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Rural landscape analyses as a spatial planning tool on the example of the Puchaczów Commune

SYLWIA BARWICKA

Faculty of Horticulture and Landscape Architecture, University of Life Sciences in Lublin

Abstract: *Rural landscape analyses as a spatial planning tool on the example of the Puchaczów Commune.* The paper presents key landscape analyses enabling identification and diagnosis of the environment, and consequently helping to formulate the principles of sustainable development for specific areas. The territorial scope of the research covered the rural commune of Puchaczów, located in the Lubelskie Voivodeship, where, due to the natural conditions, in the second half of the 20th century the mining industry developed. The study included an analysis of land cover, a simplified analysis of ecotopes, environmental hazards and ecological structures. The result of the above research is the analysis of the tendencies of changes taking place in the commune, which indicates specific problem areas and, as a consequence, allows to propose appropriate directions of spatial development. In the Puchaczów Commune, since the 1970s, the main factor determining the character of the landscape has been the activity of the hard coal mine, which has transformed, inter alia, relief and hydrosphere. The measures proposed in the applications are aimed at stopping the negative effects of mining activities by strengthening the natural system of the commune.

Key words: Puchaczów, rural commune, sustainable development, landscape research methods

INTRODUCTION

According to the data of the national statistical office – Statistics Poland, rural areas in Poland constitute 93% of the country's territory (Główny Urząd Statystyczny 2020). Thus, the shaping and functioning of these areas has a significant impact both at the regional and supra-local level. Due to the large diversity of rural areas at the social and economic level and their multifunctional development, it is believed that the appropriate development of rural areas is a more problematic issue than in the case of cities (Czapiewski 2013). The basic tool for shaping and protecting the environment is the spatial planning process, which should always be preceded by detailed landscape studies. One of the first stages of creating planning documents in Poland (i.e. a study of the conditions and directions of spatial development and local spatial development plans) is an ecophysiographic study. According to the Ordinance of the Minister of the Environment of 9 September 2002, the scope of ecophysiography covers, inter alia, recognition and diagnosis of the functioning state of the environment, determination of the transformation tendencies in areas, as well as indication of development directions and limitations for various forms of land development (Rozporządzenie Ministra Środowiska z dnia

9 września 2002 r. w sprawie opracowań ekofizjograficznych). It should be emphasised that the above-mentioned planning procedures are a task that requires a lot of work and time, but also interdisciplinary research (Cieszewska and Wałdykowski 2016). The purpose of this article is to present key landscape analyses dedicated to rural landscapes, that will facilitate the reliable preparation of an ecophysiographic study, and, as a consequence, they will improve the process of shaping rural areas.

The territorial scope of the research covered the Puchaczów Commune in the Lubelskie Voivodeship, in the Łęczna Poviat. Due to the natural conditions related to the occurrence of hard coal deposits, the mining industry has developed in the region. The largest enterprise operating in the studied area is the Bogdanka mine (Szot-Gabryś 2008). The mine started its operation in the 1970s and has been the main factor driving the economic development of the commune until the present times. The substantive scope of the work included analysis of land cover, simplified analysis of ecotope (limited to hypsometry analysis), current and potential threats to the environment and analysis of ecological structures. This allowed for the development of the last stage of the research, showing the tendency of changes taking place in the analysed rural area. As a model in the research, the author treated the ecophysiographic study of the Kleszczów Commune, which was carried out by a team led by Professor Małgorzata Milecka (Milecka et al. 2016). This study was selected due to the similarity between the research areas. The Kleszczów Commune is also a rural area where the mining industry has developed (lignite mining) and the existence of the mining function has influenced the shaping of the landscape to the greatest extent and has caused enormous changes to the landscape.

MATERIAL AND METHODS

The basis for the development of landscape analysis of the Puchaczów Commune are generally available cartographic materials: orthophotomap, topographic map, numerical terrain model – ISOK project – hypsometry and sozological map[1] (and field research carried out by the author in 2018–2019). In addition, the current was used archival planning and strategic documents – local spatial development plans of the Puchaczów Commune as amended (Mącik et al. 2002, Uchwała nr XXVIII/176/17 Rady Gminy Puchaczów), a study of the conditions and directions of development of a commune (Mącik et al. 2012), local development strategy for the Puchaczów Commune for the years 2007–2015 (Szot-Gabryś 2008). The field research carried out consisted in the verification and refinement of data resulting from the source materials.

The land cover analysis was related to the identification of homogeneous areas in terms of the form of land development. Areas of residential and service development, agricultural areas with scattered

[1] https://puchaczow.e-mapa.net [accessed 04.03.2019].

development, forest complexes, meadows and pastures, surface waters, areas with industrial functions and communication infrastructure were selected. The simplified ecotope analysis was based on the analysis of the resulting data from a hypsometric map presenting the shape of the commune, without covering the area. Potential autonomous ecotopes found at the tops of hills, potential autonomous-transit ecotopes associated with areas with gentle altitude drops, potential transit ecotopes located on steep slopes, potential accumulation and transit ecotopes of rivers and river valleys, and potential accumulation ecotopes that are wetlands, located in depressions were determined. The classification of the areas where potential ecotopes occur is of particular importance for recognizing the manner of matter migration in the landscape, and thus the way the environment functions. Ecotopes are defined as the smallest spatial natural unit, which includes biotic and abiotic elements, having a specific type of geochemical relations. Due to a certain simplification of the method, the article shows the areas of potential ecotope occurrence and the separation of their individual types due to topography. As part of the analysis of threats, a classification was used taking into account the area of the factors constituting the current or potential source of pollution of the components of the natural environment. Point, line and surface threats for surface and ground waters, air, soil, flora, fauna were determined. The analysis of ecological structures was based on the concept of patches and corridors (Forman and Godron 1986). The study made it possible to identify basic patches, corridors, nodes, islands and ecological barriers, which consequently allowed to identify strategic areas for the development of ecological systems, and thus important in terms of shaping the natural conditions of the commune.

The summary of the above research is an analysis of the trends in changes taking place in the environment. The analysis identified the areas with high, medium and low biological activity. By the term biological activity, the author understands the intensity of the processes of accumulation and flow of energy, matter and information, related to the type of vegetation covering the area, as well as to biodiversity. The areas with the high biological activity are those with the greatest species diversity, i.e. forest complexes. Medium biological activity occurs in meadows and pastures, and low in the fields. The areas of building, infrastructure and industry were classified as degraded areas, creating a barrier to the transfer of biological activity.

RESULTS AND DISCUSSION

Land cover analysis

Research has shown that agricultural areas are the dominant form of land cover in the Puchaczów Commune. They constitute approx. 37% of the commune's area. They occur throughout the area, but their concentration is in the southern part of the commune, between the villages of Puchaczów, Wesołówka, Ciechanki and Ostrówek. The location of the agricultural function in this place is related to the occurrence of appropriate natural conditions (very good and good wheat complex, mild terrain). The next largest form of land cover are areas of meadows and pastures (21%). They are lobed and

streaked. They include wetlands and the river valleys of the Mogielnica and the Świnka. Forests and trees cover 10% of the Puchaczów Commune area. It should be noted that the Puchaczów-Las and Puchaczowski Gaj forest complexes located in the south of the Bogdanka coal mine act as a buffer zone, separating the largest industrial area from agricultural land. The area of residential and service development and road infrastructure is 21%. There are 16 villages in the commune. The highest concentration of the settlement network occurs along the main communication routes. Industrial areas, despite a relatively low degree of coverage in relation to the area of the entire commune (3%), have the greatest impact on the development of the region. Their location is closely related to the location of hard coal raw materials. The largest enterprise, the Lubelski Węgiel Bogdanka S.A. mine, operates in the centre of the commune in Bogdanka, and in the east in Nadrybie.

The analysis shows that in the Puchaczów Commune there are various forms of land development, the location of which depends on the natural conditions. The area of the commune is multi-functional. Despite the fact that the percentage of agricultural activity occupies

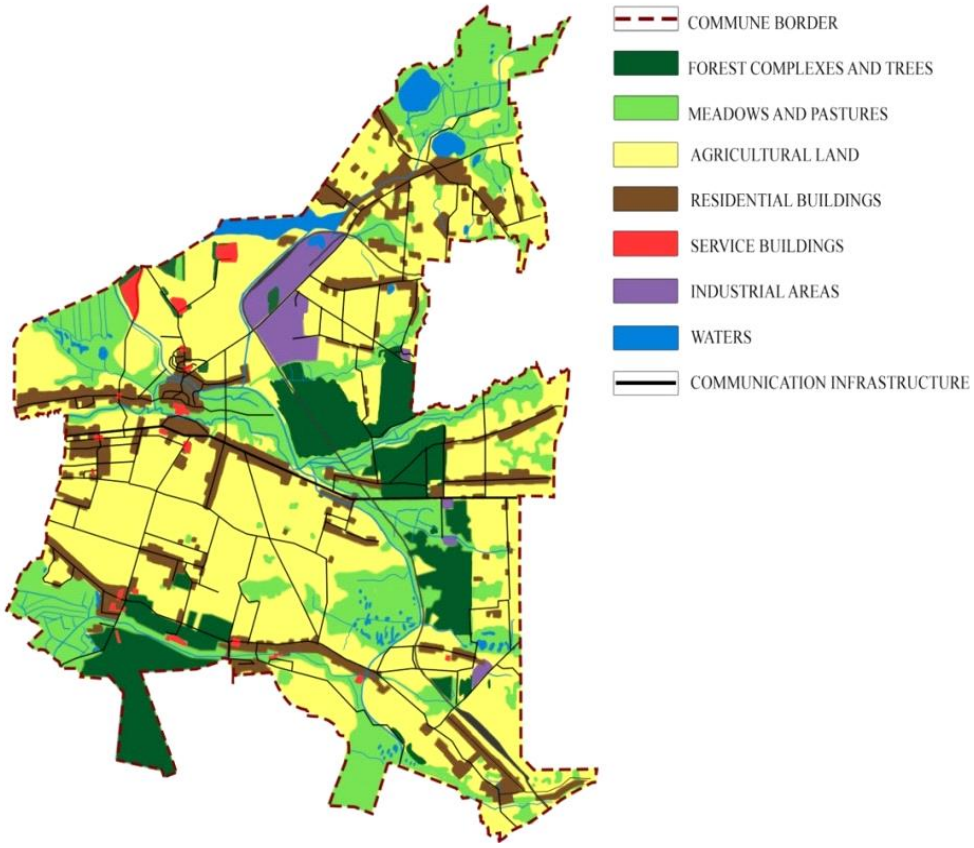

FIGURE 1. Analysis of land cover in the Puchaczów Commune (own study, 2020)

the largest area, there is a noticeable disagrarisation in favour of the development of the extractive industry (Fig. 1).

Simplified ecotope analysis

Placement of individual types of ecotopes depends on the hypsometry of the studied area. In the Puchaczów Commune, there are mainly flat landforms, the characteristic feature of which is a slight height difference. Autonomous ecotopes are the highest in terms of altitude. They are located on the tops of hills. In the Puchaczów Commune, these ecotopes are the rarest and are present 4% of the area. Their characteristic feature is lower humidity and fertility, comparing to other ecotopes. Autonomous-transit ecotopes (54%) are the most numerous recorded in the study area. They occur in areas with mild height differences, where the processes of matter and energy movement are not very strong. They are transition units between autonomous and transit ecotopes. Transit ecotopes have been selected on steep slopes, where there is an intense movement of matter and energy to the lower areas. Their area in relation to the size of the entire commune is 13%. In terms of height below the transit ecotope, there are other transitional ecotopes: the accumulation and transit ecotopes. In the Puchaczów Commune, they account for 10% of the area.

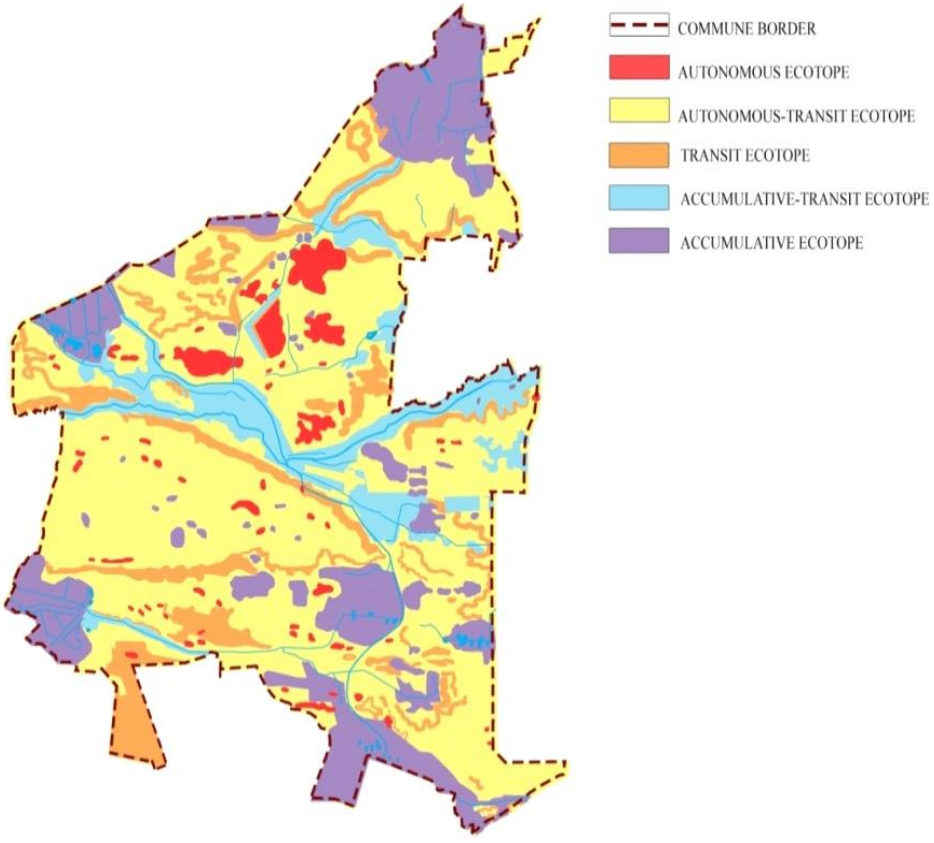

FIGURE 2. Simplified analysis of ecotopes (own study, 2021)

The occurrence of this unit coincides with the location of the river valleys and floodplains. A characteristic feature of the accumulation and transit ecotopes is both the accumulation of substances flowing from the areas located above, and parts of its runoff to the lower parts of the landscape. In stagnant areas and drainless water reservoirs where energy accumulates and matter, accumulation ecotopes were distinguished. Their area was estimated at approx. 19%. It should be noted that the location of the accumulation-transit and transit ecotopes coincides with the location of the most valuable natural areas. At the same time, these are the most vulnerable to pollution that origin from higher ecotopes (Fig. 2).

Environmental hazard analysis

Based on the sozological map, land cover and ecotope analysis, an analysis of threats to the components of the natural environment was prepared (Fig. 3). It should be stated that the threats occurring in the Puchaczów Commune are diversified in terms of the type and area of impact on the components of the environment. Bearing in mind the above, the division into surface, point and line elements was applied. In addition, the study established which elements are currently and which are potentially harmful to surface and ground waters, air, soil, flora and fauna (the table).

As the table shows, surface hazards are the dominant type of negative elements for the environment in the Pucha-

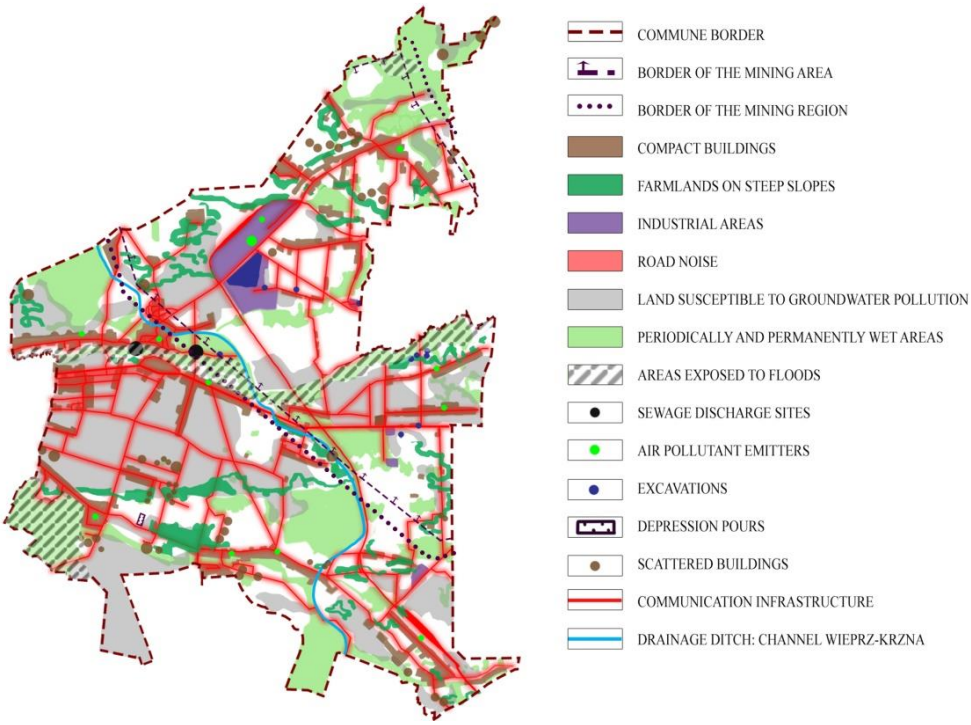

FIGURE 3. Analysis of environmental hazards in the Puchaczów Commune (own study, 2020)

TABLE. Current and potential threats to environmental components in the Puchaczów Commune (own study, 2021)

Type of hazard	Hazard emitter	Hazard for			
		water	air	soil	fauna and flora
Surface	compact buildings	current	potentially	current	current
	farmlands on steep slopes	potentially	potentially	current	current
	industrial areas	current	current	current	current
	road noise	–	–	–	current
	land susceptible to inflation of pollutants into groundwater	current	–	current	current
	periodically and permanently wet areas	current	–	current	current
Point	sewage discharge sites	current	–	current	current
	air pollution emitters	potentially	current	potentially	current
	depression pours	current	-	current	current
	excavations	current	current	current	current
Linear	river melioration	current	–	current	current
	communication infrastructure	potentially	current	potentially	current

czów Commune. Among them, the areas exposed to the inflation of pollutants to groundwater have the greatest range. Groundwater degradation is an intensive process related to the agricultural and mining functions of the commune and the lack of adequate water and sewage management, including the sewage system of rural buildings. Too much exploitation of arable land, the use of artificial fertilizers causes the penetration of pollutants into the deeper layers of the soil, which in turn affects the quality of groundwater and significantly shapes the conditions for the development of flora and fauna.

Operation in the fossil region influences quantitative and qualitative changes in the hydrosphere. Raw material extraction is related to rock mass drainage. The extraction of hard coal causes a number of changes related to the topography, which results in the formation of post-mining waste heaps and land depressions. The existence of subsidence basins may lead to both flooding of areas and drainage of land, lowering the level of groundwater (Kraśnicki 2019). The mining process increases the pollution of surface waters as a result of mine wastewater discharge (Mącik et al. 2012). The consequence of the transformation of water relations are changes in the agricultural production space, plant communities, and then faunal ones. The industrial area is also a current threat to the atmospheric air in the Puchaczów Commune, which is particularly dangerous in times of present climate change. It is worth noting that the mine itself does not have an organised emitter (chimney), but Łęczyńska Energetyka – the plant that provides services to the mine in the field of energy supply, is equipped with boiler rooms, dust and gas pollution emitters that transmit gases to the atmosphere. According to the integrated report of the Grupa Kapitałowa Lubelski Węgiel Bogdanka (2019), direct emission of greenhouse

gases generated in the combustion process by mobile sources (passenger cars, ground and underground locomotives) and stationary, operating as a result of the operation of the mine, is 54,883.56 tCO_2e (tonne of carbon dioxide equivalent), and indirect (produced as a result of electricity demand) 250,993.38 tCO_2e. At this point, it is worth emphasising that Glasgow Leaders' Declaration on Forests and Land Use clearly emphasises the need to reduce emissions from coal, the fuel that contributes to the greatest extent to the formation of greenhouse gases. At the COP26 climate summit, more than 40 countries (including Poland) have pledged to gradually reduce the use of coal in the near future[2].

The threats of linear nature in the studied area include the communication infrastructure, melioration of rivers, and linear infrastructure, e.g. overhead power line. The presence of roads with high traffic intensity is related to the increased acoustic nuisance caused by noise and the emission of carbon dioxide by vehicles. The emitted pollutants pose a current threat to the quality of air, flora and fauna. The Wieprz-Krzna Canal runs through the territory of the Puchaczów Commune. It is the longest canal in Poland, and its environmental degradation is enormous. As a result of the construction of melioration, the area of wetlands was reduced and peat bogs, loss of habitats of many rare species of animals and plants. The functioning of the canal led to the drying of mineral-organic soils. Lack of activities related to the revitalization of the water system of the Wieprz-Krzna Canal will result in further unfavourable transformations in the ecological zone of the commune (Pichla 2011).

The analysis proved that in the entire territory of the Puchaczów Commune there are various threats to the natural environment, and the emitters are mainly factors of anthropogenic origin, related to the development of industry and the intensification of agriculture. Industrial areas and workings pose a current threat to each of the listed elements that build the environment, while fauna and flora are the components most exposed to increasing anthropopressure.

Analysis of ecological structures

The analysis of ecological structures (Fig. 4) has shown that within the administrative boundaries of the commune there are many areas of natural value, between which there is a connection in the form of an ecological corridor formed mainly by the river valley of the Mogielnica and the Świnka. This corridor requires strengthening due to the negative impact of ecological barriers. Ecological patches, i.e. areas characterised by the same method of covering, the internal shape of which does not determine the processes of matter and energy movement (Chmielewski 2013), include large forest complexes located in Ciechanki, Ostrówek, Zawadów, Wesołówka, Puchaczów and Nadrybie, as well as wet meadows, including Łąki Stawiska, Szerokie Błoto, Rukiecina. Most of the forest complexes are those found in oak-hornbeam habitats. The typical hornbeam is the most common

[2] https://klimat.rp.pl [accessed 16.11.2021].

(*Tilio carpinetum typicum*). Moreover, in the Puchaczów Commune a significant area is also occupied by forest and typical alder forests (Mącik et al. 2012).

Ecological corridors of local importance situated within the studied area include meadows and pastures in the form of strip structures. These are mainly areas related to the river valleys of the Mogielnica and the Świnka, placed in the northern and south-western part of the commune and the Wieprz-Krzna Canal. Ensuring spatial continuity of ecological corridors and their proper management is particularly important for the proper functioning of the natural system of the region. It is worth adding that the above-mentioned structures serving as patches and corridors (forest complexes, areas of meadows and pastures, water-peat bogs) are also a fragment of an ecological corridor of supra-local importance (nationwide). These are areas connecting various natural habitats, including forest complexes i.e. Puchaczów-Las, Puchaczowski Gaj, Las Turmowolski, Starowieski, Las Zwierzyniec, areas of wet meadows i.e. Łąki Stawiska, Łąka Skućków and areas located by lake Nadrybie. In the local spatial development plan of the Puchaczów Commune (Mącik et al. 2002) these areas are protected as the Ecological System of Protected Areas.

Ecological nodes are regions of high species richness, high habitat diversity and a low degree of anthropogenic transformations. They are, therefore, the

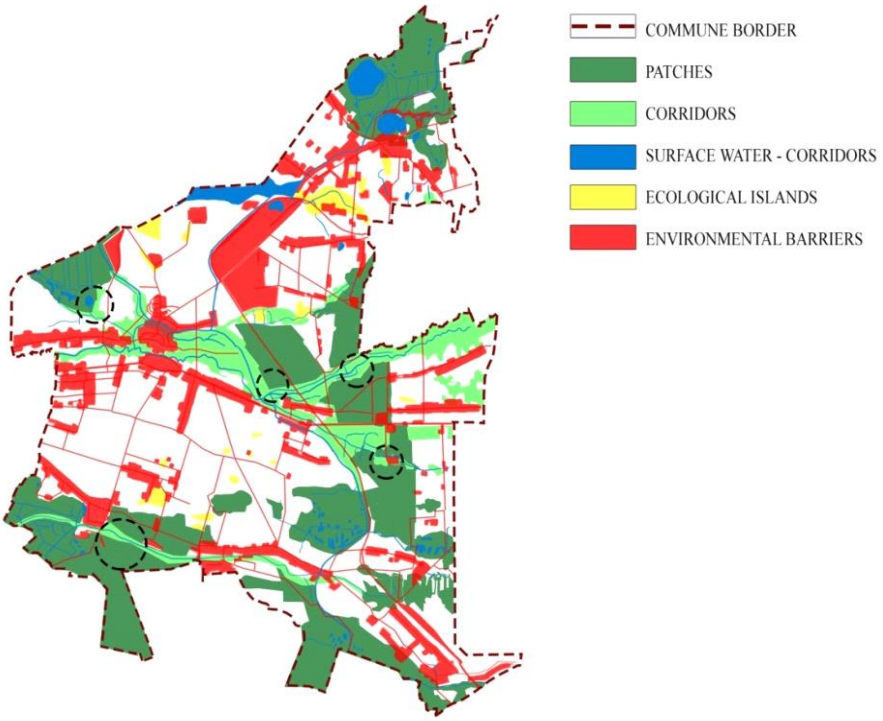

FIGURE 4. Analysis of ecological structures (own study, 2021)

most valuable areas in terms of nature. Usually, ecological nodes are the areas where ecological corridors converge or intersect (Chmielewski 2013). Five such areas should be distinguished in the Puchaczów Commune. These are forest and peatland ecosystems. Ecological islands are defined as isolated, smaller fragments of ecosystems (Chmielewski 2013). The ecological islands in the commune include landscaped green areas, park greenery and manor houses and grasslands as well as clumps of trees in the agricultural landscape.

Industrial areas, roads with intensive traffic and compact buildings constitute ecological barriers, cutting across ecological patches and hindering the movement of matter, energy and information in the natural environment. Moreover, linear barriers hinder the proper functioning of ecological corridors.

Analysis of trends in changes taking place in the environment

When analysing the trend of changes taking place in the environment of the Puchaczów Commune, it should be stated that the main factors determining the transformation of the landscape are the mining industry, and to a lesser extent agriculture and the development of the residential function. Due to the rural nature of the area in the commune, there is a predominance of areas with low biological activity, for which the arable land has been classified. Ecosystems meadows and pastures as well as forest complexes are of medium and high biological activity (Fig. 5). The research carried out by the author in 2018–2019 showed that in these systems there is a greater species diversity than in the case of agricultural zones. The process of the flow of biological activity takes place from units with the highest degree of biodiversity to the least biologically active areas, however, this transfer is inhibited by ecological barriers.

The surface of the mining area within the administrative boundaries of the commune is approx. 43 km^2, which constitutes 47% of the Puchaczów Commune area. It is a space particularly exposed to harmful effects of mining works. The Bogdanka mine is located in close proximity to the land of high natural values, Łęczyńsko-Włodawskie Lakeland. The mining area and the mining region include valuable ecosystems, which are a component of the ecological corridor, and thus play an important role in the functioning of the natural system at the regional and supra-local level.

The industrial zone, including post-mining waste disposal sites, are degraded areas or areas where this degradation may take place. Currently, the landfills cover an area of approx. 84 ha and will ultimately cover an area of 95 ha (Grupa Kapitałowa Lubelski Węgiel Bogdanka 2019). This area will be enlarged by transforming a part of the Puchaczowski Gaj forest complex into a green area with a storage function (Uchwała nr XXVIII/176/17 Rady Gminy Puchaczów), which may cause changes in the species structure. Moreover, mining damage caused by the exploitation of hard coal causes a slow liquidation of the villages of Bogdanka, Nadrybie, Albertów, Wesołowska (Mącik et al. 2012). The area with a tendency to degradation is also the south-eastern part of the commune, near the town of Zawadów. In this

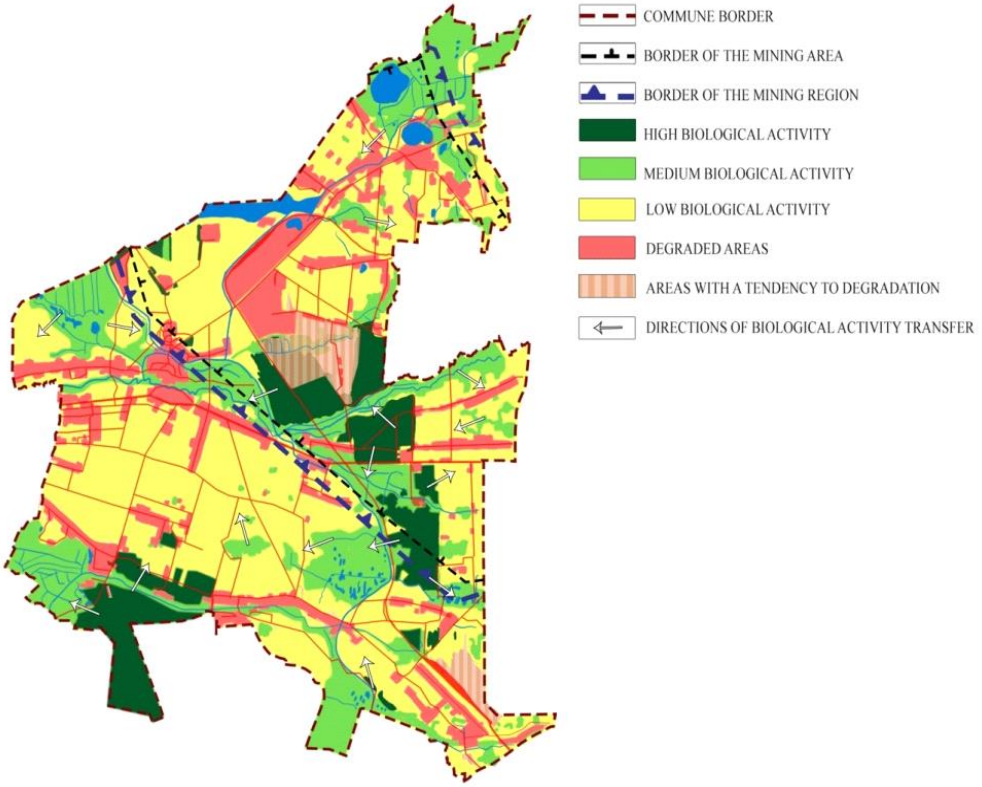

FIGURE 5. Analysis of trends in changes taking place in the environment (own study, 2021)

place, an investment is planned related to the construction of a power plant, a facility posing a potential threat to the quality of the environment.

The problem of developing industrial areas and their subsequent reclamation was also highlighted in archival and applicable planning and strategic documents. The need to revitalise the natural environment was mentioned among the commune's development priorities. Both in the local development strategy of the Puchaczów Commune for the years 2007–2015 (Szot-Gabryś 2008) and in the study of and directions of development of the commune (Mącik et al. 2012) it was emphasised that the negative effects of hard coal mine activity are visible in the environment, and the basic ones include transformations in the natural relief. As shown in the paper, the impact of the mining zone on the landscape is much wider and should be perceived this way each time.

Based on the analysis of the trends of changes taking place in the environment, guidelines for shaping the natural system of the commune, as well as conflict areas (which include the industrial zone and buildings located near ecological corridors) requiring special improvement of the ecological function, can be determined (Fig. 6).

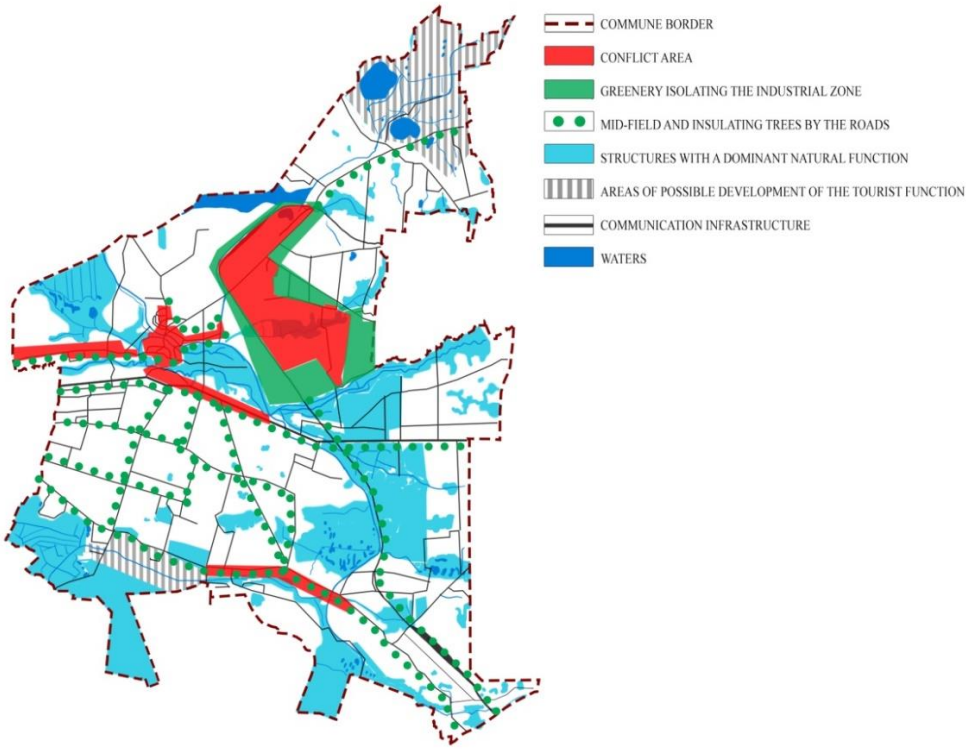

FIGURE 6. Guidelines for shaping the natural system of the commune (own study, 2021)

CONCLUSIONS

The analyses presented in the paper constitute key landscape studies dedicated to the landscape of a multifunctional commune, which enable the recognition and diagnosis of the environment, and thus can be the basis for an ecophysiographic study, the findings of which will help in the preparation of a planning document that fully embraces the task related to shaping landscape resources and will help in designing a green system which will be supporting the natural system of the commune.

As demonstrated in the region of the Puchaczów Commune, mining activities have the greatest impact on the landscape, posing a current threat to the environment. Therefore, it is important to find a compromise between economy and nature protection in shaping the commune's space. The natural system of the area requires protection and reconstruction mainly through the use of native vegetation, taking into account the habitat conditions, and the need to improve the functioning of problem zones. The areas with low biological activity should be enriched in terms of biodiversity. This can be achieved by creating new or supplementing the existing mid-field and protective trees along communication routes. Forest complexes, meadows and pastures are part of the patches and ecological corridors, structures particularly

sensitive to degradation, and therefore their main function should be limited to the natural one, with the possibility of extending it to tourist use, which will not be harmful to the environment. The industrial zone should be additionally isolated from residential and agricultural areas by strengthening forest areas in the north of the commune. There is also a need to compensate for the negative impact of hard coal mines on habitats with high natural values by creating new groups of trees, complementing the natural system of the commune.

It is worth adding that the above conclusions are in line with the recommendations of the Glasgow Leaders' Declaration on Forests and Land Use (2021) and in particular with the provision relating to the preservation of forests and other terrestrial ecosystems and the acceleration of their restoration[3].

REFERENCES

CHMIELEWSKI T.J. 2013: Systemy krajobrazowe struktura – funkcjonowanie – planowanie. Wydawnictwo Naukowe PWN, Warszawa.

CIESZEWSKA A., WAŁDYKOWSKI P. 2016: Zastosowanie badań terenowych w opracowaniach ekofizjograficznych na przykładzie „Zakola Wawerskiego" w Warszawie. Prob. Ekol. Kraj. 41: 189–202.

CZAPIEWSKI K. 2013: Planowanie przestrzenne na obszarach wiejskich – przegląd istniejących źródeł informacji. Biuletyn KPZK 252: 132–142.

FORMAN RT.T., GODRON M. 1986: Landscape ecology. John Wiley and Son, New York.

Glasgow Leaders' Declaration on Forests and Land Use 2021. UN Climate Change Conference (COP26) at the SEC – Glasgow 02.11.2021. Retrieved from: https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use [accessed 16.11.2021].

Główny Urząd Statystyczny 2020: Obszary wiejskie w Polsce w 2018 r. Urząd Statystyczny w Olsztynie, Warszawa–Olsztyn.

Grupa Kapitałowa Lubelski Węgiel Bogdanka 2019: Stabilny rozwój w niełatwym otoczeniu. Raport zintegrowany 2019.

KRAŚNICKI S. 2019: Oddziaływanie projektowanej kopalni węgla kamiennego eksploatującej złoże Lublin na wody podziemne i powierzchniowe. Ludów Polski [typescript].

MĄCIK E. et al. 2002: Miejscowy plan zagospodarowania przestrzennego gminy Puchaczów. Uchwała nr IV/30/2002 Rady Gminy Puchaczów z dnia 30 grudnia 2002 r. w sprawie miejscowego planu zagospodarowania przestrzennego gminy Puchaczów. Biuro Projektów Urbanistyki i Architektury, Puchaczów [typescript].

MĄCIK E. et al. 2012: Studium uwarunkowań i kierunków zagospodarowania przestrzennego gminy Puchaczów. Załącznik 1 do uchwały nr XXVIII/166/12 Rady Gminy Puchaczów z dnia 18 grudnia 2012 r. Biuro Projektów Urbanistyki i Architektury, Puchaczów [typescript].

MILECKA M., WIDELSKA E., MILECKI A. 2016: Opracowanie ekofizjograficzne podstawowe na potrzeby przeprowadzenia procedury zmiany planu miejscowego dla terenu gminy Kleszczów. Pracownia Architektury Krajobrazu „Eko-Styl", Tomaszów Mazowiecki [typescript].

PICHLA A. 2011: Role of Wieprz-Krzna Canal in region water management [Rola Kanału Wieprz-Krzna w gospodarce wodnej regionu]. Wiad. Melior. Łąk. 54 (2): 67–69.

Rozporządzenie Ministra Środowiska z dnia 9 września 2002 r. w sprawie opracowań ekofizjograficznych. Dz.U. 2002 nr 155 poz. 1298.

SZOT-GABRYŚ T. 2008: Strategia rozwoju lokalnego gminy Puchaczów na lata 2007–2015. Fundacja Centrum Rozwoju Lokalnego, Lublin.

Uchwała nr XXVIII/176/17 Rady Gminy Puchaczów z dnia 25 stycznia 2017 r. w sprawie uchwalenia zmiany miejscowego planu zagospodarowania przestrzennego gminy Puchaczów na terenie górniczym obszaru górniczego

[3] https://eustafor.eu [accessed 16.11.2021].

Puchaczów V w zakresie trasy przebiegu estakady taśmowej napowietrznej do transportu urobku z pola Stefanów do Bogdanki, lokalizacji składowiska węgla oraz przestrzennego rozmieszczenia składowiska odpadów górniczych (obiektu unieszkodliwiania odpadów wydobywczych) wraz z zapleczem technicznomaszynowym.

Streszczenie: *Analizy krajobrazu wiejskiego jako narzędzia planowania przestrzennego na przykładzie gminy Puchaczów*. W artykule zaprezentowano kluczowe analizy krajobrazowe umożliwiające identyfikację i diagnozę środowiska, a w konsekwencji pomagające w formułowaniu zasad rozwoju zrównoważonego określonych terenów. Zakresem terytorialnym badań objęto gminę wiejską Puchaczów, położoną w województwie lubelskim, gdzie z uwagi na uwarunkowania przyrodnicze w II połowie XX wieku rozwinął się przemysł wydobywczy. W pracy wykonano analizę pokrycia terenu, uproszczoną analizę ekotopów, zagrożeń dla środowiska oraz struktur ekologicznych. Wypadkową powyższych badań jest analiza tendencji zmian zachodzących w gminie, która wskazuje obszary problemowe, a w konsekwencji umożliwia zaproponowanie odpowiednich kierunków rozwoju przestrzennego. W gminie Puchaczów od lat 70. XX wieku głównym czynnikiem determinującym charakter krajobrazu jest działalność kopalni węgla kamiennego, powodująca przekształcenia m.in. rzeźby terenu i hydrosfery. Zaproponowane we wnioskach działania mają na celu zahamowanie negatywnych skutków działalności wydobywczej poprzez wzmocnienie systemu przyrodniczego gminy.

Słowa kluczowe: planowanie przestrzenne, gmina wiejska, rozwój zrównoważony, metody analizy krajobrazowej

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Author's address:
Sylwia Barwicka
(https://orcid.org/0000-0002-4887-0481)
Uniwersytet Przyrodniczy w Lublinie
Wydział Ogrodnictwa i Architektury Krajobrazu
Katedra Architektury Krajobrazu
ul. Głęboka 28, 20-400 Lublin
Poland
e-mail: syszef@wp.pl