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ORIGINAL PAPER
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SELECTED ASPECTS OF SPATIAL CHANGES IN LAND USE DUE TO SUBURBANISATION – A CASE STUDY IN POLAND

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ABSTRACT

Motives: The reason for undertaking this study was the need to identify the extent of suburbanisation in Eastern Poland, observed in the municipalities located in the vicinity of Lublin – one of the largest cities in this region.
Aim: The aim of this study was to determine the changes in land use in the area of the municipalities of Głusk and Jastków in a selected period, and to compare them in terms of changes in land cover due to the suburbanisation process. The research was divided into the following stages: the acquisition of reliable data on the use of the study area in 2000 and 2018; the preparation of land cover data in graphical form; the verification of the information as to which municipality has undergone greater changes in relation to the suburbanisation process.
Results: The analysis showed that over recent years, progressive changes have taken place in the agricultural and rural landscape in both municipalities. The changes in land use in the study area are significant. Agricultural land is being replaced by newly created land intended for construction purposes. In addition, new, previously non-existent forms of land cover are emerging. New suburban housing estates, new houses and, often, new public spaces are being created.

Keywords: urbanisation, land-use change, regional planning, small towns

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INTRODUCTION

Suburbanisation is understood as any process of transferring urban spatial layouts and urban lifestyles outside the metropolis. The suburbanisation process is a phenomenon that is noticeable both in Poland and worldwide. There are several factors affecting the development of the suburbanisation process, and thus changing land use in suburban communes. These can be spatial, social, economic, natural, cultural, historical, legal, and administrative. The areas that were previously used for agricultural purposes, and are near major metropolises, are referred to as rural areas within the city's influence zone. Many factors determine the decision to change the place of residence. People move from their current place of residence to a new one looking for a job or improved living conditions. The process of suburbanisation is an issue that is increasingly being addressed, both in Polish and world literature. The term can be defined as the urbanisation of areas surrounding a city, which originally used to be rural areas. Not only does this involve a change in the place of residence (from the city to peripheral areas) but also the transfer of urban lifestyles including modern construction, infrastructure, land use, and landscape forms to these areas. Such links appear to be developing new functions of suburban zones. Nowadays, some studies already indicate that it is not appropriate to use the traditional division of urban spaces into central and suburban areas, as the contemporary world is already in the post-urbanisation phase (Hlaváček et al., 2019). From the perspective of the analysis undertaken in this study, the process has an enormous impact on the spatial layout and significantly changes not only the development of the areas concerned but also the location of various enterprises. In Poland, this also holds for the cities where the decentralisation process is observed, which mainly involves people and companies moving from the city centre to its suburbs. Urban sprawl is a specific type of land management. The world literature presents suburbanisation as a seemingly problem-free phenomenon to be defined, which, when subjected to analysis, presents three main problems. According to Pagliarin (2022), the first one is the possibility to recognise, around the world, similar suburban spatial layouts, as the uncontrolled urban expansion taking place worldwide is characterised by a wide variety of morphologies. The infrastructure-based development of suburban areas can be noticed as well (Hamel & Keil 2015; Keil, 2013). Another problem is the lack of unanimity among researchers on the use of indices for the measurement of uncontrolled urban sprawl (European Environment Agency, 2016; Inostroza et al., 2013; Paül & Tonts, 2005; Salvati & Carlucci, 2016; Seto et al., 2012; Siedentop & Fina, 2012; Taehyun & Youngre, 2023). Thirdly, urban sprawl is the result of a combination of multiple different factors that are difficult to characterise, because they are not unambiguous, and each of them can be a factor enhancing further development and expansion of suburban areas (Artmann et al., 2019; European Environment Agency and European Commission, 2006; Inostroza et al., 2013; Seto et al., 2012).

According to Krisjane et al. (2012), residential suburbanisation is one of the most eye-catching processes of urban change in Central and Eastern Europe (CEE), especially in the metropolitan areas of the capital cities (Borén & Gentile, 2007; Leetmaa et al., 2009; Tammaru & Kontuly, 2011). Currently, residential suburbanisation considerably surpasses workplace suburbanisation, which results in a strongly increased flow of commuting to work in Central and Eastern European countries (Ahas et al., 2010; Tammaru, 2005). Aguiléra et al. (2009) point out that in metropolitan areas, the proportions of suburb-to-suburb journeys and central city-to-suburb journeys have risen whilst the proportion of suburb-to-central city journeys has declined. The development of suburb-to-suburb commuting and reverse commuting, defined as home-to-work journeys from the central city to the outskirts was initiated by the suburbanisation of jobs and housing (Christopher et al., 1995).

According to Hlaváček et al. (2019), suburbanisation is also presented as the reason behind the problems of three main pillars of sustainability, namely

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economic, environmental, and social. The problem is that with intensive economic development, it is very difficult to limit land use changes. Suburbanisation also has a major impact on water courses and their ecosystems, and the more an area is populated (e.g. the higher the density of population and built-up areas, the networking of transport and technical infrastructure), the more difficult and costly it is to restore water courses.

An interesting point of view on the presented issues is demonstrated by Kährik et al. (2012) who, through research on the suburban region of the city of Tallinn in Estonia, showed that the most important factor in the decision to move to a new suburban settlement was the need for improved housing conditions, particularly the desire to live in one's own house. The most striking result was that there was very little evidence of induced moves to the suburbs i.e., suburbanisation directly caused by life changes such as family reunion or the birth of children. However, dissatisfaction with the urban environment was a relatively important factor, which was also linked to the perception of what constituted a suitable environment for raising children. When choosing a particular settlement in the suburban area of the city of Tallinn, people usually attached great importance to proximity to the city, and their lives remained closely connected to their jobs, social infrastructure, and social networks of the urban environment. A tendency has emerged to search for a new house or a flat close to the city but in a suburban settlement with its own good-quality, modern infrastructure (roads, water supply and sewage system, etc.).

This issue has also been clearly described by Polish authors. Currently, the areas surrounding cities in Poland are experiencing a boom and dynamic development because of the ongoing suburbanisation process. Communes adjacent to large cities are becoming increasingly attractive for urban dwellers. This is supported by several issues. Among other things, suburban communes offer more privacy, a greater degree of security, and better access to places referred to as recreational (e.g., forests, and lakes). At the same time, due to certain individualism of the suburban zone, e.g. gated residential communities or, more often, separate single-family houses, public spaces are becoming an uncommon thing. Due to the lack of places for local community integration, and the inhabitants' need to get away from the hustle and bustle of the city, these people confine themselves to their premises, and relax alone (Mierzejewska, 2018). In such cases, it should be the local government's responsibility to reach out to the inhabitants and create friendly public spaces, and then encourage local communities to use and further co-create them. Gzell (2011) defines suburbanisation as the construction of suburbs. The literature also provides the term *urban sprawl* (Źróbek-Różańska & Zysk, 2015). Three spatial aspects are indicated to distinguish the process of suburbanisation. The first of them is internal suburbanisation which takes place in areas that are not invested in, within administrative boundaries of the city. Another spatial context within which the suburbanisation process emerges can be defined as the so-called close suburban zone within the city limits. These areas are characterised by high levels of investment. Then, processes taking place within the further suburban zone, situated outside the close suburban zone, can also be distinguished. This zone is dominated by such land use forms which, in landscape terms, resemble the countryside (Zając et al., 2016).

The mobility of people has improved thus longer distances to the workplace are less often considered problematic. Thanks to improved mobility, transport, and road infrastructure outside the city, it is easy to travel several more kilometres to work in the city centre. Work-wise it is not necessary to choose between living in the city and living in a suburban zone. According to Źróbek-Różańska and Źróbek (2017) thanks to the higher workers' incomes and the improved transport systems, the preferred commuting distances range between 6–20 km, while the preferred commuting time ranges from 15 to 20 minutes.

The settlements being developed in suburban zones are generating problems related to the sparsity or the lack of certain social functions in a particular area. In rural areas, the access to social institutions may be more problematic. Daycares, kindergartens,

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schools, or healthcare institutions, if not missing, may be located at considerable distances. What is more, key cultural institutions such as cinemas, theatres, art galleries or sports and leisure facilities are commonly found only in the cities. Lack of all of the services listed above may decrease the time spent in rural areas to the minimum. The increasing number of people coming from the city to the countryside is also reflected in the change in the behaviour of villagers who have a new model, namely the "urbanites". The rural population is assimilating the lifestyle of the new inhabitants, which leads to the gradual disappearance of folk traditions and culture. The mingling of urban and rural populations highlights the differences in terms of financial situation between these communities, with social segregation taking place (Małek, 2011).

Scholars also mention the negative environmental impacts of the phenomena. Continued urban sprawl and the formation of "transition zones" between the city and the countryside lead to irreversible changes in the natural environment. The expansion of residential, service, industrial or transport areas has adverse consequences of environmental degradation. Due to the demand for land, trees, which serve an important role in mitigating the adverse effects associated with intensive farming are being cut down (Źróbek et al., 2014). Trees form ecological corridors, improve the microclimate, and are an important component in the creation of places for leisure and recreation (Kujawa et al., 2017). Taking over agricultural and forest land for new investments results in the Polish rural landscape being destroyed. Open spaces are being built with new houses and estates, spatial chaos is being created, and natural ecosystems are being destroyed. The increased population of a particular area and an increase in the number of cars result in increased exhaust emissions to the atmosphere i.e. environmental pollution (Małek, 2011).

Another issue found in the literature is the lack of regulations for constructing new buildings in the suburban zone. Dispersed buildings are an example of the lack of spatial order i.e., poor spatial planning in these areas. The literature on the subject believes that appropriate measures need to be taken to prepare agricultural land for its new functions (Źróbek et al., 2014). Local plans are found in a small portion of rural areas or are often missing there. This results in uncontrolled sprawl of built-up areas. Newly constructed individual buildings or even housing complexes emerging in the suburban zone do not relate to the existing spatial layout. The principles of sustainability are often violated (Mrozik & Noskowiak, 2018). Polish legislation provides guidelines related to investments and environmental protection in local area development plans. A study of conditions and directions of spatial development of a particular commune contains rather vague provisions that lead to imbalances in sustainable development (Idczak & Mrozik, 2017). Despite the numerous adverse effects of the urban sprawl, there are also more optimistic consequences. The development of suburban villages is taking place, and the multi-functionality of suburban areas is emerging. In addition to the typical agricultural function, several other functions can be noticed as well, e.g., service, residential, or transport functions. New services are being developed that are complementary to the previously found in the particular area (Harańczyk, 2015). The suburbanisation process results in investments in new schools and other cultural institutions (Małek, 2011). New commune inhabitants contribute to the commune's budget, as they not only pay property tax but also, frequently, income tax (Źróbek-Różańska & Wolny, 2017). New jobs and business establishments are being created to serve not only the people who have moved to rural areas but also the local community (Denis & Majewska, 2011). The development of suburban settlements has resulted in the need to extend technical infrastructure to new houses. The provision of water and the disposal of wastewater is responsible of local governments, therefore there has been an expansion of the water supply and sewage networks (Słysz et al., 2013).

When examining the phenomenon of suburbanisation, we should also mention urbanization that occurs in developing countries such as China (Xiao et al., 2018), India (Basu & Das, 2023) or African coun-

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tries (Gutu, 2023). In China with the rapid development of cities, hundreds of millions of rural residents come to work and live in the city as migrant workers. China's urbanization has ignored ecological conservation and sustainable use of non-renewable natural resources because of the strong emphasis placed on economic development, as measured purely by GDP. Such an overemphasis on economic development has resulted in repeated construction, overcapacity, waste of resources, and serious environmental pollution. However, urban suburbanisation also brings negative effects to the ecological system of the urban fringe or suburbs, and the ecological environment in the suburbs has significantly changed (Wang et al., 2017). Some authors see urbanization as strongly benefitting rural areas, for instance, through increased demand for agricultural goods and services, others highlight negative effects, for example, through the loss of livelihoods emanating from displacements and the conversion of agricultural land that may lead to urban sprawl. Another important aspect is the phenomenon that appears during the economic development of individual regions of the world. To some extent, we all leave a small stain, a small footprint, a carbon footprint on our planet. It is this important parameter, already recognized all over the world, that informs how much individuals and enterprises influence the generation of greenhouse gases into the atmosphere as a result of specific activities. The carbon footprint does not only affect large enterprises, mines, or industrial plants, it is also left by individual people whose actions may disturb the environmental balance. However, the largest carbon footprint is left by companies that use a lot of greenhouse gases released into the atmosphere in the production process. The dynamic development of urban areas will also have an impact on climate change. There have been studies on this topic in the literature. For instance, Kim and Noh (2023) used four path analysis models to verify the spatiotemporal variances of the relationships between urban forms and the carbon footprints of the housing/travel sectors based on geographical data and carbon footprint survey results from Seoul and Gyeonggi in Korea in 2009 and 2018. For instance, He et al. (2023) built up the land use efficiency index measurement incorporating night-time light intensity, population density, and facility density of built-up land, and investigated the spatial pattern of the peri-urban areas' index of 36 metropolitan areas in China. For another instance, Jin et al. (2023) proposed a comprehensive model to assess the green quality of urban spatial development, focusing on the synergy of multi-dimensional objectives and the balance of multi-regional interests, and took the metropolitan city of Hangzhou of China as an example.

In contrast, Finland, the most sparsely populated country in the EU with 18.3 persons per km^2 in 2022 (according to Statistics Finland, vaerak database), has recognised suburbanisation as part of renewed urban-rural classification in need of systematisation and data collection. The classification was renewed in 2013, from administrative area-based to spatial data-based as information-based area classification, calculated mostly at an accurate 250 x 250 metres grid (Helminen et al., 2014). The source data of population, labour, land use, commuting and potential accessibility as well as area density of buildings, was used to calculate criteria variables such as quantity, density, efficiency, accessibility, intensity, diversity and direction. The variables, e.g., population density or land use intensity, were calculated with a focal analysis, part of neighbourhood analysis with local and global characteristics (Fotheringham et al., 2000). The delineation of urban areas was the starting point of the process of urban-rural delineation which resulted in three urban area classes: *Inner urban area, Outer urban area, Peri-urban area*, and rural four classes: *Local centres in rural areas, Rural areas close to urban areas, Rural heartland areas, Sparsely populated rural areas. Rural areas close to urban areas* class used a modified potential accessibility index (Yoshida & Deichmann, 2009). The classification is used in research and planning as well as by Statistics Finland. According to Statistics Finland, looking at the population change in the areas between the years 2000 and 2022, only the three urban area classes noted a positive increase. Among the rural population, the smallest decrease of 2% was noted in *Rural areas close to urban areas*, while

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for example, the population of *Sparsely populated rural areas* dropped by almost 30%.

The subject of analyses under this study was to determine the changes in land use in the area of the Głusk and Jastków communes in the selected period (from 2000 to 2018) and to compare them in terms of the changes in land cover due to the suburbanisation process. The research work stages included, successively, the acquisition of reliable data on the use of land under study in the years 2000 and 2018; preparation of land cover data in graphic form; verification of the information as to which commune underwent greater changes in terms of the suburbanisation process. This article is an attempt to find the reasons for the changes noted, and to explain their significance.

This article reports a case study covering the territory of two communes located in the vicinity of the city of Lublin. The rural communes under analysis include the communes of Jastków and Głusk with a combined total area of 75 313 ha. To conduct the analysis of land use changes, the Corine Land Cover database was used. The CLC Programme was established to collect land cover information for the whole of Europe at regular intervals. The study used the data available for the years 1990, 2000, 2006, 2012, and 2018. The maps were compiled in the QGIS 2.18 program using data from the National Register of Boundaries and Areas of Territorial Division Units of the Country (in Polish: Państwowy Rejestr Granic, PRG) made available by the Head Office of Land Surveying and Cartography. The analysis results showed that over recent years, both communes have been characterised by progressive changes taking place in the agricultural and rural landscape. Changes in land use in the area under study are significant. Agricultural land is being replaced by newly created usable land intended for construction purposes. Moreover, new, previously non-existent land cover forms are emerging. New suburban housing estates, new houses and, often, new public spaces are being created. The analysis result can be used for broader considerations concerning suburbanisation in these areas as well as in other communes located in the vicinity of the city of Lublin. In addition, they provide the opportunity to develop planning guidance and guidelines and to establish environmental protection plans.

MATERIALS AND METHODS

Analysis of the land use structure in Poland

According to the Regulation of the Minister of Development, Labor and Technology 27 of July 2021 on Register of Land and Buildings (Regulation, 2021), the land use structure comprises agricultural land, forest land, wooded and shrub land, built-up and urbanised areas, land under water, and miscellaneous areas.

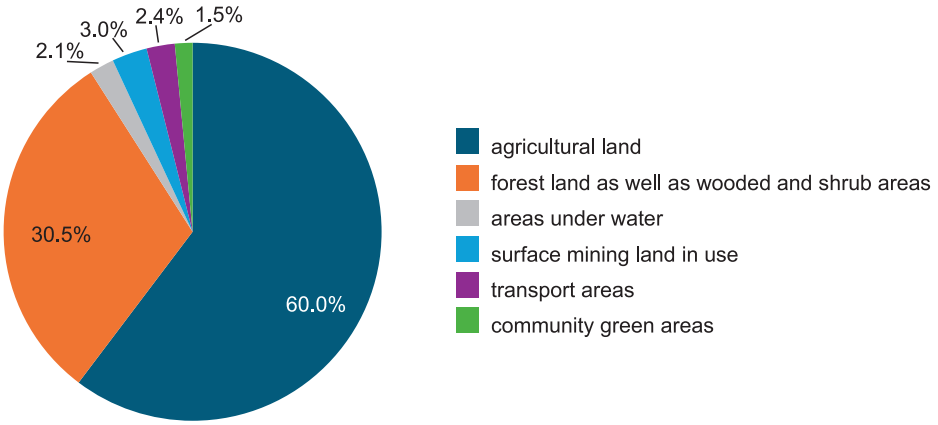

Fig. 1. The land use structure in Poland (status valid as of 1 January 2019)
Source: Statistics Poland (GUS, 2020b).

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Based on the Statistics Poland (GUS) data (Fig. 1), agricultural land is predominant in Poland, as its proportion in the total area of the country accounts for 60%. Not only is this due to the presence of favourable natural factors but also to the low level of industrial development in these areas as well as to historical determinants. On the other hand, the areas which do not satisfy agricultural requirements are densely forested (e.g., north-western Poland) or urbanised/industrialised. As a comparison, the share of agricultural land in the whole EU-27 in 2018 was only 39.1% (see Table 1) and has a decreasing trend.

These are followed, in terms of their proportion in the total area of the country, by forest land as well as wooded and shrub areas, which cover 9 533 639 ha i.e., 30.5% of the area of Poland. The highest proportion of forests in the land use structure is noted in Zachodniopomorskie, Mazowieckie, and Wielkopolskie Voivodeships, while the lowest one is noted in Opolskie Voivodeship (Statistics Poland (GUS), 2020a). Dynamic changes in land cover and land use are occurring in the cities themselves as well as in the surrounding areas. The area of arable land and, sometimes, forests is declining in favour of built-up areas, mainly residential but also industrial, commercial, and transport ones. The ongoing process is contributing to changes in the landscape, living conditions, and the social situation of inhabitants of the area adjacent to the big city (Kałamucka et al., 2012).

Table 1. Land use structure in the EU-27 (%)

Land use	2015	2018
Agriculture	40.4	39.1
Forestry	34.1	35.9
Services and residential area	6.6	5.7
Mining and quarrying	0.3	0.3
Industry and manufacturing	0.2	0.2
Transport, telecommunication, energy distribution, storage, protective works	2.4	3.0
Community services	0.6	0.6
Residential area	2.9	2.9
All other	12.5	12.3
Total	100.0	100.0

Source: Eurostat (lan_use_ovw database).

Characteristics of the studied area

The area under study, presented in this publication, includes two communes neighbouring the voivodeship capital city of Lublin. This area was selected because it is the central hub of the Lublin agglomeration. Lublin is the ninth most populous city in Poland. Referred to as the capital city of Eastern Poland, Lublin is the largest and the most rapidly developing city of the Lubelskie Voivodeship and Lubelski District, located on the right side of the Vistula River. As the capital city of Lubelskie Voivodeship, Lublin serves the role of administrative, economic, and cultural centre of the region. Lublin's rich, seven-century history and its location in a multicultural melting pot make the city particularly valuable. The selected communes are located on the opposite sides of the city of Lublin. The commune of Jastków is located on the north-western side of the city, while the commune of Głusk is on the south-eastern side. They are characterised by an increase in the built-up areas on the land that was previously used for agricultural purposes. A spatial image of the area under study, against the background of Europe, is presented in Fig. 2. The study was conducted over an area of 75 313 ha.

The commune of Głusk

The commune of Głusk is a rural commune located in the central part of Lubelskie Voivodeship, in the eastern part of Lubelski District (Fig. 2). It is located at two exit roads from Lublin: national road No. S-17 towards Chełm, and regional road 835 towards Biłgoraj. The area of the commune is 6400 ha. There are 17 localities in the commune of Głusk. The data provided in the graph (Fig. 3) show that the population of the commune of Głusk is steadily increasing, as it increased by 4760 people over 18 years. The largest increase took place in 2010 (by 547 people) as compared to the previous year.

Figure 4 shows the internal migration balance in the commune of Głusk. The recent few years have seen a significant increase in people's mobility in this region. There is a positive rate of the internal migration balance. In 2018, this index amounted to 331.

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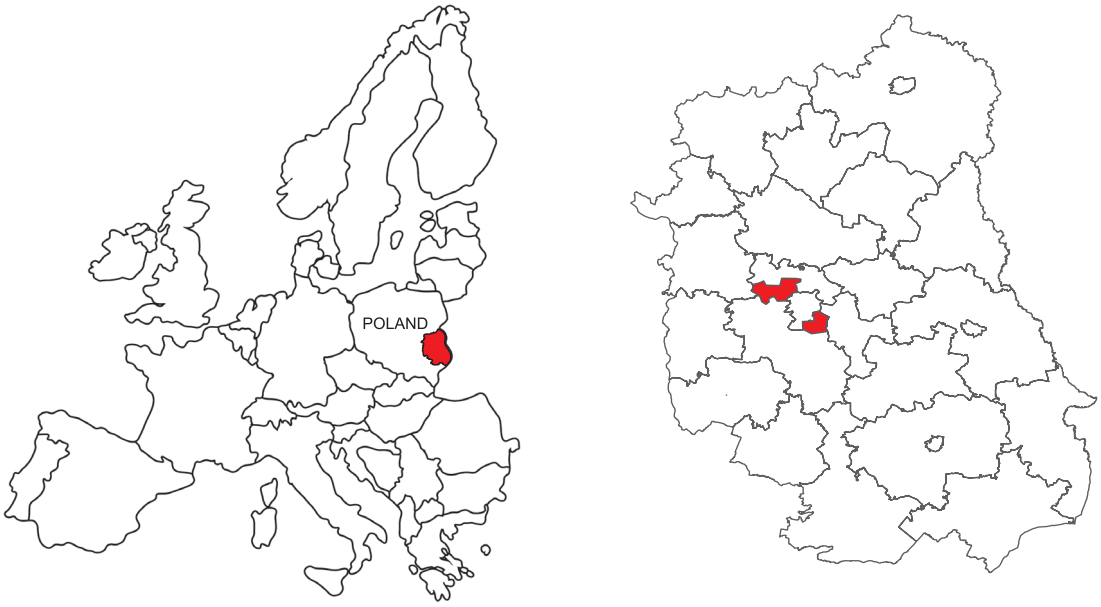

Fig. 2. A spatial image of the area under study against the background of Europe and Poland and Lubelskie Voivodeship
Source: own elaboration.

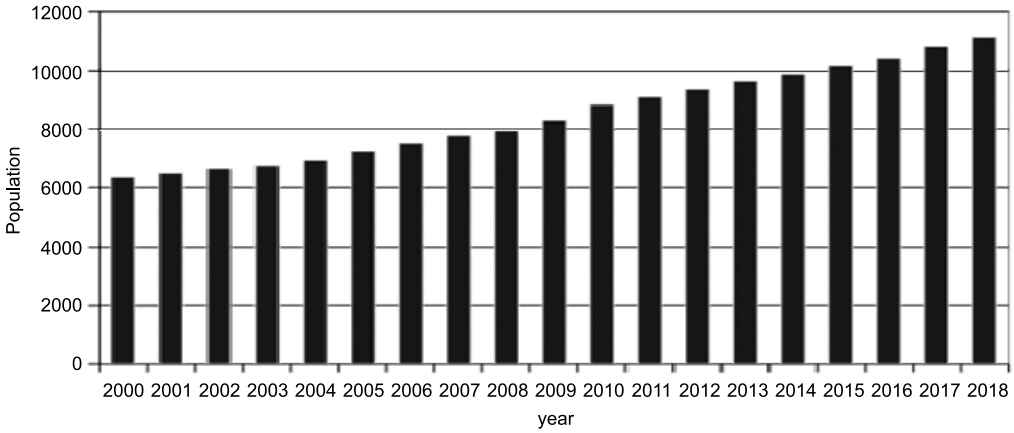

Fig. 3. The population of the Głusk commune in the years 2000–2018
Source: Statistics Poland (GUS, 2020b).

Tourist infrastructure has not developed in the commune, which is due to its proximity to the city of Lublin. A 37.2 km cycle route runs through the commune area. Thanks to its location, proximity to the large city of Lublin, and the existing infrastructure, the commune of Głusk is a place offering good conditions for the development of agriculture, processing, and small enterprises. There are attractive construction and investment areas in the commune. The commune of Głusk also has areas for the development of commercial services including wholesale and retail trade as well as other types of economic activity (Commune of Głusk, 2020b). The Głusk commune used to be considered an agricultural commune but its character is slowly transforming, which is promoted by the location near the city of Lublin. In area development plans, agricultural land is being changed into area for

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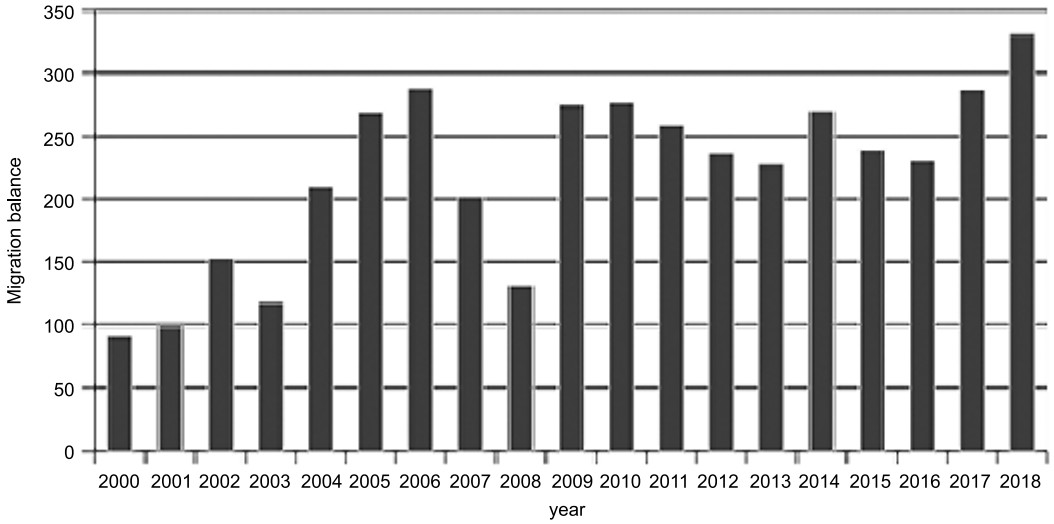

Fig. 4. The balance of internal migration in the Głusk commune in the years 2000–2018
Source: Statistics Poland (GUS, 2020b).

housing developments. The proportion of arable land in the total area of the commune is decreasing year after year. Currently, this proportion amounts to approx. 80%, as compared to approx. 87% noted a few years earlier (Commune of Głusk, 2020a).

The commune of Jastków

The commune of Jastków is a rural commune located in Lubelskie Voivodeship, in Lubelski Poviat (district), and is directly adjacent to the city of Lublin (Fig. 2). Its area amounts to 11 313 ha. The commune is situated in the belt of the Nałęczowski Plateau, which is part of the Lublin Upland. It is characterised by varied topography. In the area under study, there are denudation valleys, loess ravines, non-drained depressions, sunken lanes, and the two largest river valleys of the Ciemięga and Czechówka rivers (Commune of Jastków, 2020). According to the Statistics Poland (GUS) data (GUS Local Data Bank), the commune was inhabited by 11250 people in 2000. The number of inhabitants increased year after year to reach the population of 14 032 in 2018 (Fig. 5), which is an increase of 19.82%.

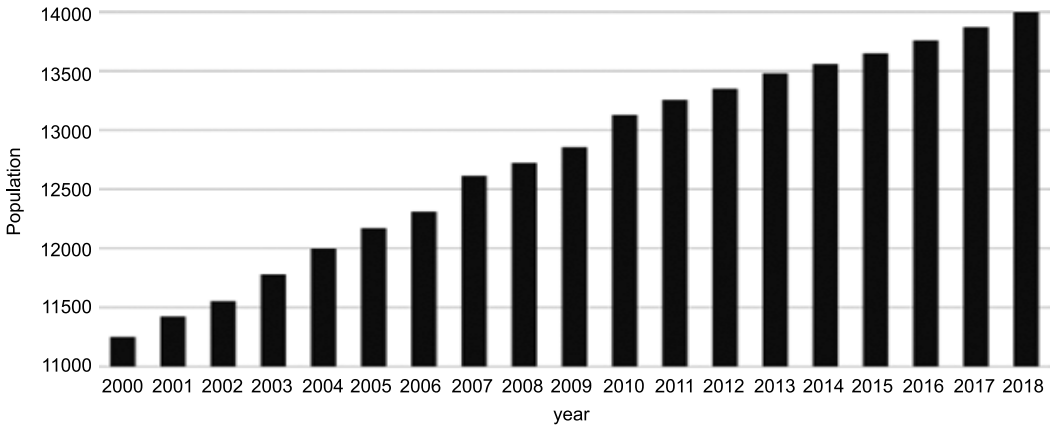

Fig. 5. The population of the Jastków commune in the years 2000–2018
Source: Statistics Poland (GUS, 2020b).

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In 2018, women outnumbered men in the commune of Jastków. The working age group population was also predominant. The smallest percentage of the population comprised people of post-working age (Fig. 6) (Statistics Poland (GUS), 2020b).

Homestead and private buildings, characterised by an urban style, are predominant in the commune. The number of multi-family buildings is negligible and is not increasing considerably, while single-family houses are growing in popularity year after year (Commune of Jastków, 2020). The dominance of agricultural land was noted in both 2000 and 2018, while their proportion has been declining over these years. However, there has been a steady increase in the development of built-up areas (General Inspectorate for Environmental Protection (GIOŚ), 2020a). To analyse the land use changes, the Corine Land Cover database was used. The CLC Programme was established to collect land cover information for the whole of Europe at regular intervals. The data are available for the years 1990, 2000, 2006, 2012, and 2018. At the national level, the responsibility for it lies with the Chief Inspectorate of Environmental Protection (GIOŚ) (General Inspectorate for Environmental Protection (GIOŚ), 2020a). The advantage of the data acquired from this database is the universality of class separation for the entire Europe according to the same criteria. The maps were compiled using the QGIS 2.18 program using the data from the National Register of Boundaries and Areas of Territorial Division Units of the Country (PRG), available on the Head Office of Land Surveying and Cartography website.

Analytical and research work stages

The first stage of research was to acquire data on land cover in the communes of Jastków and Głusk in 2000 and 2018 from the Corine Land Cover (CLC) database. CLC offers data to be downloaded in various extensions. For the analyses, the shape format was selected. The data were imported into the QGIS Desktop 2.18.24 program. As the land cover was shown for the entire Poland, a trimming to the boundaries of the commune under study had to be performed. To this end, the administrative units made available in the shape extension on the Head Office of Land Surveying and Cartography website were imported from the National Register of Boundaries to the program.

The data acquired from CLC were presented as a single layer, with different land cover forms being only distinguished by the legend. Therefore, each

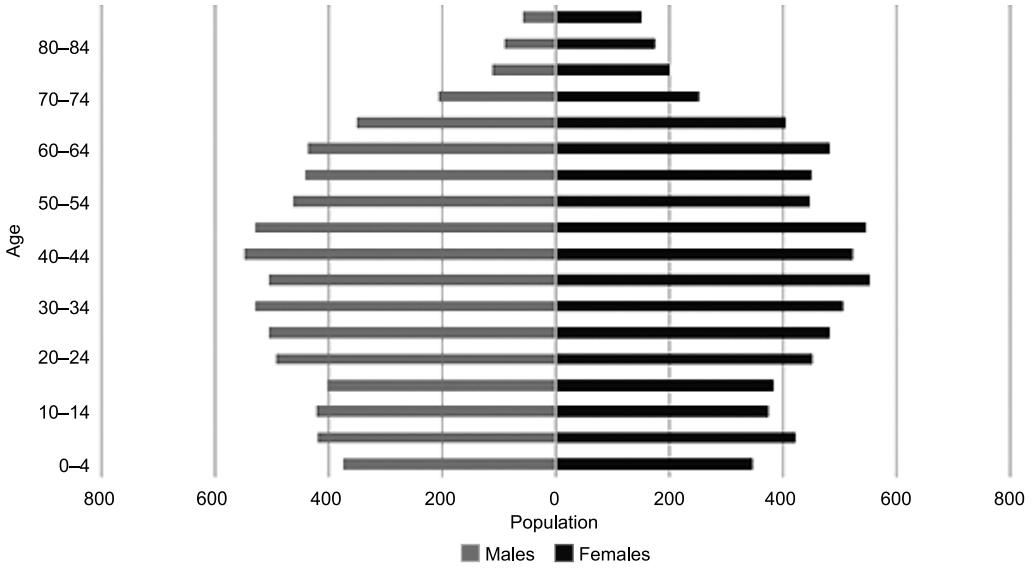

Fig. 6. Age and gender pyramids of the Jastków commune inhabitants in 2018
Source: Statistics Poland (GUS, 2020b).

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Table 2. The land cover forms distinguished in the Corine Land Cover data base

Level 1	Level 2		Level 3
1 – Artificial surfaces	1.1 – Urban fabric	1.1.1	Continuous urban fabric
		1.1.2	Discontinuous urban fabric
	1.2 – Industrial, commercial and transport units	1.2.1	Industrial or commercial units
		1.2.2	Road and rail networks and associated land
		1.2.3	Port areas
		1.2.4	Airports
	1.3 – Mine, dump, and construction sites	1.3.1	Mineral extraction sites
		1.3.2	Dump sites
		1.3.3	Construction sites
	1.4 – Artificial, non-agricultural vegetated areas	1.4.1	Green urban areas
		1.4.2	Sport and leisure facilities
2 – Agricultural areas	2.1 – Arable land	2.1.1	Non-irrigated arable land
		2.1.2	Permanently irrigated arable land
		2.1.3	Rice fields
	2.2 – Permanent crops	2.2.1	Vineyards
		2.2.2	Fruit trees and berry plantations
		2.2.3	Olive groves
	2.3 – Pastures	2.3.1.	Pastures
	2.4 – Heterogeneous agricultural areas	2.4.1	Annual crops associated with permanent crops
		2.4.2	Complex cultivation patterns
		2.4.3	Land principally occupied by agriculture, with significant areas of natural vegetation
		2.4.4	Agro-forestry areas
3 – Forest and seminatural areas	3.1 – Forest	3.1.1	Broad-leaved forest
		3.1.2	Coniferous forest
		3.1.3	Mixed forest
	3.2 – Shrub and/or herbaceous vegetation associations	3.2.1	Natural grassland
		3.2.2	Moors and heathland
		3.2.3	Sclerophyllous vegetation
		3.2.4	Transitional woodland/shrub
	3.3 – Open spaces with little or no vegetation	3.3.1	Beaches, dunes, sands
		3.3.2	Bare rock
		3.3.3	Sparsely vegetated areas
		3.3.4	Burnt areas
		3.3.5	Glaciers and perpetual snow
4 – Wetlands	4.1 – Inland wetlands	4.1.1	Inland marshes
		4.1.2	Peatbogs
	4.2 – Coastal wetlands	4.2.1	Salt marshes
		4.2.2	Salines
		4.2.3	Intertidal flats
5 – Water bodies	5.1 – Inland waters	5.1.1	Water courses
		5.1.2	Water bodies
	5.2 – Marine waters	5.2.1	Coastal lagoons
		5.2.2	Estuaries
		5.2.3	Sea and ocean

Source: General Inspectorate for Environmental Protection (GIOŚ). (2020b). Corine Land Cover Programme Legend. http://clc.gios.gov.pl/index.php/o-clc/legenda

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component had to be extracted from the legend as a separate and independent layer. The classes distinguished in the Corine Land Cover database were used (Table 2).

Another step was to calculate the area of each layer using a field calculator. On this basis, a comparison was made between the changes that took place between 2000 and 2018 in the studied communes.

The analysis, which resulted in the creation of a layer depicting changes in land cover in the communes of Jastków and Głusk, comprised a few steps. The first of them was to use a geoprocessing tool: the *Product*. Its input layer was the one downloaded from GIOŚ, relating to the year 2000, while the layers for the *Product* – each one with isolated land cover from 2018. In the next step, the resulting layers from the *Product* were used in the tool *Difference* as the input data. The layers for the *Difference* were selected similarly to those for the previous tool, the only difference being that they were selected from the year 2000. The tool allowed layers with the differences that occurred within the study period to be obtained. The final step was to add them up. To this end, the data management tool *Merge Vector Layers* was used.

The procedure described above yielded a land cover map for the communes of Jastków and Głusk in 2000 and 2018, and a map with marked areas that differ between these years. Additionally, their areas were calculated in the attribute table. They were compiled in tabular form in the Microsoft Excel program. For each land cover type, both its area expressed in hectares and the percentage proportion for 2000 and 2018 were presented in tabular form.

RESULTS

Changes in land use are not new or uncommon. However, they can be determined by different factors, and be brought about for a variety of reasons. Analysis of the acquired and processed data enabled the identification of changes that had occurred in the communes under analysis, and how this can be related to the suburbanisation process.

The commune of Głusk

Land cover in the commune of Głusk in 2000 is presented in Table 3.

Table 3. Land cover in the commune of Głusk in 2000

Item	Land type	Area (ha)	Proportion of total area (%)
1	Discontinuous urban fabric	123.41	1.9
2	Non-irrigated arable land	4891.15	76.4
3	Pastures	56.56	0.9
4	Complex cultivation patterns	784.95	12.2
5	Land principally occupied by agriculture, with significant areas of natural vegetation	63.32	1.0
6	Broad-leaved forest	195.96	3.1
7	Coniferous forest	182.22	2.8
8	Mixed forest	108.08	1.7
	Total	6405.65	100.0

Source: General Inspectorate for Environmental Protection (GIOŚ 2020a). Corine Land Cover Programme. https://clc.gios.gov.pl/

Table 3 shows the proportion of particular land types in the entire area of the Głusk commune in 2000. The total area of the commune is 6405.65 ha. In 2000, the largest area was occupied by non-irrigated arable land. It was an area of 4891.15 ha, which accounted for 76.4% of the total land area. Complex cultivation patterns came as the second largest type of land found in the commune of Głusk, with an area of 784.95 ha (12%). Pastures, which accounted for 0.9% of the commune's area, represented the smallest proportion of 56.56 ha. There were few areas occupied by agriculture with significant areas of natural vegetation, with an area of 63.32 ha (1%). Broad-leaved forests occupied 195.96 ha i.e., 3.1% of the commune area, coniferous forests – 182.22 ha i.e., 2.8%, and mixed forests 108.08 ha i.e., 1.7%. In total, forests accounted for 7.6% of the commune area. Discontinuous urban fabric occupied 123.41 ha i.e., only 1.9%.

Non-irrigated arable land accounts for the predominant part of the commune (Fig. 7), and it is dis-

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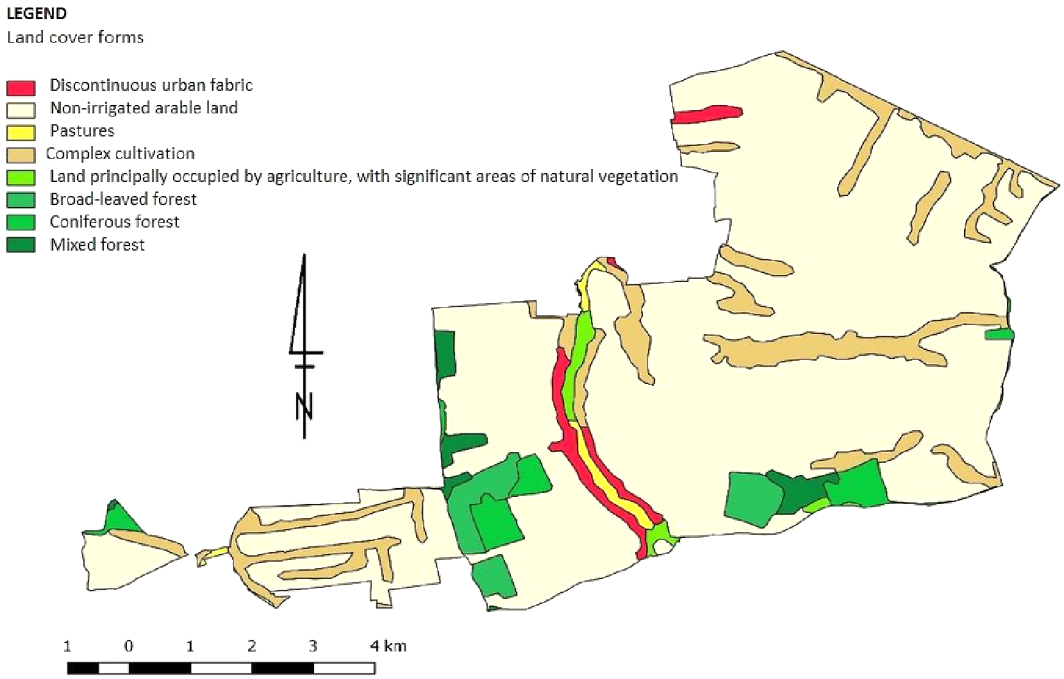

Fig. 7. Land cover in the commune of Głusk in 2000
Source: General Inspectorate for Environmental Protection (GIOŚ), 2020a, 2020b.

tributed uniformly over the entire area of the commune. Forests, including broad-leaved, coniferous, and mixed, are mainly located in the western and southeastern parts of the commune. Pastures can only be found in the central part of the commune. There are a few complex cultivation patterns, which are distributed unevenly across the commune area. The land occupied by agriculture, with significant areas of natural vegetation, is located in the central and south-eastern part. The discontinuous urban fabric is found in the central part of the commune, with a small part in the northern part. Its shape resembles narrow strips, which may suggest that it is situated across the roads running through the commune.

Table 4 presents the land cover in the commune of Głusk in 2018.

In 2018, the dominance was noted of non-irrigated arable land which accounted for 71% of the total commune area (Table 3). This is, however, a smaller proportion than that in 2000. A change in land use is evident, as the proportion of complex cultivation patterns decreased by 3 percentage points as compared

Table 4. Land cover in the commune of Głusk in 2018

Item	Land type	Area (ha)	Proportion of total area (%)
1	Discontinuous urban fabric	653.43	10.2
2	Non-irrigated arable land	4545.55	71.0
3	Pastures	96.04	1.5
4	Complex cultivation patterns	569.96	8.9
5	Land principally occupied by agriculture, with significant areas of natural vegetation	15.35	0.2
6	Broad-leaved forest	159.26	2.5
7	Coniferous forest	152.28	2.4
8	Mixed forest	162.11	2.5
9	Industrial and commercial units	19.40	0.3
10	Forests and vegetation	32.27	0.5
	Total	6405.65	100.0

Source: General Inspectorate for Environmental Protection (GIOŚ 2020a). Corine Land Cover Programme. https://clc.gios.gov.pl/

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to 2000. What is more, the proportion of areas occupied by agriculture with significant areas of natural vegetation decreased as well (2018 – 0.2%). Pastures occupy an area of 96.04 ha, which accounts for 1.5% of the commune area. Forest still covers a small area of 7.4%. Broad-leaved forests occupy 159.26 ha i.e., 2.5% of the commune area, coniferous forests – 152.28 ha i.e., 2.4%, and mixed forests 162.11 ha i.e. 2.5%. A new land cover form has emerged, which was non-existent in 2000, namely forests and vegetation, which cover an area of 32.27 ha i.e. 0.5% of the commune area. Another new form is industrial and commercial units covering an area of 19.40 ha (0.3%). Discontinuous urban fabric occupies a considerably larger area of the commune in 2018 as compared to 2000 and accounts for 10.2% of the commune area (653.43 ha).

Looking at the map of land cover in the Głusk commune in 2018 (Fig. 8), one can notice changes as compared to 2000. The greatest difference can be observed for the discontinuous urban fabric whose area has increased. The existing built-up areas increased, and new ones emerged, being distributed unevenly over the entire area of the commune. Non-irrigated arable land, located all over the commune area, is predominant. Forest, including broad-leaved, coniferous, and mixed, are located in the central part of the commune. Complex cultivation patterns are distributed evenly across the entire area under study. Two new forms of land cover emerged, namely forests and vegetation, and industrial and commercial units. A small area covered by forests and vegetation is located in the southern part of the commune, while industrial and commercial units are found in its northeastern part.

Table 5 presents the results of a comparative analysis of land cover in the commune of Głusk in 2000 and 2018. This enables an easy comparison of the area of individual land cover forms in these years. Changes are evident in each of the forms. Components emerged that were non-existent in 2000.

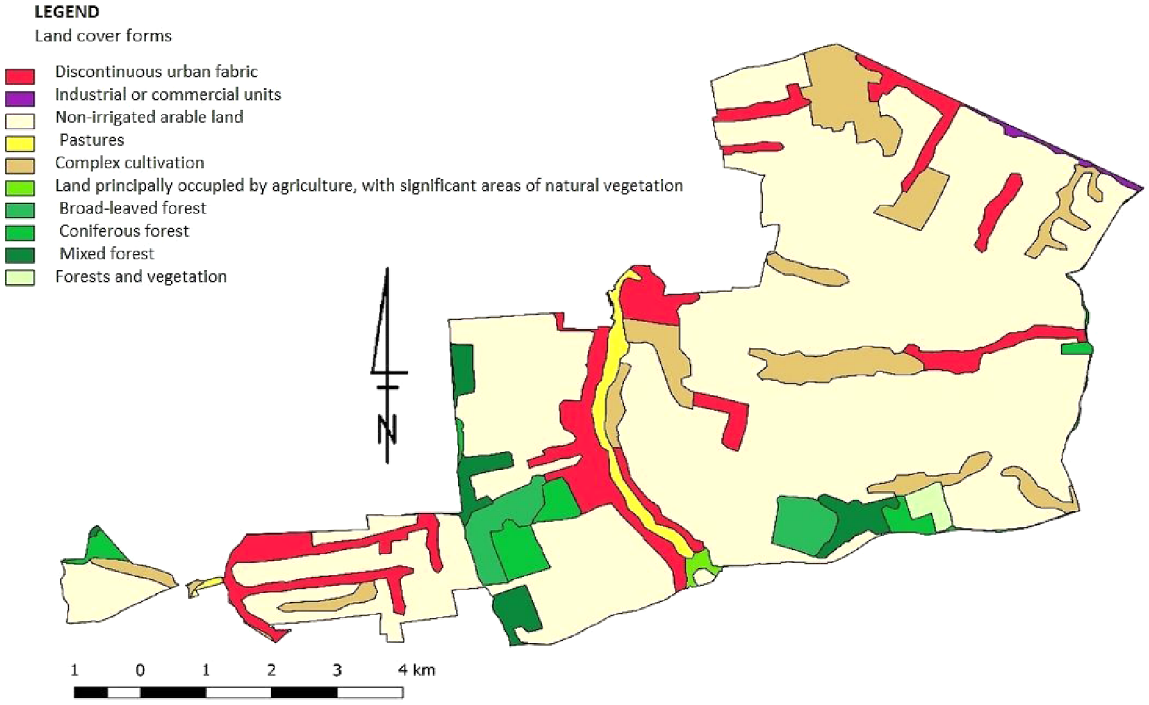

Fig. 8. Land cover in the commune of Głusk in 2018
Source: own elaboration based on General Inspectorate for Environmental Protection (GIOŚ, 2020a, 2020b).

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Table 5. The comparative analysis of the land cover in the commune of Głusk in 2000 and 2018

Item	Land type	Land cover in 2000		Land cover in 2018	
		Area (ha)	Proportion of total area (%)	Area (ha)	Proportion of total area (%)
1	Discontinuous urban fabric	123.41	1.9	653.43	10.2
2	Non-irrigated arable land	4891.15	76.4	4545.55	71.0
3	Pastures	56.56	0.9	96.04	1.5
4	Complex cultivation patterns	784.95	12.2	569.96	8.9
5	Land principally occupied by agriculture, with significant areas of natural vegetation	63.32	1.0	15.35	0.2
6	Broad-leaved forest	195.96	3.1	159.26	2.5
7	Coniferous forest	182.22	2.8	152.28	2.4
8	Mixed forest	108.08	1.7	162.11	2.5
9	Forests and vegetation	-	-	32.27	0.5
10	Industrial and commercial units	-	-	19.40	0.3
	Total	6405.65	100.0	6405.65	100.0

Source: own elaboration based on General Inspectorate for Environmental Protection (GIOŚ, 2020a).

Table 6 presents the changes that occurred over 18 years in individual forms of land cover noted in 2000. Non-irrigated arable land has been partly replaced by other types of use, namely discontinuous urban fabric (198.88 ha i.e., 3.1% of the area of arable land as of 2000), mixed forests 14.64 ha i.e., 0.2% of the area of arable land as of 2000), and complex cultivation patterns (218.18 ha i.e., 1.3% of the area of arable land as of 2000). The fact that land cover forms appear repeatedly in the "status as of 2018" section of the table is because they emerged in the area which, in 2000, was covered by different land use types.

The map above (Fig. 9) presents, in graphic form, the areas of the commune in which changes took place in land cover. Most changes can be observed in the northern, north-eastern, and western parts of the

Table 6. The changes in land use in the commune of Głusk in 2018 as compared to 2000

Status as of 2000			Status as of 2018		
Land type	Total area		Land type	Magnitude of changes	
	ha	%		ha	%
Non-irrigated arable land	4891.15	76.4	Discontinuous urban fabric	198.88	3.1
			Mixed forest	14.64	0.2
			Complex cultivation patterns	218.18	3.4
Complex cultivation patterns	784.95	12.3	Non-irrigated arable land	82.63	1.3
			Industrial and commercial units	19.40	0.3
Land principally occupied by agriculture, with significant areas of natural vegetation	63.32	1.0	Discontinuous urban fabric	331.14	5.2
			Pastures	39.47	0.6
			Non-irrigated arable land	3.49	0.1
			Mixed forest	3.52	0.1
Broad-leaved forest	195.96	3.1	Mixed forest	36.74	0.6
Coniferous forest	182.22	2.8	Forests and vegetation	32.27	0.5
			Broad-leaved forest	0.04	0.0

Source: own elaboration based on Source: General Inspectorate for Environmental Protection (GIOŚ, 2020a).

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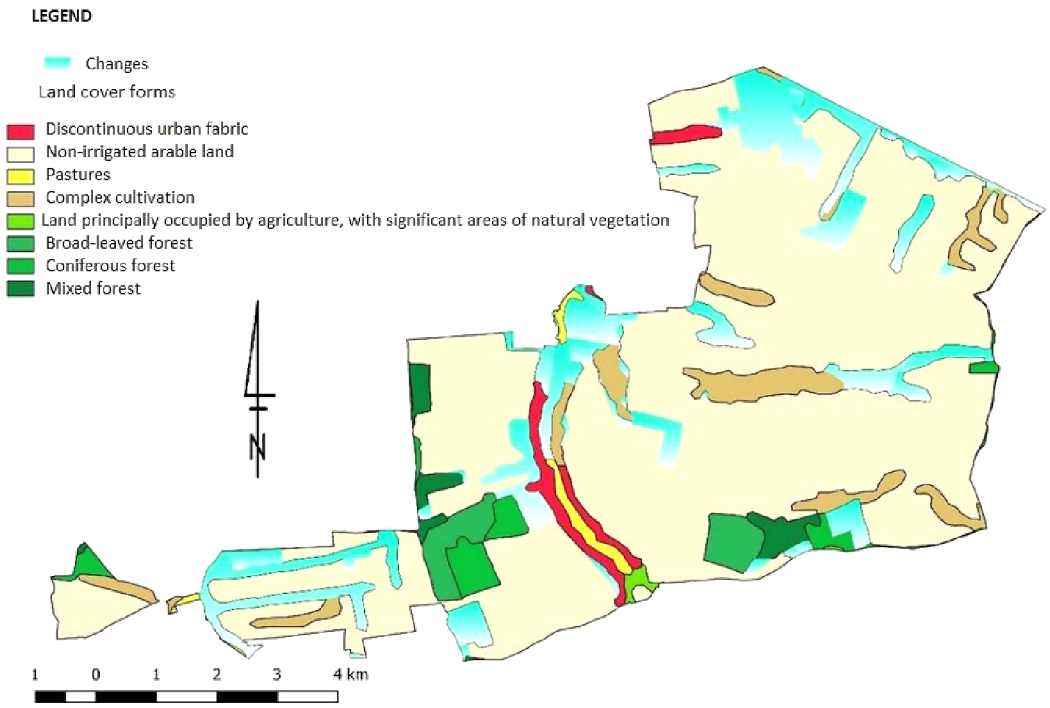

Fig. 9. The changes in land use in the commune of Głusk in 2018 as compared to 2000
Source: General Inspectorate for Environmental Protection (GIOŚ, 2020a, 2020b).

commune, while the least changes occurred in its south-eastern part. The greatest changes occurred within the area of complex cultivation patterns (Table 5) i.e. a mosaic of small plots adjacent to each other and used for growing a variety of crops, and dispersed settlement areas along with homestead gardens, allotments, and orchards (General Inspectorate for Environmental Protection (GIOŚ), 2020b). These were converted to discontinuous urban fabric, with 331.14 ha gained. The urban fabric comprises residential buildings, townhouses, single-family houses, and public utility buildings. These are usually urban areas as well as large villages. A large portion of non-irrigated arable land was converted into complex cultivation patterns and discontinuous urban fabric. A mixed forest also emerged in this area. Land principally occupied by agriculture, with significant areas of natural vegetation, was replaced by pastures, non-irrigated arable land, and mixed forests. Broad-leaved forests partly turned into mixed forests, while coniferous forests turned into forests and vegetation (the result of forests degradation or its regeneration, with plant nurseries and tree clearance sites included) (Commune of Jastków, 2020) and a broad-leaved forest. Complex cultivation patterns turned into a new land cover form, namely industrial and commercial units. These are areas with a stabilised surface, where industrial, storage, and commercial buildings are found (Commune of Jastków, 2020).

The commune of Jastków

Detailed characteristics of the land cover in the commune of Jastków in 2000 are presented in Table 7.

According to the data summarised in Table 6, the commune of Jastków in 2000 was characterised by the predominance of arable land with an area of 7219.67 ha, which accounts for 63.5% of its entire area. Such a result indicates strong agricultural character of the commune. This is additionally confirmed by the second largest proportion of complex cultivation pattern land which occupies an area of 2161.85 ha, which accounts for 19.0%, and plots and land occupied by agriculture, with significant areas of natural

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Table 7. Land cover in the commune of Jastków in 2000

Item	Land type	Area (ha)	Proportion of total area (%)
1	Discontinuous urban fabric	95.59	0.8
2	Non-irrigated arable land	7219.67	63.5
3	Fruit trees and berry plantations	52.47	0.5
4	Pastures	586.65	5.2
5	Complex cultivation patterns	2161.85	19.0
6	Land principally occupied by agriculture, with significant areas of natural vegetation	872.03	7.7
7	Broad-leaved forest	331.75	2.9
8	Mixed forest	53.79	0.5
	Total	11373.80	100.0

Source: General Inspectorate for Environmental Protection (GIOŚ, 2020a). Corine Land Cover Programme. https://clc.gios.gov.pl/

vegetation, with an area of 872.03 ha (7.7%), with the simultaneous small proportion of urban fabric with an area of only 95.59 ha which accounts for 0.8% of the total area of the commune. Pastures occupied 586.65 ha (5.2%) of the commune area, while fruit trees and berry plantations only 52.47 ha (0.5%). In 2000, the area of the commune also had a small, forested area of 385.54 ha (3.5%), with broad-leaved forests with an area of 331.75 ha (2.9%) being predominant, and mixed forests with an area of 53.79 ha (0.5%) as the remainder.

The spatial distribution of land cover forms in the commune of Jastków in 2000 is presented in the figure below (Fig. 10).

According to the data presented in Table 7, in 2000 the commune of Jastków was dominated by non-irrigated arable land, which is evident in Figure 10. This land is distributed across its entire area. Complex cultivation patterns and land principally occupied by agriculture, with significant areas of natural vegetation, are unevenly distributed. In general, pastures are located in the western part of the commune, while fruit trees and berry plantations occupy a small area in the south-eastern part. The largest area occupied

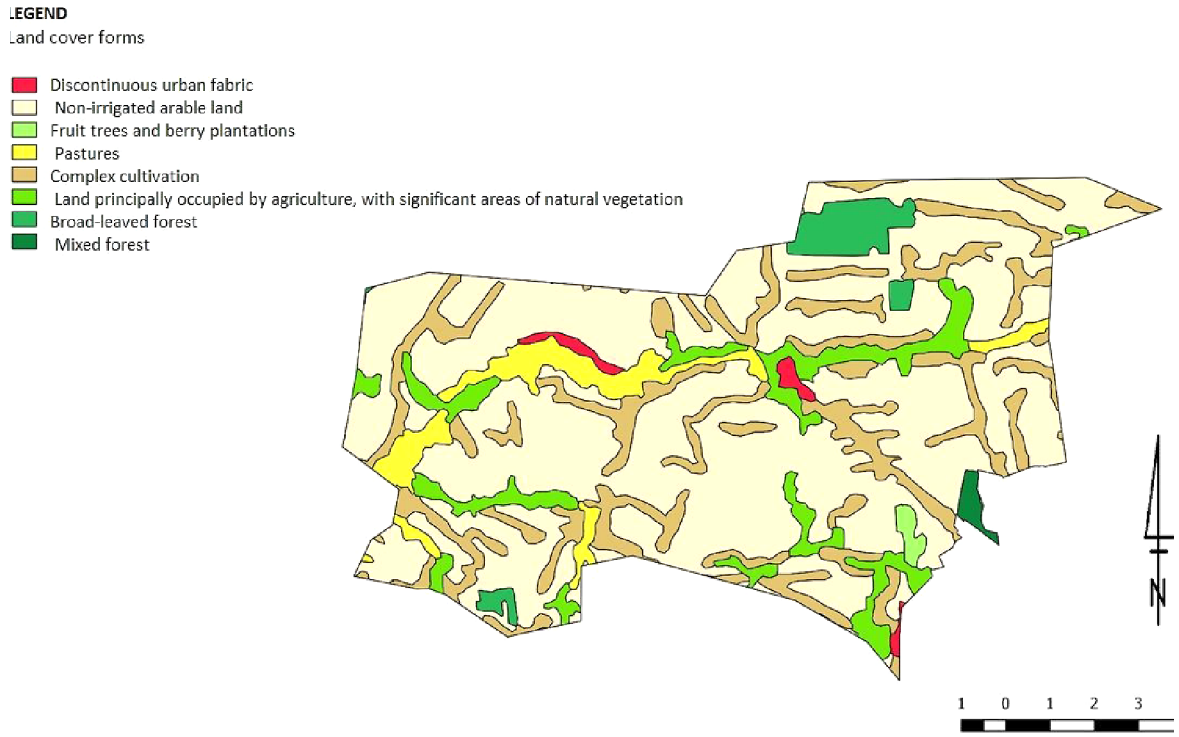

Fig. 10. Land cover in the commune of Jastków in 2000
Source: own elaboration based on General Inspectorate for Environmental Protection (GIOŚ, 2020a, 2020b).

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by broad-leaved forests is found in the north, while mixed forests only occur in the south-eastern part. The discontinuous urban fabric is located at three main locations, namely in the central, north-western, and south-eastern parts. Their elongated shape coincides with the occurrence of arable land and indicates buildings located along local roads.

In 2018, new land cover components could be noted in the commune of Jastków, which were non-existent in the previously analysed year 2000. This indicates the development of the commune in an urban rather than rural direction. Table 8 presents the details of the land cover in the commune in 2018.

According to the analysis results provided in Table 8, the dominant land cover form in 2018 was non-irrigated arable land accounting for 63% of the entire Jastków commune area. This form was followed by complex cultivation patterns accounting for 11.7%. Land principally occupied by agriculture, with significant areas of natural vegetation, only occupy 1.4% of the area. Pastures account for more, namely 5.9%, while fruit trees and berry plantations only account for 0.4%. Forested areas occupy a relatively small area of the commune: broad-leaved forests cover 4.5%, and mixed forests 1.4% of the area. The new land cover form, non-existent in 2000, namely forests and vegetation, accounts for only 0.5%. A significant increase in the area was noted for discontinuous urban fabric which accounted for 8.3% of the entire Jastków commune area in 2018. In addition, two land cover forms, previously non-existent, can be noticed. The first of them is transport areas (2.7%), while the other is sport and leisure facilities (0.1%). The conducted analyses are reflected in Fig. 11.

The map of land cover in the commune of Jastków in 2018 is much more varied than that relating to the year 2000 (Fig. 11). Non-irrigated arable land is found throughout the area under analysis. Complex cultivation patterns as well as discontinuous urban fabric are unevenly distributed. In the central and south-eastern part of the commune, transport areas – non-existent in the previous study period – are located. A small sport and leisure facility is situated to the south of them, while in the north, land principally occupied by agriculture, with significant areas of natural vegetation, is found. Fruit trees and berry plantations are located in the south-eastern part. Pastures are primarily found in the western part of the commune, with their smaller patches occurring in the central, southern, and eastern parts. The area occupied by forests increased. In addition to their occurrence in the north, broad-leaved forests can be noticed in the central part of the commune as well as in the west and southern west. In contrast, mixed forests are located in the east and proximity to broad-leaved forests in the southern-west. Forests and vegetation area found both in the western and the eastern part of the commune.

Table 8. Land cover in the commune of Jastków in 2018

Item	Land type	Area (ha)	Proportion of total area (%)
1	Discontinuous urban fabric	944.05	8.3
2	Transport areas	303.13	2.7
3	Sport and leisure facilities	8.02	0.1
4	Non-irrigated arable land	7169.35	63.0
5	Fruit trees and berry plantations	43.90	0.4
6	Pastures	674.66	5.9
7	Complex cultivation patterns	1334.11	11.7
8	Land principally occupied by agriculture, with significant areas of natural vegetation	162.91	1.4
9	Broad-leaved forest	509.92	4.5
10	Mixed forest	161.56	1.4
11	Forests and vegetation	62.23	0.5
	Total	11373.83	100.0

Source: General Inspectorate for Environmental Protection (GIOŚ, 2020a). Corine Land Cover Programme. https://clc.gios.gov.pl/

Table 9 summarises the areas of individual land cover forms in the years under study.

The changes that occurred over the area of 18 years in the commune of Jastków are shown in Table 10. These are presented in detail and indicate how each land cover form from 2000 changed as compared to the year 2018. Similarly to the Głusk commune, the land use forms appearing repeatedly in the "status as of 2018" section of the table result from the fact that

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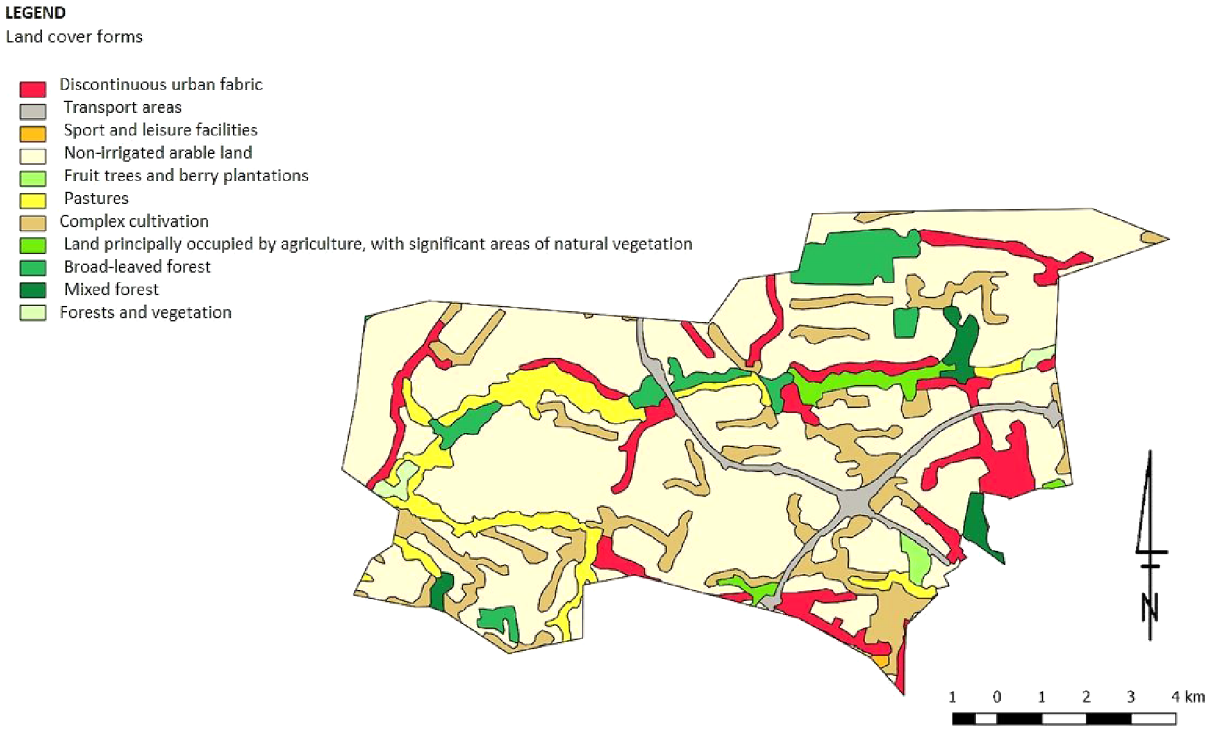

Fig. 11. Land cover in the commune of Jastków in 2018
Source: own elaboration based on General Inspectorate for Environmental Protection (GIOŚ, 2020a, 2020b).

Table 9. Land cover in the commune of Jastków in 2000 and 2018

Item	Land type	Land cover in 2000		Land cover in 2018	
		Area (ha)	Proportion of total area (%)	Area (ha)	Proportion of total area (%)
1	Discontinuous urban fabric	95.59	0.8	944.05	8.3
2	Non-irrigated arable land	7219.67	63.5	7169.35	63.0
3	Fruit trees and berry plantations	52.47	0.5	43.90	0.4
4	Pastures	586.65	5.2	674.66	5.9
5	Complex cultivation patterns	2161.85	19.0	1334.11	11.7
6	Land principally occupied by agriculture, with significant areas of natural vegetation	872.03	7.7	162.91	1.4
7	Broad-leaved forest	331.75	2.9	509.92	4.5
8	Mixed forest	53.79	0.5	161.56	1.4
9	Forests and vegetation	-	-	62.23	0.5
10	Transport areas	-	-	303.13	2.7
11	Sport and leisure facilities	-	-	8.02	0.1
	Total	11373.80	100.0	11373.83	100.0

Source: own elaboration based on General Inspectorate for Environmental Protection (GIOŚ, 2020a).

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Table 10. The changes in land use in the commune of Jastków in 2018 as compared to 2000

Status as of 2000			Status as of 2018		
Land type	Total area		Land type	Magnitude of changes	
	ha	%		ha	%
Discontinuous urban fabric	95.59	0.8	Complex cultivation patterns	2.33	0.1
			Transport areas	235.77	9.5
			Complex cultivation patterns	149.43	6.0
			Discontinuous urban fabric	122.35	4.9
Non-irrigated arable land	7219.67	63.5	Land principally occupied by agriculture, with significant areas of natural vegetation	6.72	0.3
			Fruit trees and berry plantations	3.44	0.1
			Pastures	0.63	0.0
			Sport and leisure facilities	0.06	0.0
Fruit trees and berry plantations	52.47	0.5	Transport areas	7.84	0.3
			Non-irrigated arable land	4.17	0.2
			Forests and vegetation	62.23	2.5
			Broad-leaved forest	40.15	1.6
Pastures	586.65	5.2	Transport areas	7.17	0.3
			Non-irrigated arable land	6.86	0.3
			Discontinuous urban fabric	5.59	0.2
			Discontinuous urban fabric	692.85	28.0
Complex cultivation patterns	2161.85	19.0	Non-irrigated arable land	369.40	14.9
			Transport areas	40.11	1.6
			Pastures	0.20	0.0
			Pastures	209.18	8.5
			Broad-leaved forest	138.02	5.6
			Complex cultivation patterns	123.03	5.0
Land principally occupied by agriculture, with significant areas of natural vegetation	872.03	7.7	Mixed forest	107.76	4.4
			Non-irrigated arable land	87.64	3.5
			Discontinuous urban fabric	30.00	1.2
			Transport areas	12.24	0.5
			Sport and leisure facilities	7.95	0.3

Source: own elaboration based on General Inspectorate for Environmental Protection (GIOŚ, 2020a).

they occupied an area which, in 2000, was covered by different land cover forms.

The changes that occurred over 18 years are presented in graphic form as a map (Fig. 12). These covered the area of the entire commune, drastically changed the spatial development pattern, and guided its further development. Most changes occurred within the non-irrigated arable land (Table 10). Its large area of 235.77 ha (9.5%) was occupied by transport areas. The constructed roads play a significant role in the development of the commune, as they provide good transport accessibility. They primarily include express

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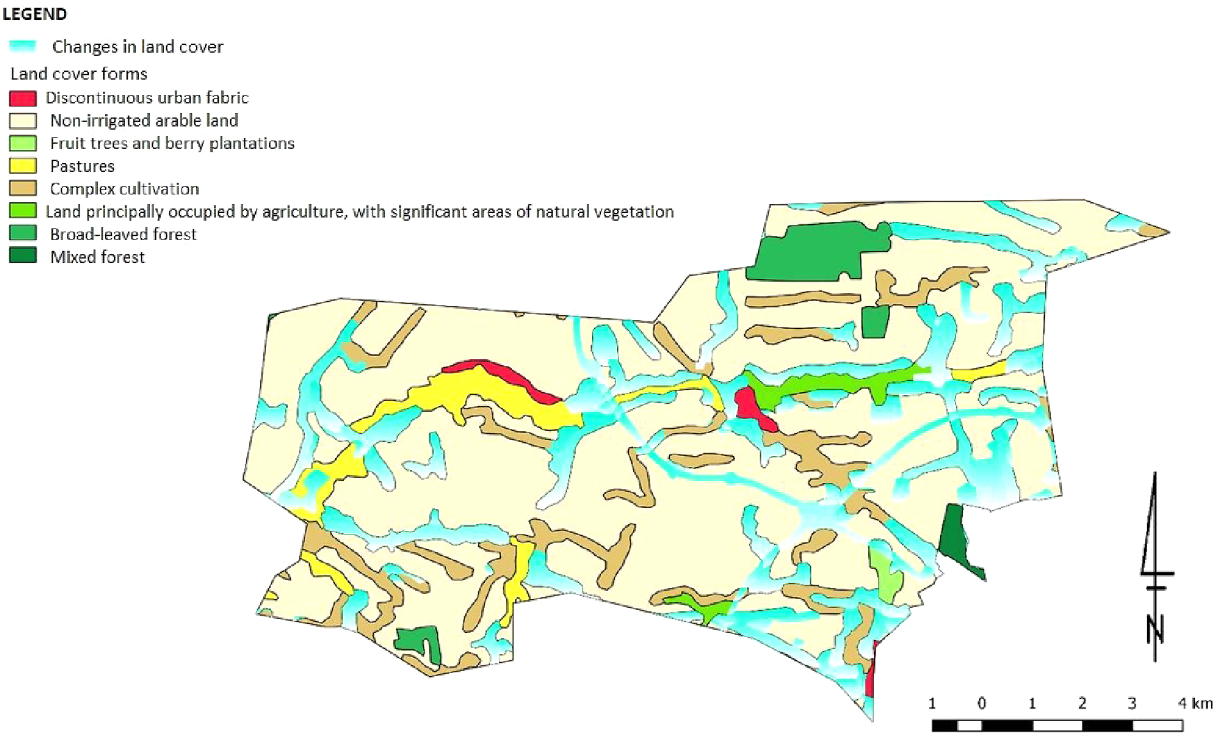

Fig. 12. The changes in land use in the commune of Jastków in 2018 as compared to 2000
Source: own elaboration based on General Inspectorate for Environmental Protection (GIOŚ, 2020a, 2020b).

roads No. S12 and S17, and the national road No. S19. In the suburbanisation process context, the conversion of arable land and complex cultivation patterns into discontinuous urban fabric areas can be noticed. This represents a total increase in the commune area from 0.8% to 8.3% (Table 9). What is more, a relatively small sport and leisure facility of 0.06 ha was established, which includes playing fields, campsites, golf fields, allotments, and summer houses (Commune of Jastków, 2020). Another major change was the decrease in the area of land occupied by agriculture, with significant areas of natural vegetation i.e., small arable fields alternating with wooded areas of small meadows and pastures. These changes were primarily related to the increase in the area of meadows and mixed forests as well as, to a lesser extent, the artificial surfaces.

The conducted analysis shows that the changes towards suburbanisation in the commune of Jastków have been more advance than those in the commune of Głusk, where the changes are smaller but noticeable.

DISCUSSION

The study showed that the suburbanisation process increased the area of discontinuous urban fabric thanks to the people moving from the city of Lublin to nearby rural areas. An increase in the population of the commune of Głusk resulted in a change in the land use structure. Non-irrigated arable land continues to be dominant, which indicates the agricultural character of the commune. However, the increase in the population generates new needs, including demand for land. In addition to the increased built-up areas, new industrial and commercial units were established. The influx of the urban population to the predominantly agricultural commune of Jastków

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considerably changed the pattern of its land use. The new inhabitants brought along the urban type of development to the landscape while displacing the rural one. The migration forced the commune to adjust, inter alia, the transport infrastructure and service facilities. This gave the commune a more urban character resembling that of the suburbs of Lublin, where the boundary is gradually becoming blurred. The common consequence for the communes subject to the suburbanisation process is the emergence of residential buildings (most frequently single-family, occasionally multi-family ones) in the immediate vicinity of agricultural fields. Arable land, which is being converted into plots for development, is most often characterised by an unfavourable shape, as it is typically narrow and long, which later necessitates its appropriate development and involves certain restrictions.

The process of suburbanisation of the neighbouring communes of a large city may be of both positive and negative significance. This process leads to the depopulation of the city and to abandoned estates being left behind (especially in the city centre), which up to a certain point is beneficial, but if it continues, it may prove to be troublesome for cities. This, however, is not predicted to take place for the city of Lublin, which due to the offered renowned higher educational institutions, is a popular destination for students from all over Poland and from abroad. The residential vacancy made by the outmigration to the suburban communes is being filled by the immigrating students.

The study enabled the determination and mapping of the changes in land use that took place in the communes of Głusk and Jastków over 18 years in the context of suburbanisation. The analyses were conducted based on the information contained in the Corine Land Cover database that covers the whole of Poland. In the Głusk commune, the greatest change can be noticed within the built-up areas which replaced other land use forms, in particular non-irrigated arable land and complex cultivation patterns. There was an increase in the discontinuous urban fabric by 8.3%, as compared to the year 2000. New land use forms, non-existing 18 years earlier, emerged. These are industrial and commercial units which developed in the northern part of the commune. Similar changes can also be noticed in the commune of Jastków. What stands out in this case is the conversion of agricultural land into discontinuous urban fabric, mainly residential and public utility buildings. This represents an increase of 7.5%. Another very important aspect, non-existent in 2000, is the construction of dual carriageways, which has enabled better transport accessibility, and enhanced travelling comfort. New sports and leisure facilities were established as well. All of these changes are directly related to the suburbanisation process. The forested and wooded areas also increased as results of the close-to-the-nature trend.

This case study demonstrated that in the analysed communes, the process of suburbanisation is present, progressing and introducing many changes. It is unclear, however, in which commune the changes are more advanced. In the commune of Głusk, changes concerning improvements on land are certainly predominant. Over 18 years, an increase of 8.3% was noted, while for the commune of Jastków, this value amounts to 7.5%. If one looks at the process more broadly, the total volume of changes (including transport areas, industrial units, or leisure facilities) amounts to 10.3% of the entire area of the Jastków commune, and for the commune of Głusk, to 8.6%. Analysing the percentages, it can be indicated that the Głusk commune is being intensively built up, while apart from the emerging industry, no other forms of land use related directly to suburbanisation are observed. Głusk can be therefore referred to as the "dormitory" of Lublin, with all other activities of the inhabitants being located in the big city. The commune of Jastków seems to be a little further ahead in this developmental respect. Apart from the so-called "dormitory", also the infrastructure was built there, which proves that it is more developed, and the process is more intensified. When comparing the maps of the changes (Fig. 9 and Fig. 12), it is noticeable that the changes affected the communes under study in different ways, yet in both cases, the impact is

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visible. As regards the commune of Głusk, the specific locations of changed areas can be easily indicated, while for the commune of Jastków, the changes occurred unevenly over virtually the entire area. The continuous development of both communes towards the spread and dispersal of buildings is already leading to a noticeable disruption of the spatial order as well as the disappearance of the traditional rural and natural landscape. The level of the development and intensity of the suburbanisation process, and thus the changes taking place, are also affected by the location of communes; Głusk to the east, and Jastków to the west of the city of Lublin. In this context, it is the latter that has better prospects, which is evidenced by its location on the road leading towards the capital city of Warsaw. The migration of Lublin inhabitants to the neighbouring communes could be from different perspectives. Based on the literature (Źróbek et al., 2014), it is possible to distinguish factors which are commonly dominant when deciding to move from the city to the suburban zone. These include a developed urban transport network extending beyond the city limits, an increase in the wealth of the community, competitive property prices in the suburban zone as compared to those found in the city, lower living costs in rural areas, the need for contact with nature, and the escape from pollution. Without a doubt, there are many socio-economic reasons behind the phenomenon of suburbanisation. Major factors, listed by the scholars, include an increase in the wealth of the community and increased mobility by owning a car. Travelling to work and services is not dependent on public transportation. The studied literature shows that people, when looking for their place of residence, more and more tend to choose areas located away from the centre, very often outside the city limits. They are interested in a location offering peace, healthy, and pure air, and an attractive environment. More and more important is one's own space and a garden surrounding the house. Therefore places in which urban life mixes with rural life are created. Typical agricultural activities are combined with functions typical of the city.

The phenomenon of suburbanisation is a complex process which has both positive and negative consequences, and its significance for cities and suburban communes is different. Undoubtedly, most studies indicate the adverse effects of the suburbanisation process. Agricultural land is being excluded from use in favour of the emerging multi-storey and large-scale structures as well as single-family houses. There is a change in the function of the village. The new houses are neither local nor traditional but are constructed according to modern and, often, foreign designs, thus they do not blend in with the landscape of the Polish countryside. The buildings are dispersed, the order is lacking, and there is spatial and constructional disorder.

The urban attributes are being extended to the areas neighbouring the city and bring along major investments. Different population cohorts show interest in the suburban zone. As mentioned above, this may boost the depopulation process of a city, however in the case of Lublin, where positive net migration is assured thanks to young adults. Therefore, suburbanisation has a more noticeable impact on the suburban zone. Traditional agricultural areas are reduced, and rural traditions and culture are at risk of disappearing as urban buildings and lifestyles are entering the suburbs. Among examples of positive developments are new economic centres, service facilities, and educational institutions. These areas easily become investment areas, and large workplaces are established in which local inhabitants can find jobs. However, the increased number of suburban zone inhabitants results in an increased number of cars and heavier traffic. The commuting to the city generates more air and noise pollution than it did before. Following the concept of "quid pro quo", this state of affairs should be accepted, as suburbanisation offers great opportunities for the development of the commune. All the communes surrounding big cities offer good conditions for development and the use of one's potential. The suburban zone is a place where convenient conditions for living are prevailing. Built-up areas are developing while the agricultural function is disappearing.

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The results of this case study bring broader considerations concerning suburbanisation in the vicinity of the city of Lublin. In addition, they provide an opportunity to develop land use planning guidelines and environmental protection plans.

CONCLUSIONS

Suburbanisation is a process that is more and more commonly found worldwide in areas located in the vicinity of large metropolises as well as smaller cities. There are several factors affecting the development of the suburbanisation process, and thus changing land use in suburban communes. These can be spatial, social, economic, natural, cultural, historical, legal, and administrative. Many people increasingly choose to live outside the city, and search for locations close to nature. The possibility of satisfying their housing needs makes them aim for houses with a garden, in a contrast to a block of flats. People wish to improve the quality of their lives by moving to houses with more space, to open areas, where the natural environment is of better quality. Housing prices are lower there as compared to those in the city. Migration between rural and urban areas is associated with an improved financial situation of the public. The social position changes and social advancement takes place. The increase in people's affluence creates new needs. Moving into one's own house located on the outskirts of the city in a reputable area is evidence of financial advancement.

One of the factors promoting the development of the suburbanisation process is Poland's flawed legal system. Under Polish law, individual interest is more protected (Słysz et al., 2013), while the significance of the principles of sustainable development, the preservation of spatial order, and the natural environment are often minimised. Currently in Poland, a local area development plan is the main regulation concerning land use while rural communes are rather poorly covered within those. On the other hand, a Study of conditions and directions of spatial development is not a local law, therefore its findings do not protect against uncontrolled development. The absence of a local area development plan results in the issue of outline planning permissions which is not necessarily consistent with the study of conditions and directions of spatial development for a particular commune, city, or village.

It should be mentioned, that in addition to the phenomenon of suburbanisation, in many countries there is also the phenomenon of urbanisation. When well-managed, urbanisation can play a pivotal role in reducing rural poverty, improving food security and creating opportunities for rural transformation. Urbanisation results in the development of cities and suburban areas. It has many reasons, and one of them is the desire to improve the living conditions of rural people who move to cities. Therefore, urbanisation will be a more noticeable phenomenon in cities such as Mumbai and Beijing.

Based on the conducted study, the following conclusions can be formulated:

Land use is undergoing constant change due to the processes taking place in space. Currently, from the perspective of changes occurring in the communes under study, suburbanisation is of significance.

The process of suburbanisation directly affects the communes of Głusk and Jastków, located in the vicinity of the city of Lublin. This blurs the characteristics of traditional countryside in favour of the development towards an urban model.

The case study of the land use in the communes of Głusk and Jastków in the years 2000 and 2018 enabled the identification of changes that took place as an effect of suburbanisation, typical of suburban areas throughout the country.

In the studied communes, more built-up areas were established: for the Głusk commune, 530.02 ha which accounts for 8.3% of the area, while for the Jastków commune, 848.46 ha i.e., 7.5% of the area.

In 2018 compared to 2000, new land cover forms were observed, e.g. industrial and transport units, or sports and leisure facilities.

The newly established land use forms primarily replaced the areas occupied for agricultural purposes.

Factors supporting suburbanisation are: an increase in the wealth of the community, transport

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accessibility, competitive prices of property located outside the city, noise and air pollution in the city, the desire to live close to nature, quiet and peace in the suburban zone.

It is not possible to clearly indicate which of the two communes experienced greater changes in land use in the context of the suburbanisation process. Having considered only the discontinuous urban fabric i.e., residential and public utility buildings, the commune of Głusk leads the way. However, having analysed the situation as a whole (including the cover of land that is not typically rural, e.g., industrial, transport, and sport and leisure areas and facilities), the changes in the Jastków commune are more significant for the expanding city and the suburban zone that is taking over its habits.

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