treasury and during the transition to a market economy. Since the beginning of the transformation period, the primary privatization form of municipal dwellings has been their sale to sitting tenants. From the point of view of rational MHS management, taking into account the obligations of municipalities to meet the housing needs of low-income households and other vulnerable social groups with the help of this stock, such privatization has shown inconsistency with other elements of local housing policy and has caused numerous social and economic controversies.

One of the reasons for many privatization problems is the improper manner of its implementation.

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The processes of selling municipal dwellings have been conducted almost exclusively in an uncontrolled manner, using the dispersed privatization method, where any eligible tenant could purchase his or her housing unit in any building. This privatization method led to a gradual scattering of municipal housing ownership, the initial effect of which was to divide MHS into two segments. The first (S1) Segment includes municipal dwellings in buildings which constitute the sole property of local authorities. In this segment, the municipality, as the only owner, has full autonomy in making decisions and performing property management activities. The second (S2) Segment of MHS includes municipal dwellings in buildings owned by Homeowners' Associations (HOAs). Here the municipal ownership is connected to the respective co-ownership shares in the land and common parts of the building (as the common property), which are jointly owned by all the dwelling owners. In these buildings, the municipality, as one of the many dwelling owners and a mandatory HOA member, has limited impact on decisions and management activities concerning the common property. The limitation is determined by the size of the municipality's share in the common property that is expressed by the ratio of the floor area of municipal dwellings to the floor area of all units in the HOA building. Observation of practice shows that dispersed privatization of municipal dwellings changes not only the size of the MHS, but also its internal structure, due to the flow of buildings from the S1 to the S2 Segment and the gradual shrinkage of the S2 Segment as a result of the exit of municipalities from HOAs after selling off the last dwellings in those buildings. Structural changes in MHS caused by such privatization, although common, have not yet been studied more intensively in the space of individual municipalities.

The main aim of this paper was to analyze the effects of the dispersed privatization of municipal dwellings in the spatial and ownership structure of the MHS of the city of Olsztyn in Poland. This type of analysis is of great importance because the privatization of municipal housing, by continuously modifying the spatial and ownership structure of the MHS, has considerable implications for the sustainable spatial development of large urban areas, as well as for effective governance (decision-making) and management of those housing assets. Furthermore, these effects influence the extent to which municipalities fulfil their statutory obligations to meet the housing needs of local communities.

Following the Introduction, this paper contains four sections. The first section outlines the literature review on the premises and effects of municipal housing privatization in Poland; the second section induces material and methods used for achieving the aim of the study; the third section presents and discusses the results of the empirical research, while the fourth section concludes the results and formulates recommendations for future research.

LITERATURE REVIEW

Privatization of public housing in the European perspective

The late 20th century marked a turning point in both Eastern and Western European housing policies and other continents. Europe, Australasia and the USA were characterized by a receding involvement in public housing and a general instability within different housing systems in the 1980s, and this trend has continued through the 1990s and into the new century [Forrest & Lee, 2003; Gruis et al., 2009]. As part of these changing policies, a significant portion of public housing stock was sold to tenants [Jones & Murie, 2006]. Public housing privatization has significantly affected the tenure structure and created a new class of homeowners in Western, Central and Eastern European countries. In Western Europe, abandoning public housing since the mid-1970s was motivated by an ideological turn to the right and by the effort to decrease public spending by reducing the welfare state. The premises and effects of council housing privatization in Western Europe has been well documented [e.g. Doling, 1994; Boelhouwer et al., 1997; Priemus et al., 1999; Priemus & Dieleman, 2002; Goodlad & Atkinson, 2004; Aalbers & Holm, 2008; Scanlon & Whitehead, 2008; Holm, 2011; Elsinga

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et al., 2014; Disney & Luo, 2017; Kitzman, 2017]. In Central and Eastern European (CEE) countries, privatization of public housing was introduced more than a decade later, around 1990, as part of a broader process involving a reduction in the role of central governments and public spending on housing, deregulation and decentralization of housing services associated with the transition to a market economy [e.g. Clapham et al., 1996; Struyk, 1996; Lux, 2003; Tsenkova & Lowe, 2003; Mandič, 2010; Hegedüs et al., 1996, 2013; Lux & Sunega 2014; Lis & Zwierzchlewski, 2015; Pojani & Baar, 2016; Broulíková & Montag, 2020, Muczyński et al., 2021]. Notwithstanding the differences between the CEE countries, common features of public (council) housing privatization in these countries include the following: the dominance of selling dwellings at heavily discounted prices (or even giving them away for free) mainly to sitting tenants, the large proportion of low-income households and/or those with low ownership awareness among purchasers of privatized units and the generally poor physical condition of the transferred housing stock, which consisted to a great extent of deteriorated multifamily buildings with neglected repairs and serious technical and functional deficiencies [UNECE, 2006, pp. 6–8]. The rules and scale of the discussed privatization were very different in the individual CEE countries. For example, in Estonia, Romania and Slovakia, large-scale privatization of former public housing took place mainly because of the application of the tenants' right to buy. The legislation defined the general terms for privatization and municipalities had only limited possibilities to influence the scale or the fundamental conditions of privatization. In contrast, in the Czech Republic and Poland, the scale and speed of privatization were much more modest. Tenants in public rental housing did not receive the unrestricted right to buy, and municipalities could decide for themselves the scale and terms for housing privatization [Lux, 2003, p. 249]. Almost one-third of the public housing stock in CEE countries was privatized by 1995 [Hegedüs et al., 1996, p. 103]. Privatization culminated in most CEE countries around the year 2000, but in slow-privatizing countries such as the Czech Republic and Poland, half of the MHS had been sold by 2002 and 2011, respectively. As a result, the share of public housing in their total housing stock had decreased from 38% and 32%, respectively, in 1991 to about 8% in 2011 [Muzioł-Węcławowicz, 2013, pp. 195–209].

Privatization of municipal dwellings in the Polish perspective

In Poland, privatization of MHS was initiated in the early 1990s and has continued with varying intensity to date. Since the beginning of the transformation period, there has been a tendency at the municipal level to withdraw from housing ownership through its privatization, understood primarily as the sale of housing units to sitting tenants. Among the motives (premises) for privatization of the MHS in Poland, four motives have played an important role [Kucharska-Stasiak et al., 2014, p. 124]:

- *Ideological motive*: striving to limit the role of public authorities, which resulted from political and systemic reasons and was in line with the direction of the market economy development;
- *Economic motive*: shifting maintenance costs to the private sector and obtaining funds from privatization;
- *Pragmatic motive*: greater care of the private owner for property (public property treated as "nobody's property"), as well as improving management efficiency;
- *Social motive* – growing the group of people with residential property ownership.

In addition, the personal interest of new owners was to expand the secondary housing market by introducing the freedom of disposal of dwellings – the possibility of inheriting, selling, securing loans, etc. Until the end of 1994, privatization of municipal dwellings did not pose any special problems either for municipalities, which had not yet had a full recognition of the technical condition and maintenance costs of the housing stock acquired from the State Treasury, or for purchasers, as all users paid relatively little for the possessed dwellings regardless of whether they were their owners or tenants [Majchrzak, 2003,

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pp. 115–117]. The situation changed dramatically in 1995 when the municipal budgets were burdened with the maintenance costs of the acquired housing stock while private owners of housing units were also made fully responsible for the maintenance expenses of the common property in buildings belonging to HOAs. These circumstances, combined with the implementation of the market economy rules, resulted in a stronger emphasis on the economic rationale for MHS privatization and made it much more complicated.

In view of the lack of funds in local government budgets to finance all tasks related to housing needs, most municipalities were not able to cope with the high costs of maintaining the communalized housing stock. In fact, the MHS management had to be subsidized by municipalities because the commonly charged uneconomic rents did not even cover the ongoing exploitation and maintenance costs of the stock. Moreover, it was found that a significant part of the MHS were substandard dwellings, located in buildings with poor technical condition, overpopulated or poorly equipped with basic installations. Hence, the main economic rationale for privatizing municipal housing became the reduction, if not cessation, of subsidies to MHS [Sobczak, 2001, p. 197]. An equally important premise was to limit the scale of the progressive decapitalization of the MHS as a result of many years of neglected repairs. If the MHS were to be completely destroyed, it would be necessary to incur even greater expenditures in the future, as restoring the same number of dwellings would be much more expensive than their renovation. An additional premise for the privatization in question was that municipalities would make *ad hoc* profits in the form of streams of one-time income from the sale of units and proceeds from property taxes. In general, the privatization of municipal dwellings was to lead to a situation in which the costs of exploitation, maintenance, repairs and management of privatized buildings and dwellings would be borne by new owners, and the funds thus obtained were to be allocated for the repairs of the existing stock and for the development of municipal housing and the creation of a reserve of vacant dwellings enabling rational management of MHS in the long term [Muczyński & Turbaczewska, 2013, pp. 26–27]. From the point of view of future owners, the purchase of dwellings from municipalities was to mean a reduction in fees for their exploitation and ongoing maintenance, an increase in material interest in maintaining buildings in an appropriate technical condition and more effective financial management, which would make it possible to expand the scope of renovations.

As a result of privatization, approximately 1.4 million municipal housing units have been sold since 1991. The successive sales with very limited municipal construction resulted in the MHS shrinking nationally to less than 700,000 units at the end of 2020, representing less than 5% of all housing units in Poland [GUS, 2021]. The privatization of municipal, as well as company and cooperative housing, has caused significant changes in the tenure structure of the housing stock. According to Eurostat data, in 2010 up to 81.5% of the Polish population lived in houses and dwellings for which they held the ownership title, while the EU average was 70.7% (from 53.2% in Germany to 97.5% in Romania). Even in the United States, where homeownership is strongly promoted, only 66.2% of housing units were occupied by their owners [Kucharska-Stasiak et al., 2014, p. 124]. The quantitative changes in the MHS as a result of privatization caused not only a reduction in the number of recovered units but, above all, unfavorable changes in the qualitative structure of MHS [Korniłowicz, 2005, p. 49; Cesarski, 2009, p. 43; Korniłowicz & Uchman, 2011, p. 26; Zaniewska et al., 2014, p. 55], since almost 75% of the units bought back were dwellings in buildings with the best technical condition or attractive location. As an effect of privatization of the best dwellings, the MHS in buildings under exclusive municipal ownership (Segment S1) had a much worse structure than dwellings in HOAs (Segment S2), as it consisted in 2007 of 67% [Korniłowicz & Żelawski, 2007, p. 39] and in 2011 of 69% [Myna, 2014, p. 48] of dwellings built before 1944, while an increasing percentage of buildings are either eligible for demolition or for major renovations for which municipalities could not find funds in their budgets. Thus, such a sales policy

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did not contribute to improving the condition of the MHS, as the largest repair backlog accumulated in buildings not covered by the privatization process. The deterioration of the quality structure of municipal dwellings can significantly impede the proper MHS management due to the growing shortage of funds from rents [Żelawski, 2005, pp. 56–57], which poses a significant threat to municipalities' ability to finance renovation and modernization work in both exclusively municipal and common buildings.

Under pressure to reduce subsidies and stop the decapitalization process of the MHS, municipalities decided on preferential sales prices for dwellings, which on average ranged from 5% to 20% of market value and sometimes even less [Zaniewska et al., 2014, p. 55]. Such prices undermined the economic viability of privatization and caused that the revenues from it could not have a significant impact either on financing the renovation of the existing MHS or on acquiring new or adapted municipal dwellings, especially since funds from the sale of dwellings were generally used outside the municipal housing sphere [Muczyński, 2010, p. 52]. This had a negative effect on the economics of MHS management and on the technical condition of the stock and, in the absence of funds for its reconstruction, the housing support provided by municipal governments became increasingly limited. The lengthening waiting time for the rent of municipal dwellings is evidence of this because their allocations in recent years have covered less than 10% of the needs [Korniłowicz & Żelawski, 2007, p. 41]. As a result, the problem of MHS shortage intensified and most municipalities (by promoting the sale of dwellings at low prices) are increasingly failing to fulfil their mandatory housing tasks [Nowak, 2016, pp. 34–37]. Problems of this type were also highlighted by the Supreme Audit Office in Poland [NIK, 2009, p. 11], which has called for stopping the process of MHS shrinkage.

Low sales prices of municipal dwellings resulted in high interest in buying out the units by both indigent and well-to-do tenants, who found it profitable to buy an occupied dwelling, if only for speculative reasons. As a result, there has been widespread sale of public housing through the dispersed method of privatization, resulting in a huge number of public-private HOAs (Segment S2). The scale of the phenomenon is evidenced by the fact that already in 2005 in more than half of the number of municipal buildings at least one dwelling was privatized, i.e. there were owners and tenants living together in them. It subsequently became clear that a large share of the owners of the purchased apartments were low-income people (mainly the elderly), who not only did not have the means for renovation, but even are not always able to cover the costs of current maintenance of their dwellings. Moreover, many dwelling purchasers were unaware of their basic responsibilities as homeowners. It is recognized that, in this situation, the excessive dispersion of municipal property in many HOAs creates many risks and is a negative phenomenon [Majchrzak, 2005, pp. 215–219]. As Myna [2014, pp. 42–43] noted, the mixing of dwelling ownership in multifamily buildings hindered the management of the MHS and the accumulation of funds for major repairs, thus constituting one of the determinants of the decapitalization of this stock. First of all, municipalities did not solve the problems of either ongoing maintenance, or even the repair of MHS buildings [Muczyński, 2008, p. 27], while the decision-making processes in these matters became much more complicated, often slipping out of the control of local governments. Although the indigent owners effectively reduced the expenditure on maintenance of the purchased dwellings, the savings were ostensible because they were achieved at the expense of abandoning the necessary repairs of common buildings [Muczyński, 2017, pp. 282–283]. The attempt to shift the costs of improving the poor technical condition of these buildings onto the shoulders of indigent owners as a result of dispersed privatization, therefore raises the dangers of complete decapitalization of buildings belonging to HOAs and the emergence of many social problems in the long term. The excessive fragmentation of municipal ownership in many HOAs not only results in common property management problems but can also result in increased costs to maintain municipal shares in common buildings. This is especially true in cases where municipalities remain in HOAs formed by wealthy owners who can impose

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very high costs of common property management on municipalities without the possibility of negotiating or planning them in budgets. Additional complications are created by the enormous scale of social and material diversity of the dwelling purchasers, as well as the varied economic capabilities of municipalities.

MATERIALS AND METHODS

The intended analysis of structural effects of dispersed privatization of municipal dwellings has been conducted in the MHS of the city of Olsztyn. This is a voivodeship capital city located in the northeast of Poland, which at the end of 2020 had 171,249 inhabitants and a housing stock of ca. 80 000 dwellings in total, 5% of which were owned by the municipality. To achieve the aim of the study, a multi-stage, top-down research approach combining different research methods was used. The research procedure included the following stages:

1. Collection and validation of source information (data) about the subject MHS and its privatization;
2. Processing of validated data and their targeted analysis using relevant analytical methods;
3. Presentation and discussion of the results obtained.

The first research stage used source materials such as annual reports on the implementation of the long-term municipal housing stock management programs (MHSMPs) of the city of Olsztyn for 2012–2020 and the detailed analytical data about HOAs (with the participation of the Olsztyn municipality) in MS Excel spreadsheet format for the years 2013, 2016 and 2019 obtained from the Municipal Housing Management Unit (MHMU) of the city of Olsztyn. As part of the validation of the municipal dwelling sales data, the annual report data was then compared to the corresponding 2016–2020 data obtained from the Property Disposal Department (PDD) of the City Office of Olsztyn. In order to fill the information gaps and gain a deeper understanding of the research problem, the direct interview method and the source documentation analysis method were used at this research stage. A total of five open-ended interviews were conducted with managers and staff of municipal organizational units directly involved in the management and privatization processes of MHS in Olsztyn. Interviews were conducted during normal working hours at the seat of the surveyed units, MHMU and PDD.

In the second research stage, an analysis of the effects of dispersed privatization of municipal dwellings in the MHS of the city of Olsztyn from 2012 to 2020 was conducted. To visualize the spatial concentration of municipal dwelling sales in the study city, a dedicated map was developed using freely available QGIS software, version 2.18 [QGIS Development Team, 2015]. OpenStreetMap.org tiles were used as a reference data source to prepare thematic data [Dawidowicz et al., 2019, pp. 432–433]. In turn, to analyze the structural changes in the MHS under the influence of discussed privatization, analytical methods (tools) available in MS Excel spreadsheet were used, including standard and array functions. In the last stage, the research results were presented in the form of relevant tables, maps and charts.

RESULTS AND DISCUSSION

The analyzed MHS was originally transferred to the Olsztyn municipality in the early 1990s through communalization of state property along with statutory obligations to meet the housing needs of the local community. Since then, it has undergone significant quantitative and qualitative changes, the tenure structure of housing and the management organization system have been modified. In addition, there have been fundamental transformations in its environment. Many of the changes in the MHS were driven by dispersed privatization of municipal dwellings implemented consistently over a long period of time. The practical use of this privatization method was confirmed by the quantitative characteristics of the surveyed MHS (Table 1), which shows that in the years under study, on average, two out of every three municipal dwellings in Olsztyn were located in buildings owned by HOAs (Segment S2).

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Table 1. Quantitative characteristics of the municipal housing stock (MHS) of the city of Olsztyn in 2012–2020

Year	Segment S1			Segment S2			MHS [in total]		
	Buildings number	Dwellings number	Floor area [m^2]	Buildings number	Dwellings number	Floor area [m^2]	Buildings number	Dwellings number	Floor area [m^2]
2012	158	1 626	60 696	679	3 859	176 488	837	5 485	237 464
2013	156	1 584	60 675	667	3 421	154 418	823	5 005	215 093
2014	146	1 538	58 464	674	3 293	148 658	820	4 831	207 122
2015	137	1 493	58 187	664	3 213	144 404	801	4 706	202 591
2016	133	1 459	56 167	662	3 124	139 958	795	4 593	196 125
2017	124	1 420	54 423	657	2 982	134 061	781	4 402	188 484
2018	115	1 384	52 620	652	2 848	126 691	767	4 232	179 311
2019	113	1 397	51 393	645	2 726	121 293	758	4 123	172 686
2020	113	1 409	51 462	638	2 608	115 552	751	4 017	167 014

Source: own preparation based on data obtained from the Municipal Housing Management Unit (MHMU) of the city of Olsztyn (2021).

Table 1 shows that the MHS of the city of Olsztyn at the end of 2020 consisted of 751 buildings with 4,017 municipal dwellings and a total floor area of 167,014 m^2, including in the segment solely owned by the municipality (Segment S1) there were 113 buildings (15.0%) with 1,409 dwellings (35.1%) and a total floor area of 51,462 m^2 (30.8%), whereas in the segment of HOAs (Segment S2), the municipality owned shares in 638 common buildings (85.0%) disposing of 2,608 dwellings (64.9%) with a total floor area of 115,552 m^2 (69.8%). The S2 Segment was by far dominated by large HOAs (97.4%) which owned buildings with more than three units, among which the largest number of buildings were those with 11 to 20 units (33.9%) and the smallest were those with more than 50 units (5.0%). The present size and structure of the MHS is an outcome of a clear and sustained declining trend of this stock between 2012 and 2020, both in terms of the total number of buildings (a drop of 10.3%) and dwellings (a drop of 26.8%), and in terms of total floor area (a drop of 29.7%). It should be noted that due to the negligible scale of investment and disinvestment in the surveyed MHS during the period in question, the revealed trend constituted, in principle, an exclusive effect of the implemented privatization (sale) of municipal dwellings. Decomposition of the discussed trend into its components shows, on the one hand, that the decline in the number of buildings between 2012 and 2020 was several times higher in the S1 Segment (28.5%) than in the S2 Segment (6.0%). On the other hand, it was found that the decline in the number of dwellings in the S1 Segment (13.3%) during the period was much lower than in the S2 Segment (32.5%). This exposes the mechanism of dispersed privatization of the MHS in Olsztyn, which was uncontrollably extended to more municipal buildings, transferring them to the S2 Segment, while at the same time, the chaotic sales of a relatively large number of municipal dwellings in many HOA buildings was conducted, without taking well-coordinated efforts to complete the sale of municipal dwellings in greater groups of common buildings and effectively exit the municipality from HOAs.

An analysis of the effects of the discussed privatization in the surveyed MHS required gathering information about its size during the period 2012–2020. The quantitative characteristics of both planned and actual volumes of sales of municipal dwellings in Olsztyn are presented in Table 2.

The data in Table 2 indicate that during the period in question, the actual volumes of sales of municipal dwellings from the MHS of the city of Olsztyn varied from 101 to 474 units per year, while the total floor area of the units sold varied from 5,435 m^2 to 24,007 m^2 per year. It should be emphasized that the revenues received by the municipality from

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Table 2. Quantitative characteristics of privatization (sales) of municipal dwellings from the MHS of the city of Olsztyn in 2012–2020

Year	Planned volumes			Actual (realized) volumes		
	Dwellings number	Floor area [m^2]	Sales revenues [PLN]	Dwellings number	Floor area [m^2]	Sales revenues [PLN]
2012	160	8 000	4 000 000	283	14 929	8 762 384
2013	160	8 000	4 000 000	474	24 007	13 823 373
2014	160	8 000	4 000 000	170	8 777	5 546 158
2015	160	8 000	4 000 000	131	6 936	5 086 404
2016	160	8 000	4 000 000	118	5 584	4 943 709
2017	140	7 500	4 000 000	119	5 596	4 757 234
2018	140	7 500	4 000 000	166	8 380	6 835 312
2019	140	7 500	4 000 000	101	5 435	5 699 053
2020	140	7 500	4 000 000	112	5 524	5 347 085

Source: own preparation based on data obtained from the Municipal Housing Management Unit (MHMU) and the Property Disposal Department (PDD) of the City Office of Olsztyn (2021).

housing privatization, particularly high in 2013, were not allocated in the municipal housing sphere, in particular, they were not used to enlarge the shrinking MHS despite the persistent shortage of municipal dwellings for rent by households eligible for obtaining such housing assistance from the municipality. The total shortage of municipal housing (full-standard and social dwellings) in Olsztyn was 871 units in 2012 and 849 units in 2020, which represented 15.9% and 21,1%, respectively, of the entire MHS in those years. Municipal dwellings were sold without a public tender to willing tenants with rental agreements of indefinite duration, provided that the buildings in which they were located were not formally excluded from privatization. Such sales were made at discounted prices compared to the market value of the dwellings. Since 2014, the rates of such discounts for sales with a single payment ranged from 65% to 80%, while for instalment sales they ranged from 20% to 50%, depending on the period of construction of the buildings. Previously, discount rates were even more favorable, as for single-pay sales all eligible buyers received an 80% discount (or even 90% for heritages), while for instalment sales from 50% to 70%, depending on the building age. It should be added that initiating dispersed privatization of municipal housing by tenants seriously hinders the forecasting of this process, as evidenced by the significant differences between planned and actual volumes revealed in Table 2.

As a synthesis of the preliminary research stage, the dynamics of changes in the number of dwellings in the MHS was compared with the dynamics of changes in the number of privatized (sold) dwellings from this stock. The comparison was made in relative terms by taking as a reference base (100%) the relevant data on numbers of dwellings from 2012 (Chart 1).

Chart 1 illustrates the mentioned sustained declining trend in the number of dwellings in the stock under the influence of privatization in the years 2012–2020, with the decline being more than twice greater in the S2 Segment (32.4%) than in the S1 Segment (13.3%), which translated into a relative decline in the number of dwellings in the entire MHS at the level of 26.8% (by 1,468 units in absolute terms). The dynamics of dwelling sales also showed an overall declining trend, but in relative measures they were more varied and significantly higher, as annual numbers of privatized dwellings varied in relation to the reference level (from 167.5% in 2013 to 35.7% in 2019). There were two periods of a marked increase in the number of municipal dwellings sold (the first in 2013, when 474 units were sold, and the second in 2008, when 166 units were sold). Increased sales in 2013 were due to the tenants' reaction to the rent

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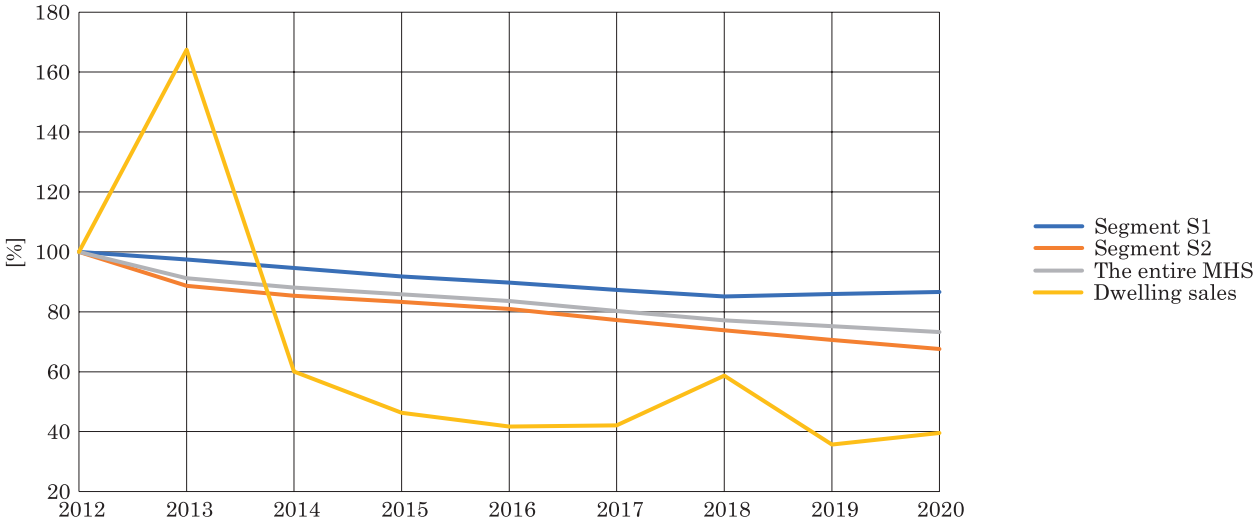

Chart 1. The dynamics of changes in the number of dwellings in the Segments S1/S2 and in the entire MHS of the city of Olsztyn and the dynamics in the number of privatized (sold) dwellings from this stock in 2013–2020 (reference base: 2012)
Source: own preparation.

rises introduced with the 2012 rent policy reform in the MHS and to the planned implementation of less favorable sales prices (discount rates) for privatized dwellings, which came into force in 2014. In turn, the much smaller increase in dwelling sales in 2018 was related to the extension of the list of buildings in the S1 Segment excluded from privatization.

In order to analyze the spatial effects of dispersed privatization of municipal dwellings in the MHS of the city of Olsztyn, a dedicated map of spatial concentration of sales of these dwellings in 2016–2020 was prepared. This map is presented in the generalized form below (Map 1).

Historical conditions and the small scale of post-World War II public housing investment have resulted in most MHS buildings in Olsztyn being located in the city center or in adjacent zones along major streets and the railroad. The spatial structure of the MHS is dominated by the oldest buildings, whose overall technical and functional condition is deficient, and this is visible in the city landscape. The highest concentration of municipal dwelling sales in 2016–2020 occurred in the Zatorze, Wojska Polskiego and Podleśna neighborhoods, especially including the following streets: Jagiellońska, Wojska Polskiego, Żeromskiego, Sienkiewicza, Zamenhofa, Niedziałkowskiego, Poprzeczna, Reymonta, Limanowskiego and Kasprowicza (about 23.8% of all transactions). This area is one of the oldest in the city, located close to the center and well communicated with it, with buildings of historical value mainly created at the turn of the 19th and 20th centuries. A moderate concentration of such sales was recorded in the Śródmieście, Pojezierze, Kościuszki and Kętrzyńskiego neighborhoods, particularly on Kościuszki, Dworcowa, Katowicka, Mazurska and Warmińska streets (13.6% transactions). This area is marked by great diversity in terms of age and type of buildings, because there are both historic buildings and those built using large-panel technology from the late twentieth century. These estates are located in the city center and constitute its representative part. Many municipal dwellings sold in this area were located in the main streets of the city or near the old town square. The area is dominated by HOA buildings with single municipal dwellings. A much smaller, but still noticeable concentration of the analyzed sales took place in the housing estates of Grunwaldzkie and Podgrodzie, on Grunwaldzka and Warszawska streets (3.8% of transactions). This area is characterized by very high location and communication values. The remaining sales took place in smaller clusters

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Map 1. A dedicated map of spatial concentration of municipal dwelling sales in the MHS of the city of Olsztyn in 2016–2020
Source: own preparation based on data obtained from the Property Disposal Department (PDD) of the City Office of Olsztyn (2021). Basemap: OpenStreetMap.org tiles,© OpenStreetMap contributors, licensed under CC BY-SA 2.0.

either on other streets in the listed neighborhoods or in other estates more peripheral to the city center. The structure of sold dwellings was dominated by 2–3 room units with an average floor area of 50–53 m^2. These sales did not include municipal dwellings located in 108 buildings formally excluded from privatization due to the municipality's statutory housing tasks, as well as due to other circumstances associated with these buildings (relative novelty, historic character, lack of independence of the premises, location in an area of planned transportation investments, etc.). It should be pointed out that the sale of municipal dwellings in buildings being in better technical condition, well located and connected with the city center and situated in mature neighborhoods in terms of technical and social infrastructure has noticeably worsened the spatial structure of the MHS of the city of Olsztyn.

In the next steps, the effects of dispersed privatization of municipal dwellings on the ownership structure of the MHS in Olsztyn were analyzed. The General Dispersion Index (GDI) was proposed to synthetically assess the overall degree of municipal ownership structure dispersion in the MHS due to privatization. The GDI Index in a given MHS is determined by the following formula:

$$GDI = \frac{S2}{S1 + S2} \quad (1)$$

where: S1 and S2 are variables that characterize the S1 and S2 Segments, respectively, in a given MHS;

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The proposed index ranges from 0 (when the MHS consists of only the S1 segment, i.e. there is no dispersion of municipal ownership in HOAs) to 1 (when there are no buildings in the MHS that are exclusively owned by the municipality and all municipal dwellings are in buildings owned by HOAs). The GDI index was determined for the MHS in Olsztyn in three variants (specific types), in which the following parameters have been taken as variables describing the S1 and S2 Segments: (1) number of buildings (GDI-BN index), (2) number of dwellings (GDI-DN index), and (3) total floor area (GDI-FA index). The obtained values of these three specific types of GDI in the MHS of the city of Olsztyn in 2012–2020 are presented in Chart 2. This chart shows that the values of the GDI-BN index based on the number of buildings in both MHS segments tended to increase, indicating that the dynamics of inclusion of municipal buildings to privatization (i.e. their flow from the S1 to the S2 Segment) was higher than the dynamics of the total removal of a municipality's shares in common buildings (i.e. the exit of the municipality from HOAs). In contrast, the values of the GDI-DN and GDI-FA indices based on the number of dwellings or floor area, respectively, showed a declining tendency.

This implies that in the process of dispersed privatization, municipal dwellings in the existing HOA buildings were sold off to a greater extent than those in municipal buildings, moving them to the S2 Segment after the first sale. These two opposing trends caused by dispersed privatization thus exerted significant effects on the overall quantitative ownership structure of the MHS during the study period.

In the following, the changes in the qualitative ownership structure of the MHS in Olsztyn due to the dispersed privatization of municipal dwellings were examined by analyzing the percentage of the oldest age groups of buildings in this stock during 2012–2020. The results are presented in Chart 3. The results indicate that the process of dispersed privatization of municipal housing, reducing the MHS by 86 buildings (10.3%) between 2012 and 2020, did not improve the disadvantageous age (qualitative) structure of buildings in this stock. This is supported by the fact that the total percentage of buildings in the three oldest age groups (shown in Chart 3) was 92.2% in 2012 and 91.1% in 2020.

A noticeable decline in the percentage (about 1%) in this period occurred only in the group of buildings built between 1919 and 1944, while the shares of the other two oldest groups of buildings in the MHS were remarkably stable. A positive effect of the privatization conducted can be seen from the fact that the percentage of the mentioned oldest age groups of buildings in the S1 Segment is about 10% lower than in the S2 Segment. Therefore, accelerating the municipality's exit from HOAs using selective privatization can perceivably improve the qualitative ownership structure of buildings in the MHS.

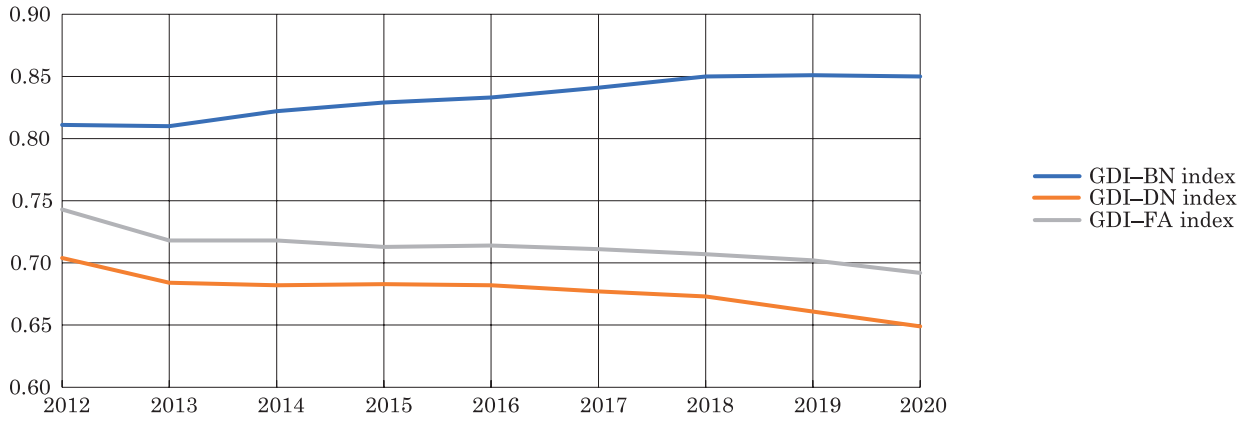

Chart 2. Values of General Dispersion Indices (GDI) of municipal ownership in the MHS of the city of Olsztyn in 2012–2020
Source: own preparation.

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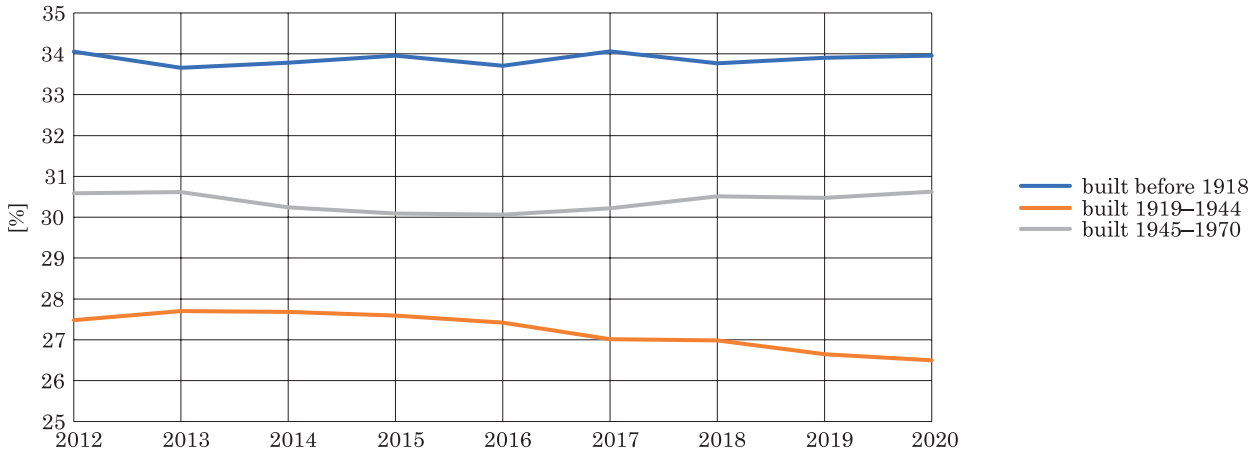

Chart 3. Percentage of the oldest age groups of buildings in the MHS of the city of Olsztyn in 2012–2020
Source: own preparation.

In the last step, the effects of dispersed privatization of municipal dwellings reflected in changes in the structure of municipal shares in common properties owned by HOAs with the participation of the city of Olsztyn in the S2 Segment of the surveyed MHS were examined. These changes, as structural effects of housing privatization, are shown in Chart 4.

This chart shows that, over time, HOAs in which the municipality had smaller shares held an increasing percentage. This means that dispersed privatization of municipal dwellings has led to an increasing fragmentation of municipal ownership in HOAs, which, as already mentioned, was a disadvantageous phenomenon for the municipality because it has resulted in numerous complications in governance and management of the MHS. It should be pointed out that the phenomenon of excessive fragmentation of municipal ownership in HOAs is relatively persistent with a tendency to grow, as evidenced by the increasing percentage of HOAs with a small number of municipal dwellings over time (Chart 5).

This tendency is also illustrated by an analysis of this phenomenon in absolute terms, as, for example, the number of HOAs in which the municipality owned

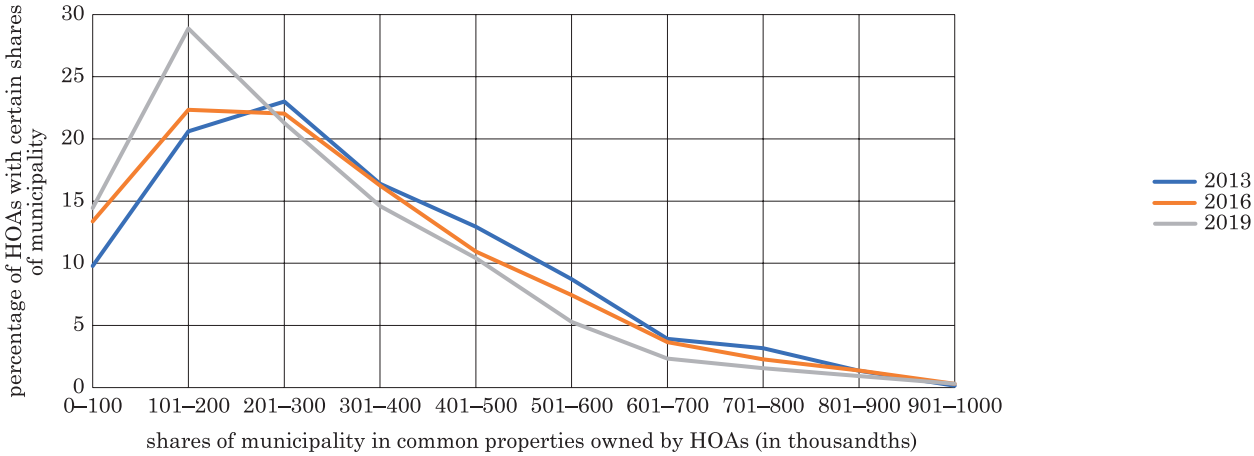

Chart 4. The structure of municipal shares in common properties owned by HOAs with the participation of the city of Olsztyn in the S2 Segment of the MHS in 2013, 2016 and 2019
Source: own preparation.

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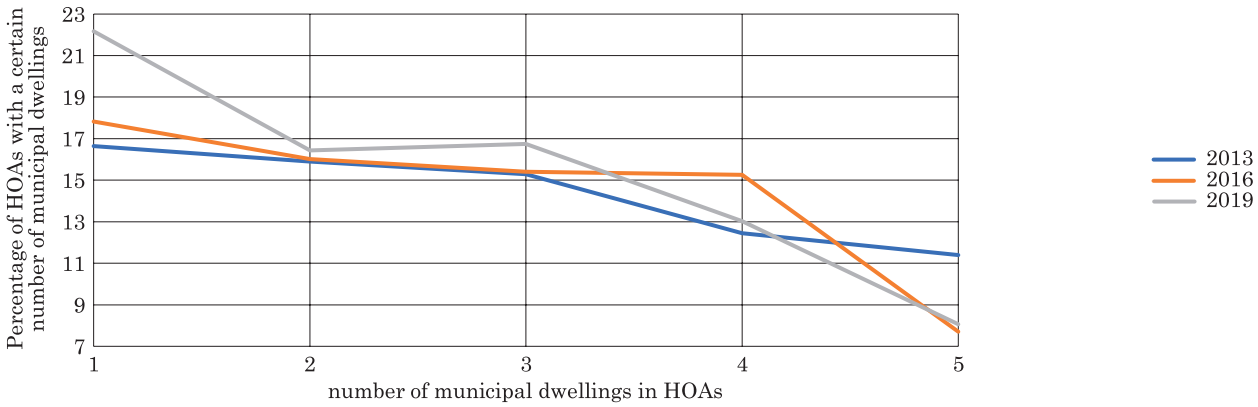

Chart 5. Percentage of HOAs with the participation of the city of Olsztyn with a small number of municipal dwellings in the S2 Segment of the MHS in 2013, 2016 and 2019
Source: own preparation.

only one unit increased from 102 in 2013 to 141 in 2019. In contrast, the number of HOAs in which the municipality owned two units remained at 106 in both 2013 and 2019. In conclusion, it can be stated that the reduction or elimination of excessive fragmentation of municipal property in the surveyed MHS requires implementing selective privatization procedures associated with active rent and renovation policies, as well as with a policy of intentional tenant relocation within the stock, which is facilitated by the amended legal regulations.

CONCLUSIONS

Privatization of public (council) housing is a global phenomenon, associated with the evolution of housing systems as a result of changes in the understanding and perception of housing in relation to the responsibility of public authorities to citizens. It has significantly affected the tenure structure in many housing markets, creating millions of new homeowners in both the Western and the Central and Eastern European countries. Poland, like the Czech Republic, adopted the concept of long-term (slow) privatization of public housing, and the main role in this process was assigned to municipalities, which took over from the State Treasury both the tasks and resources in the area of public housing, creating, on their basis, the municipal housing stock (MHS).

In Poland, the primary privatization form of municipal dwellings located in MHS has been their sale to sitting tenants. As reported in the literature, the privatization processes of municipal dwellings, which in most municipalities have been conducted using the dispersed privatization method, did not have a well-defined and socially debated purpose and has proceeded in an uncontrolled manner, inconsistent with the laws of economics and determined by short-term revenues or budget savings. Therefore, despite the rational premises for conducting them, these processes proved to be more difficult to implement in practice, bringing numerous risks and not entirely desirable effects. Moreover, the scale of accomplished privatization in many municipalities, with marginal investments in new communal construction despite obtaining significant revenues from the sale of dwellings, now raises a real threat that they will lose their ability to fulfil their most urgent own tasks in the housing field with the help of rapidly shrinking MHS.

Despite these problems, it is generally acknowledged that the privatization process of municipal dwellings cannot be stopped; they can only be rationally shaped in accordance with local conditions. From this perspective, an analysis of the effects of the dispersed privatization of municipal dwellings on the spatial and ownership structure of the MHS of the city of Olsztyn in 2012–2020 has been conducted in this paper. The results of this case study indicate the following empirical conclusions:

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1. Due to the insignificant scale of investment and disinvestment in the studied MHS, the revealed trend of its shrinkage can be treated as an exclusive effect of privatization (sale) of municipal dwellings. Positive changes include a noticeable increase in the municipality's housing investment in 2019–2020, which stemmed the decline in the number of dwellings in municipal buildings.

2. The dynamics in the number of privatized municipal dwellings in Olsztyn demonstrated a high sensitivity to rent increases in the MHS and introducing less favorable sales prices (discount rates) for eligible purchasers of housing units. These dynamics indicated much less sensitivity to the later extension of the list of municipal buildings excluded from privatization.

3. Uneven allocation of the MHS in the urban space hinders sustainable city development (promotes ghettoization, social exclusion and segregation of low-income tenants). The dispersed privatization has noticeably worsened the MHS spatial structure (by losing in the MHS the best locations) and significantly complicated the revitalization of city areas dominated by public-private HOAs.

4. Dispersed privatization processes of municipal housing had unfavorable effects on the quantitative ownership structure of the MHS, leading to increased mixing of municipal and private property in a larger number of buildings. This occurred due to the faster rate at which municipal buildings were included in privatization than the rate at which the municipality exited HOAs.

5. The extensive sell-off of municipal dwellings, despite a significant reduction in the size of the MHS, has not improved the unfavorable qualitative (age) structure of buildings in this stock. This shows that at a more advanced stage of dispersed privatization it was extremely difficult for the municipality to dispose of shares (dwellings) in the oldest buildings with technical and functional deficiencies.

6. The dispersed privatization has led to increasingly fragmented municipal ownership in HOAs. The persistent occurrence of so many common buildings with single municipal dwellings in the MHS indicates that the poorly controlled privatization process has bogged down in HOAs.

7. Positive actions of the municipality in terms of privatization include the reduction of discounts on dwelling sale prices and the exclusion of a large part of the MHS from privatization. However, improving MHS management efficiency as an effect of housing privatization remains a controversial issue, as most HOA buildings are still managed by municipal entities.

Due to the fact that sales processes of municipal housing in Olsztyn showed many similarities in relation to other cities with a similar population or size of municipal housing stock, the obtained results in this case study may be treated as a contribution to broader reflections on the impact of dispersed privatization of municipal dwellings on structural changes in MHS of many Polish cities. The results and proposals in the paper could also be of interest to other countries facing the challenge of slow privatization of public housing.

In view of the need to reduce or eliminate the indicated undesirable structural effects of dispersed privatization, it is necessary to streamline the sale procedures of municipal dwellings by subordinating them to a local housing policy based on a strategic approach, including the determination of the size of the MHS necessary for municipalities to perform their public tasks in the housing area and not to be sold, as well as to introduce relevant limitations to this process with regard to both the subjects and the objects of privatization. For many years, the preferred solution in the literature has been the selective privatization method consisting of the sale of all municipal dwellings in thoroughly selected buildings. Although this method is more difficult to implement, it brings greater benefits in terms of proper MHS governance and management. The identification of social, managerial and governmental barriers of the selective privatization of municipal dwellings as well as the development of procedures, principles and ways of its effective implementation are therefore recommended directions for further research.

Author Contributions: Andrzej Muczyński: conceptualization, methodology, validation, investigation, resources, writing – original draft preparation, supervision; Sebastian Goraj: text editing.

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