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ECOLOGICAL AND SOCIAL ASPECTS IN THE MANAGEMENTOF POST-MINING AREAS. AN EXAMPLE OF THE ADAMÓW LIGNITE BASIN

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A b s t r a c t

The study presents a management model for post-mining areas, which includes the process of reclamation and management in the context of the socio-ecological system. This means that it is necessary to include the relations in the management system that occur between the main stakeholders (internal relations) and the ecological, economic and socio-cultural conditions of the environment (external relations). Verification of the recommended model was carried out on the basis of the analysis of environmental, economic and socio-cultural processes currently observed in the Adamów Brown Coal Basin, which is in the phase of liquidation. The conclusion presents constraints in the legal system that are not propitious for comprehensive solutions in the field of revitalization.

Keywords: social-ecological system, post-mining areas, revitalization, environmental management

1. INTRODUCTION - POST-MINING AREAS AS A SUBJECT OF ENVIRONMENTAL MANAGEMENT

In discussions on the development of lignite mining in Poland, the main problems analyzed are collisions in the natural environment resulting from the exploitation

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of this raw material. The contemporary approach to the natural environment and its protection is characterized by a multifaceted integration of this problem with the social, economic and political aspects of human existence [6,7]. An expression of this is the paradigm of sustainable development sanctioned in the legal system (Article 5 of the Constitution of the Republic of Poland), forcing the functioning in the sphere of practical activities and optimal environmental management systems. The environmental management system is a practical activity dealing with designing, implementing, controlling and coordinating environmental management processes. In the systemic approach to environmental management, the management system (the organizer of the management process) and the environment being the object of management are distinguished [14]. The management system operates on the basis of management instruments (legal and administrative, financial) and instruments of environmental protection programming - program documents, including those of a strategic nature [7]. In the analysed case, the management object consists of post-mining areas (external waste banks, internal waste banks, end pits of a specific shape, morphology, engineering and technical parameters). The managing system and management object together with internal and external relations create a management system. Post-mining areas shaped in the processes of reclamation and development as new elements of the natural system also require a systematic approach to management, in particular with regard to spatial decisions.
The aim of this study is to determine the optimal model of management of post-mining areas in Poland and to verify the conditions for its implementation on the example of Adamów Brown Coal Basin currently being liquidated. The area of mining activity comprised four communes: Władysławów, Brudzew, Turek and Przykona being part of the turecki district (Wielkopolska province). They create a region that has benefited from mining and power plant operations for over 50 years.

2. MANAGRMENT OF POST-MINING AREAS – THE PHASE OF TRANSITION

Observing the over 60-year history of the development of opencast mining in Poland, two approaches can be distinguished in the management of post-mining areas. In the past, post-mining areas were managed according to the cascade model (Fig.1). The main feature of this model was management based on commands. Key decisions regarding the directions of reclamation were taken arbitrarily at governmental levels and transferred to managements of mines. These, respecting the provisions, carried out reclamation and transferred recovered post-mining areas to the management of the local administration. The

last link in the management system was the future user of these areas - the local community.

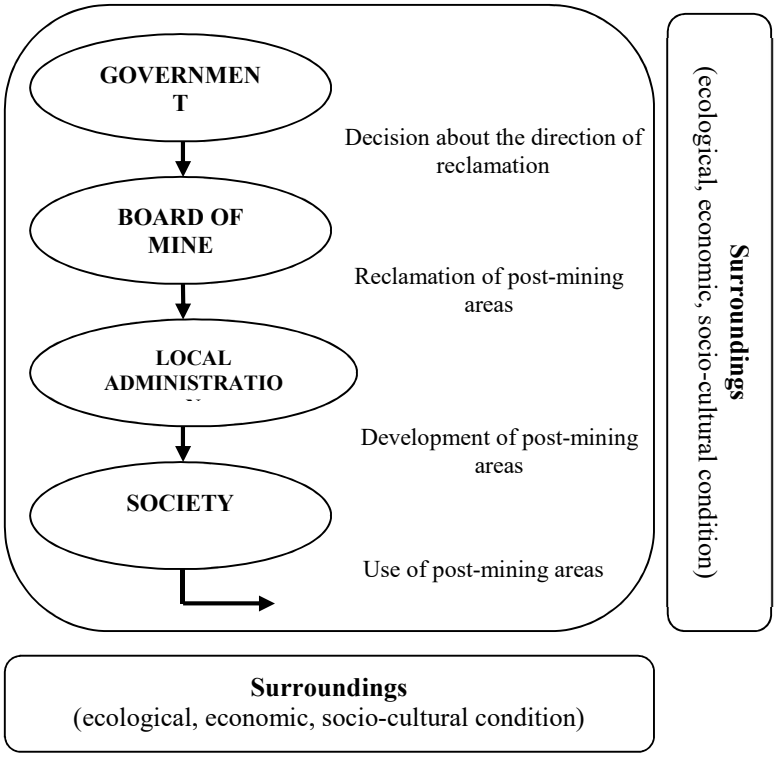

Fig. 1. Cascade model of management of post-mining landscapes.
Source: own work

Another distinctive feature of the management system was the technocratic approach to reclamation. Reclamation was limited to the restoration of utility values to degraded land by shaping terrain, improving physical and chemical properties of land, regulating water relations, restoring soils and communication infrastructure. In managing post-mining areas, environmental, economic and socio-cultural conditions were omitted. It should be added that this system functioned in the specific conditions of a centrally controlled economy based on industry, in which the exploitation of hard and brown coal was a priority, and mining expenditure was high. In the current political and economic situation, coal mining in Polish mines is based on economic balances and focuses on profit. On the other hand, there is an increase in public awareness about the importance of the environment in the quality of life, as well as an increase in the activity of society and its control in the field of reclamation of post-mining areas. From the discussion on the principles of shaping the post-mining areas in Poland in the

literature of the last few years [12, 13, 10, 9, 2, 16, 8, 1, 17], an image of the desired post-mining management model emerges, the aim of which is to capture the reclamation process in the context of the socio-ecological system. This means that it is necessary to include two kinds of relations in the management system: internal and external. Internal relations take place between stakeholders, among which the management of the mine, local administration and the local community can be identified. The stimulus for building these relations is the formal and legal basis defining the principles of mining activity (Act of 27 April 2001. Environmental law. Journal of Laws No. 25 item 150, art. 126, sec. 2, the Act of 9 June 2011. Geological and mining law. Journal of Laws No. 163 item 981, the Act of 3 February 1995 on the protection of agricultural and forest land. Journal of Laws No. 121, item 1266, art. 4 sec. 18) and the principles of spatial management (Act of 27 March 2003 on spatial planning and development. Journal of Laws No. 80 item 717). Examples of such interdependencies are presented in Tab. 1.

Table 1. Examples of internal relations between stakeholders in the management of post-mining areas

LOCAL ADMINISTRATION ⇄ **BOARD OF MINE**	
✓ Changes in entries in planning documents (Study of conditions and directions for spatial development, Spatial development plan) ✓ Conducting the environmental impact assessment ✓ Issuing permits and decision: The decision about the Environmental Conditions for the realization of the investment, granting and extinction of a mining license, the decision approving the mine sites planning, the construction permit (for example, post-mining waste landfills), the decision setting out the directions of reclamation ✓ Assessment of the correctness of the carried out reclamation and issuing the decision on its approval ✓ Ability to use the potential of reclamation of post-mining areas for creating new directions of commune development	✓ Generation of income for the commune's budget (maintenance fees, property tax, other taxes, fees for using the environment) ✓ Financing of reclamation of post-mining areas, reconstruction of technical infrastructure and liquidation of a mining plant

BOARD OF MINE ⇄ **SOCIETY**	
✓ Buy-back of private plots for mining activities ✓ Providing new jobs ✓ Ensuring a sense of financial stability for mine employees and their families ✓ Financial support for residents in the form of subsidies for culture, education, leisure and recreation Creating social facilities for employees and their families in the form of housing estates, medical clinics, care facilities (nurseries, kindergartens)	✓ Negative impact of the mine on the environment during the exploitation phase (noise, lowering of landscape values) ✓ Decrease in the value of real estate in the vicinity of mining areas ✓ Expectations the creation of attractive, multifunctional post-mining areas as part of the reclamation.
SOCIETY ⇄ **LOCAL ADMINISTRATION**	
✓ The right to express opinions on planned mining projects within the framework of the Environmental Impact Assessment procedure conducted by the administration	✓ Shaping awareness of potential of post-mining areas (e.g. recreational and natural values) ✓ Financial incentives for potential investors - buyers of post-mining areas

Source: own work based on Goerlich (2017)

External relations refer to the surroundings of post-mining areas. Post-mining areas are elements of a larger whole and should be related to the environment. The surroundings of post-mining areas is the natural environment with animate and inanimate nature, and the anthropogenic environment with a socio-economic and cultural layer. The diagnosis of ecological, economic and socio-cultural conditions of the environment should be a prerequisite for making decisions on the directions of reclamation of post-mining areas. Omitting them causes external relations to be the weakest link in the post-mining landscape management system. Reclamation projects only refer to the space degraded by mining. In many cases, the reclamation process is not preceded by consultations, research on the preferences and expectations of landscape users, i.e. local communities.

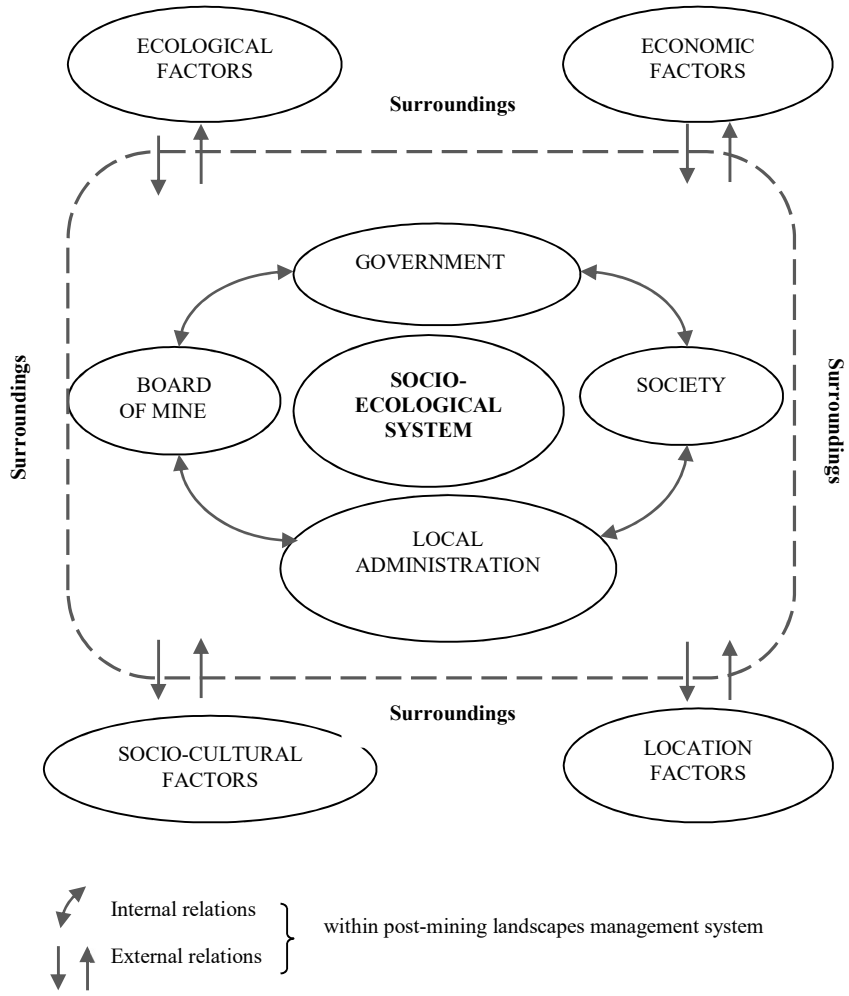

Fig. 2. Participatory, co-creative and consensual model of management of post-minig landscapes. Source: own work

However, there are also examples of some activities currently undertaken in Poland in the field of reclamation, which are included in the recommendations presented above. This makes it possible to put forward the thesis that the modern post-mining management process is in the phase of transition to the participative system (Fig. 2), based on co-creative and consensual model of reclamation of post-mining areas. Implementation of this model for reclamation practices should be based on building and strengthening internal and external relations on two levels (Fig. 3).

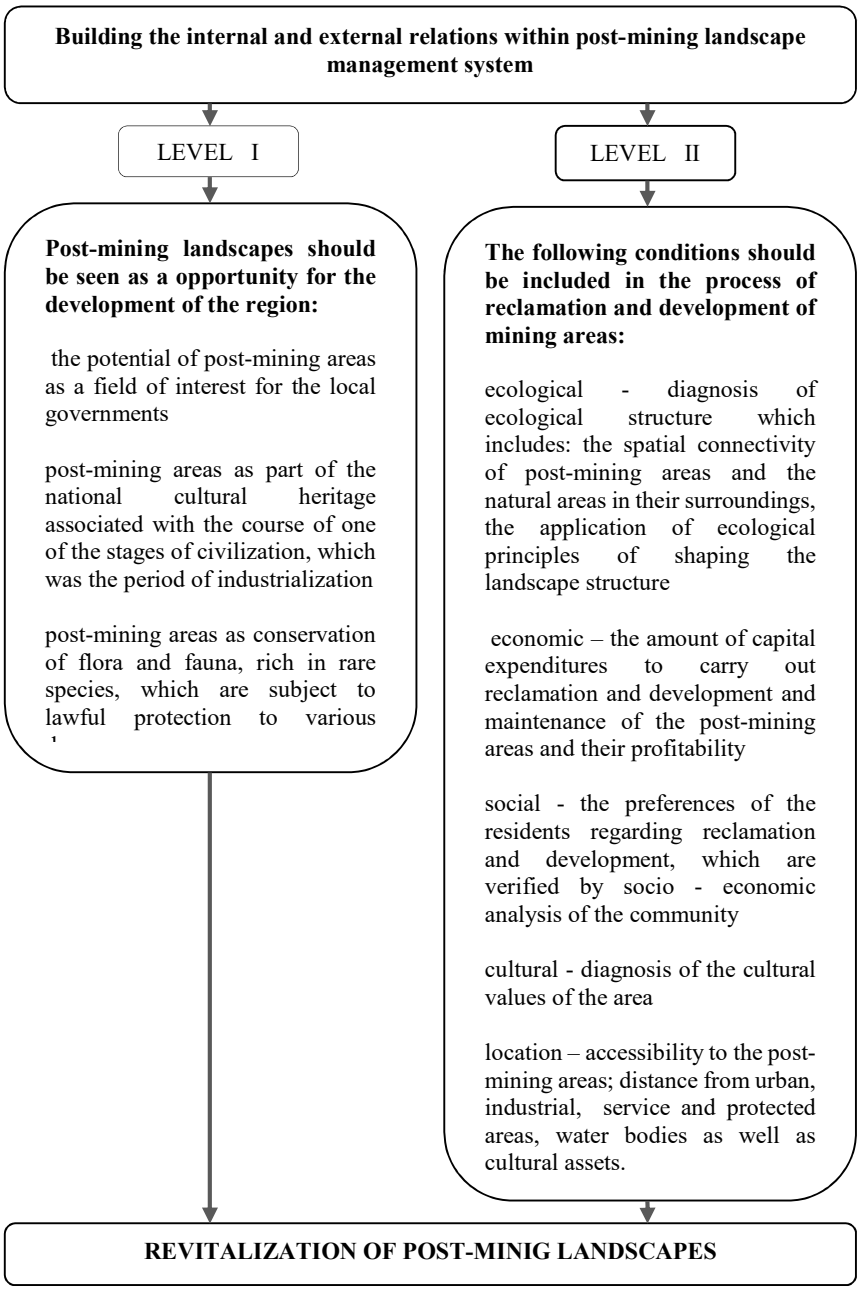

Fig. 3. The change in approach to post-mining landscape management.
Source: own work

The former concerns changing the approach to post-mining landscape management at the level of mine management, future users and local communities. The specific structure of post-mining areas causes that they create systems characterized by utility values, both natural and cultural, which give the reconstructed areas new functions. Therefore, post-mining areas should be seen as an opportunity for the development of areas, where they occur and not as a threat [12]. This opportunity should be associated with the development of the resource and use potential of post-mining areas, in particular with the development of biotic productivity potential related to an increase in agricultural usability of soils and an increase of forestation [3], with the development of the water potential associated with an increase of water reservoirs or development of recreational potential resulting from multidirectional reclamation. It is also important to develop the potential of biotic regulation related to the enrichment of the post-mining landscape with new geosystems, which become biotopes for species rich in biocenoses and are therefore covered by various forms of legal protection (ecological lands, nature and landscape complexes). Post-mining areas and post-industrial facilities are also part of the national cultural heritage associated with the period of industrialization, which should be subject to promotion (educational paths, tourist trails).

The second level of building relations between the management system of post-mining areas and its surroundings should consist in taking into account ecological, economic and socio-cultural conditions in the process of reclamation and management of mining areas. Shaping of ecological connections should make it possible to maintain communication between post-mining geo-networks (external waste banks, internal waste banks, end pits) and geosystems constituting their surroundings. No less important is also strengthening of the ecological structure of the post-mining geological systems. For instance, through the introduction of woodlots and shrubs, balks within large-scale internal waste banks reclaimed in the agricultural direction or strengthening of the biological stabilization of watercourses, newly built canals or water reservoirs. Economic factors should take into account both the dynamics of the commune development, the structure of the local economy and the demand for new investment areas, as well as financial possibilities in the area of post-mining land management and their subsequent maintenance. [13]. The local community as a future user should be able to determine its preferences regarding the selection of the reclamation and development of post-mining areas. It is also important to take into account location factors - transport and infrastructure links, access to post-mining areas, distances from industrial, service or tourist-recreational areas (water reservoirs, cultural facilities).

Only such an approach to the process of reclamation and development, integrating social, economic, cultural and ecological conditions, gives an opportunity for a new quality of post-mining areas and extending the scope of conceptual reclamation to comprehensive activities referred to as revitalization.

3. PARTICIPATIVE MODEL OF MANAGEMENT OF POST-MNING AREAS VERSUS THE REALITY - AN EXAMPLE OF THE ADAMÓW BROWN COAL BASIN

The Adamów Brown Coal Basin had been in operation since 1959. It included the Władysławów mining area with the Władysławów open pit, the Adamów mining area with the Adamów and Bogdałów open pits and the Koźmin and Koźmin I mining area. The extraction from the Władysławów open pit was terminated in 2012. The Koźmin open pit was closed in the emergency mode in 2016. The exploitation from the Adamów open pit will end in May 2020, despite earlier assurances that the open pit will be functioning until the coal plants are depleted, which was assumed for 2023. The Adamów Power Plant ended its operations in 2017. As a result, Adamów Brown Coal Basin is in the liquidation phase. The post-mining communes of Władysławów, Turek, Przykona and Brudzew form a mining region in which we are currently observing intense environmental, economic and socio-cultural processes related to the liquidation of the fuel and energy industry.

3.1. Background

The period of intensive development of the region. In 1959, when the mine began its activity, Turek had about 9,000 inhabitants and currently, approx. 28,000 people lives here. The functioning of the Adamów mine and power plant contributed to the intensive development of the region.

The cash inflows from the exploitation fee and property taxes (land including open pits, workshop and administrative facilities, external waste banks) constituted one of the basic sources for supplying the budget for mining communes. In 2010-2015, more than PLN 132 million were credited to the cash of Adamów Brown Coal Basin mining communes only from these fees. Income per capita of the mining commune was more than twice as high as the national average. For example, in 2011, in the Władysławów commune, it amounted to PLN 2766.17, compared to the average in Poland - PLN 1330.93 (*www.wladyslawow.bip.net.pl*). The mine and power plant were the largest workplaces in the region. In 1980, there were 3,030 people employed in KWB Adamów, in 2012 - only 1,600. In 1989, the power plant employed 1,352 people (according to PAK KWB Adamów data). Symbols of prosperity were the emerging mining settlements with social facilities for miners and their families, a

modern bus station with the largest network of connections in a city of this size, and the "Węgiel Brunatny" Holiday and Wellness Centre in Kołobrzeg.

Identity built around the mine and the power plant. As part of its activity, the mine developed mining culture and traditions. These included the celebrations of the mining holiday - Barbórka, with miners marching through the city streets and beer taverns. The symbol of mining culture was the mining orchestra operating for 48 years (since 1966) honouring the important events for the region. It was dissolved for economic reasons in 2014. Miners, through meetings with children in kindergartens and schools, built relationships with the younger generation. The newly built church in Turek (1990 - 2009) that met the religious needs of the local community was entrusted to the patron saint of miners - Saint Barbara. The mine, through subsidies for culture and education, played the role of a patron and provided a sense of professional stability and financial security to a significant part of society. These elements have developed a sense of identity related to the mine and the power plant in the local community for over 50 years.

3.2. Liquidation of the Adamów mine and power plant

Social moods in the region. Social moods are a combination of subjective assessments and expectations regarding the quality of life in the region. Only to a certain extent, they correspond to objective indicators describing the socio-economic reality, but despite subjective sources, the state of mood at a given moment exists as an objective phenomenon and includes the possibility of influencing the course of social and economic processes [15]. The analysis of social media and Internet users' opinions regarding the liquidation of the mine and the power plant indicate catastrophism, fear and anxiety and the sense of the end of the era among the inhabitants. The comments of the Internet users are dominated by the following statements: "After closing the mine and the power plant you will live in a hole called poverty and unemployment", "Turek, Turek and the end of Turek, in 2 years it will be a village with pensioners and senior citizens", "this is a tragedy for Turek and the region as there will be no mine for everyone, the remaining "companies" will start paying their employees as much as they want (minimum statutory). We must leave - for economic reasons." Spirals of fear and hopelessness were amplified by titles in the local media: - Echo Turku newspaper: “Twilight of Turek", "Miners' Day in the climate of the end of the era", "Only six years remained for Turek", "Quality of life "after the mine” will drastically deteriorate"; turek.net.pl portal: "The end of the power plant and the mine. What to spend the last coal money on?" , "In 2017, the light in the Adamów Power Plant in Turek will go out".

No prospects. Social moods, an increase in the number of unemployed people and the outdated qualifications associated with the liquidation of the mine and the power plant create a sense of lack of prospects. This is clearly reflected in the high negative migration balance observed in the population aged 25-34. The reasons for the leave were dominated by factors related to the situation on the local labour market ("lack of work and prospects on the spot, in the Turek district", "lack of work related to education/qualifications"). Over 6% of the inhabitants of the district also declared that they intended to move to another town within the next two years. The main destinations for the planned trips are: another country, the cities of Poznań and Łódź [5].

No dialogue. There was a lack of dialogue, lack of information flow, lack of consultations between the PAK KWB Adamów Management Board, the local administration as well as the inhabitants and mine employees:

- the decision to close the Koźmin open pit was a surprise for local governments and workers' unions. In December 2015, the Board of the Mine, in response to the request of the Commune Head of Brudzew, did not confirm plans to close the open pit. After a month, at the end of January 2016, the commune administration received a decision to stop the extraction in an emergency mode. The President of the Management Board stressed that first the management makes a decision, informs the Supervisory Board and then all other interested parties.
- In June 2015, the Commune Head of Brudzew asked the Board of the Mine to submit an application for the change of the local spatial development plan when planning changes concerning the use of land registered in the local spatial management plan as mining areas (e.g. decisions to stop removing the overlayer and exploitation). The introduction of changes regarding the purpose of land to the local spatial development plan is a procedure lasting approx. 2 years, which means that the area is excluded from use during this period.
- The Management Board of ZE PAK informed in January 2018 that KWB Adamów intends to dismiss 149 employees by the end of March (nearly half of the staff). The labour office in Turek was not informed about this decision. A spokesman for ZE PAK was unable to say what miners can expect (https://wysokienapiecie.pl/7109-likwidacja-elektrowni-weglowa-adamow-2018/)

The lack of partner relations between the management of the mine - local government - local community, does not build a good climate for active involvement in the process of revitalization of post-mining areas. This applies to both the community, overlooked in access to information and in consultations, as well as local authorities. As a result, post-mining areas are perceived as a problem

and a threat. In a new document approved by the local government, the Integrated Strategy for Economic Development of the Communes of the Turek District for the years 2015-2025 [5], in the strategic analysis for the component of Spatial development, environment, culture and tourism as a threat to the Turek district, occurrence of degraded areas and post-mining areas, as well as the lack of the concept of their development are indicated. At the same time, there is lack of facilities for development for supra-local services, e.g. tourism, recreation and culture. Such provisions in the strategic document for the area, where post-mining communes occur, indicate a complete lack of awareness of the resource and use potential of post-mining areas among local authorities (compare to section 2). On the other hand, post-mining geo-landscapes are created by landscape systems characterized by utility values, both natural and cultural, which give the recreated areas new functions that can be used in the development of the region.

4. CONCLUSION - LEGAL CONSTRAINTS OF THE POST-MINING LANDSCAPE MANAGEMENT

The dissonance between the recommended, participative model of management of post-mining areas and practices of decision-makers, examples of which are described in this study, is possible due to imperfections of current legal and financial instruments that support such activities. For instance,

- separation of statutory provisions and regulations governing the two processes of post-mining area development: reclamation and development. The concept of reclamation and management are not defined in the Geological and Mining Law, but in the law on agricultural and forest land. The provisions of this Act do not take into account the specific features of post-mining areas, in particular the fact that the reclamation process begins already in the coal plants exploitation phase (external and internal waste banks) - only the final excavations are reclaimed in the mine's liquidation phase.
- lack of a clear definition of reclamation and development, which would separate the objective scope of these activities, leads to conflicts arising from a divergence of interests - the mine, which is responsible for reclamation - seeks to minimize the cost of reclamation while the future user expects solutions which would maximize the benefits.
- lack of precise guidelines defining the scope of reclamation documentation. The Act on protection of agricultural and forest land does not specify the elements that the reclamation project should contain. These elements are contained in the Polish Standard PN-G- 07800:2002 Opencast mining - Reclamation - General design guidelines. The standard is intended for use in the design and implementation of reclamation works related to excavations,

however, this standard does not have legal authority, because pursuant to art. 5 section 3 of the Act of 12 September 2002 on standardization (Journal of Laws 2002 No. 169 item 1386 as amended), the application of Polish Standards is voluntary

- lack of connection between the concept of reclamation and management (deposit management project) and the local spatial management plans exclude the realization of a coherent vision of local development using the potential of the post-mining areas
- current tax law regulations are not conducive to care of the reclamation process, which would result in the creation of multifunctional, aesthetic post-mining landscapes, because during the whole period of reclamation, a mining entrepreneur is charged with real estate tax at the rate calculated for land taken for business. The vision of long-term payment of high tax on non-profitable land while carrying out the prolonged "landscape" reclamation is a justified argument that this period, to the detriment of the quality and achievable effects, should be reduced to an absolute minimum. Thus, the tax system prefers maximally simplified reclamation as soon as possible.
- lack of legal instruments to ensure public participation in decision-making regarding land reclamation
- restrictions of the concept of reclamation and development to the boundaries of the mining area, without taking into account the criterion of restoring spatial connectivity of post-mining areas and their surroundings

A well-functioning post-mining landscape management system is an opportunity to revitalize post-mining areas. Its optimization should therefore combine the element of promoting a new perception of post-mining areas, supported by the modification of imprecise legal regulations in the field of reclamation and management.

REFERENCES

1. Eckart K: *Social, economic and cultural aspects in the dynamic changing process of old industrial regions. Ruhr District (Germany), Upper Silesia (Poland), Ostrava Region (Czech Republic),* Münster, LIT Verlag, 2003.
2. Fagiewicz K.: *Ekologiczno-krajobrazowe zasady kształtowania struktury obszarów pogórniczych*, in: Innowacyjne rozwiązania rewitalizacji terenów zdegradowanych 2011, Skowronek J., Katowice, Instytut Ekologii Terenów Uprzemysłowionych, 2012, 197-206.
3. Fagiewicz K., Brzęcka K.: *Ocena jakości rekultywacji gruntów pogórniczych w obszarze odkrywki "Adamów"*, Przegląd Górniczy, 10, 1126 (2016) 24-32.

4. Goerlich A.: *System społeczno-ekologiczny gminy pogórniczej na przykładzie Władysławowa*, praca magisterska napisana w Zakładzie Geografii Kompleksowej, WNGiG, Archiwum Prac Dyplomowych, 2017.
5. Mackiewicz M., Dzielnicka E., Gołębiowski C., Górecka-Ojdana A., Kania I., Kretowicz P.: *Zintegrowana Strategia Rozwoju Gospodarczego Gmin Powiatu Tureckiego na lata 2015–2025*, Warszawa, Ecorys Polska Sp. z o.o 2014, (https://www.powiat.turek.pl/media/att/Zintegrowana-Strategia-Powiat-Turecki2.pdf).
6. Mizgajski A.: *Zarządzanie środowiskiem i jego pozycja w badaniach geograficznych*. Przegląd Geograficzny 80,1 (2008a) 17-30.
7. Mizgajski A: *Zarządzanie krajobrazem jako aspekt zarządzania środowiskiem*, Problemy Ekologii Krajobrazu, 20 (.,2008b) 147-151.
8. Nita J., Myga-Piątek U.: *Poszukiwanie możliwości zagospodarowania obszarów poeksploatacyjnych w celu zachowania ich walorów geologicznych i krajobrazowych.* Tech. Poszuk. Geol. Geosynoptyka i Geotermia 3, (2005) 53-71.
9. Ostręga A., Polak K., Cała M., Różkowski K., Bucholski K., Wojnicka-Put B.: *Koncepcja rewitalizacji zbiornika Władysławów wraz z otoczeniem. Etap I – Opracowanie wytycznych dla rewitalizacji odkrywki Władysławów wraz z otoczeniem na podstawie uwarunkowań*, Kraków, AGH 2010.
10. Ostręga A., Uberman R.: *Kierunki rekultywacji i zagospodarowania - sposób wyboru, klasyfikacja i przykłady*. Górnictwo i Geoinżynieria 34,4 (2010).
11. Pietrzyk–Sokulska E.: *Kryteria i kierunki adaptacji terenów po eksploatacji surowców skalnych. Studium dla wybranych obszarów Polski.* Studia, Rozprawy, Monografie 131 (2005), Wydawnictwo IGSMiE PAN, Kraków.
12. Pietrzyk–Sokulska E.: *Tereny pogórnicze szansą rozwoju obszarów ich występowania. Studium na przykładzie Wyżyny Krakowsko – Częstochowskiej*, Kraków,Wydawnictwo IGSMiE PAN 2008.
13. Pietrzyk-Sokulska E.: *Rekultywacja i adaptacja terenów pogórniczych – aspekty prawne, techniczne i ekonomiczne. Wybrane przykłady realizacji w Europie i Polsce*, Kraków, Wydawnictwo IGSMiE PAN 2016.
14. Poskrobko B.: *Zarządzanie środowiskiem*. Warszawa, PWE 1998.
15. Sierzputowska E.: *Nastroje społeczne w latach 1989–1994*, Kancelaria Sejmu, Biura Studiów i Ekspertyz, 2014. (http://biurose.sejm.gov.pl/teksty_pdf_94/r-59.pdf).
16. Skowronek J.: *Innowacyjne rozwiązania rewitalizacji terenów zdegradowanych 2011,* Katowice, Instytut Ekologii Terenów Uprzemysłowionych Katowice 2012.
17. Wirth P., Černič-Mali B., Fischer W.: *Post- mining regions in Central Europe. Problems, potentials, possibilities,* München, Oekom Verlag 2012.

EKOLOGICZNE I SPOŁECZNE ASPEKTY W ZARZĄDZANIU OBSZARAMI POGÓRNICZYMI. PRZYKŁAD ADAMOWSKIEGO ZAGŁĘBIA WĘGLA BRUNATNEGO

S t r e s z c z e n i e

W opracowaniu przedstawiono model zarządzania obszarami pogórniczymi, który ujmuje proces rekultywacji i zagospodarowania w kontekście systemu społeczno–ekologicznego. Oznacza to konieczność uwzględniania w systemie zarządzania relacji jakie zachodzą pomiędzy głównymi interesariuszami - zarządem kopalni, administracją lokalną i społecznością lokalną (relacje wewnętrzne) oraz uwarunkowań ekologicznych, ekonomicznych i społeczno-kulturowych otoczenia, w którym te obszary występują (relacje zewnętrzne). Podejście, uwzględniające oba typy relacji, powinno stanowić przesłankę do podejmowania decyzji o kierunkach rekultywacji terenów pogórniczych, aby nadać im nową jakość. Weryfikację rekomendowanego modelu przeprowadzono na podstawie analizy procesów środowiskowych, gospodarczych i społeczno-kulturowych obserwowanych obecnie się w Adamowskim Zagłębiu Węgla Brunatnego, które jest w fazie likwidacji. W konkluzji przedstawiono ograniczenia w systemie prawnym, które nie sprzyjają kompleksowym rozwiązaniom w zakresie rewitalizacji terenów pogórniczych

Słowa kluczowe: system społeczno-ekologiczny, obszary pogórnicze, rewitalizacja, zarządzanie środowiskiem

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