

CONVERSION OF THE LANDS DEVASTATED BY MINING ACTIVITY

8.1 INTRODUCTION

A period of a dynamic industrialization of Upper Silesia and, being its direct consequence, a long-term domination of the mining industry interfered greatly with the structure of the environment – by means of physical, biological and chemical degradation. These changes lower a potential ability of the land to gain maximum and stable harvest in terms of agriculture and forestry, but they also have an influence on unfavorable distortion of the landscape. In Silesia there are 5705 ha of degraded and devastated terrains, which include, among others, green wasteland, production sites, mining landfill sites, brownfields located in built-up areas, unused water tanks [5].

8.2 THE CONSEQUENCES OF LAND DEGRADATION

Among the visible consequences, what comes to the fore, is the degradation of the surface. It is conditioned by various factors, such as kind of extraction techniques, intensity of extraction, geological form of bedded deposits, which manifests by the subsidence of earth's surface, horizontal ground movement or inclination. Apart from distortion of the surface, it translates directly into destruction or damages to the buildings located in the degraded area. Thickening development of industrial areas over the years, as well as intensified exploitation, also built-up areas directly under densely containing monumental buildings (e.g. churches), have led to numerous architectural damages and building disasters.

Subsidence of earth's surface, the consequence of underground mining, often leads to formation of characteristic elements of industrial and post-industrial landscapes – fens or inundation encompassing agricultural terrains, forests or settlement terrains[6]. A fen is an accumulation of water on a lowered part of the terrain while inundation means a process leading to excessive water accumulation on the lowered terrain [6]. The negative effects of inundations are primarily:

- soil degradation,
- losses in crops and tree stand,
- destruction of natural environment of plants.

Pond created in the result of land descent shows figure 8.1.

Degradation of the surface includes also the use of the terrain for landfills which are a result of extraction of ores and their processing, the so-called heaps and slime separators which consist of coal slurry of a low calorific value. Example of dumping ground with post-

mining waste shows figure 8.2, and example of coal slurry shows figure 8.3.



Fig. 8.1 Example of a pond created in the result of land descent

Source: author's photograph



Fig. 8.2 Example of dumping ground with post-mining waste

Source: author's photograph



Fig. 8.3 Example of coal slurry

Source: author's photograph

Mining landfills have a definitely negative influence on the aesthetics of the landscape, but primarily they constitute a source which allows harmful substances to get to the environment – these are substances that get filtered into water as well as the emission of gaseous and dusty pollution. The phenomenon of spontaneous combustion, which is particularly dangerous, occurs rather on older heaps where waste less separated from coal is stored.

Degradation is also reflected in the change of water relations. It is possible to specify two groups of factors: directly influencing the change of water circulation, and a group of factors which indirectly contribute to the change of water relations. Direct factors include [9]:

- water collection and discharges,
- discharges of deep mining water to watercourses,
- water transfers between river basins,
- drainage and intensive, long-lasting exploitation of underground waters.

Indirect factors are, among others [9]:

- meliorative works,
- regulation of watercourse and development of watercourse beds,
- change of land use.

In addition to the environment, the next main recipient of negative effects of industrial activity is the man. Apart from damages which may be defined as “hard” (e.g. destruction of a residential building) there are a number of subtle factors, which cannot be measured but still significantly lower the quality of life e.g.:

- ugly view of a damaged landscape,
- unpleasant odor of the landfill,
- hopelessness of life in a chaotic environment etc.

8.3 DEVELOPMENT AND REVITALIZATION OF DEGRADED LANDS

Currently there are over 30 coal mines functioning which produce annually about 30 million tons of waste. Increasing legal rigor, referring to the influence of extraction on the environment (in terms of natural and social relations), unfortunately is not able to stop further negative impact on environment. Neighborhood of power plants as well as steelworks and plants which use solid fuels as a basic medium of energy also causes an increase in the pollution of environment by other heavy metals [3]. Nowadays, Silesian industry is mainly based on coal extraction and its use as a fuel, and therefore the highest concentration of heavy metals, including mercury, occurs in the area of such plants [1]. Thus, degradation may embrace forest, agricultural as well as built-up areas.

Due to the liquidation of many mining centers, the areas which until recently have been subjected to strong influence of extractive economy, are now becoming the so-called post-mining sites. Their dominant visual features include ruined post-mining buildings, water-filled hollows and hills of heap site. Appropriate development of those post-mining areas will restore them or add to their environmental, economic or social attractiveness.

Obviously, development or revitalization of the post-industrial areas have been implemented for many years now, but unfortunately they embrace only a small percentage of all degraded areas. Development is to give the terrain its natural shape, to bring back the natural balance of soil ingredients in order to give the terrain environmental or economic value. Revitalization is about giving the degraded terrain other function and use.

In practice, dealing with the consequences of mining activities means:

- development of post-mining sites (heaps and slime separators),
- extinguishing of fired heaps and possibly their subsequent land use, mine subsidence repair,
- revitalization of historic mining buildings.

8.4 THE OBJECTIVES OF THE DEVELOPMENT OF DEGRADED LANDS

The objectives of land development degraded by mining may be divided into three basic groups, corresponding to the pillars of sustainable development:

- environmental objectives,
- economic objectives,
- social objectives.

Protection or development of natural environment is a basic environmental objective of land development. It happens very often that, for instance, the ecosystem which has self-developed in the water tank in the hollow includes extremely valuable elements of fauna and flora. An important issue here is to decide if such enclave should be preserved or if one should bring back the original layout of the area with its characteristic assemblage of plants and animals. Thus, shaping of the post-industrial landscape can manifest itself through protection activities such as creation of reserves or nature and landscape parks. Protection of the landscape is the realm of ideas and activities aiming at preserving the objects of nature in their original form as well as protection of environment aiming at its preservation in a state that guarantees the continuity of the most important processes in the biosphere and optimal conditions of human existence [4].

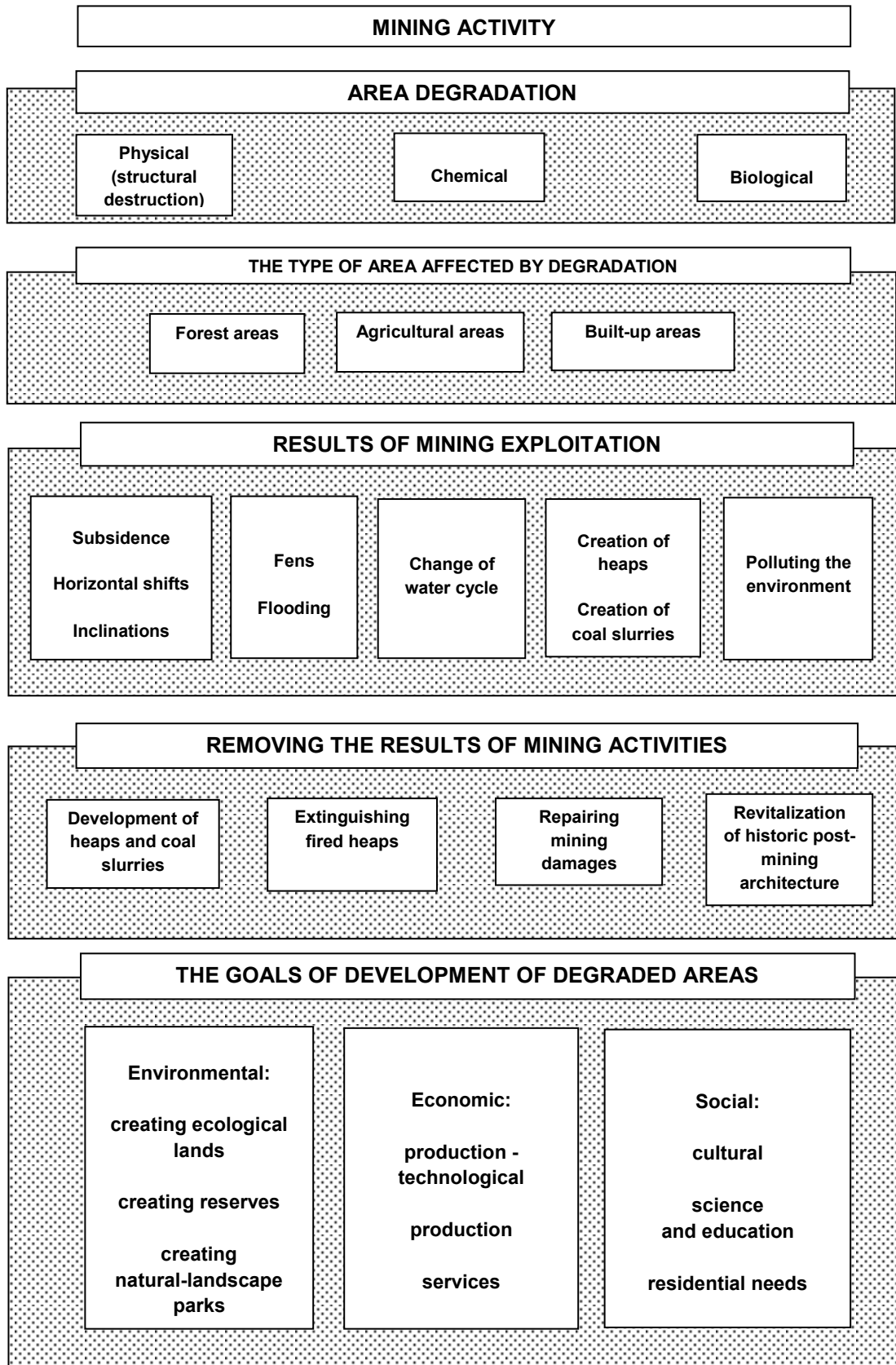


Fig. 8.4 Synthesis of results of mining activity and directions for developing the post-mining areas

Source: own work based on [9]

Development of the heaps which are no longer thermally active consists of sowing them with grass and after some reasonable time, their afforestation.

Environmental, economic and social objectives often interact with each other and the elements of one stimulate elements of the others. Land development within the area of production and technology, production or service constitutes basic directions of economic objectives. Production and technological function includes among others transportation, storage, industrial as well as scientific and technological parks. Service development is often focused around trade and services downtown, catering, entertainment centers as well as services connected with business etc. Social objectives embrace broadly understood cultural, scientific and educational activities, extended to activities related to housing needs.

In the late XIX century and early XX century, in the age of the so-called “industrialization”, in a close neighborhood of emerging extraction and processing plants, deliberately planned housing areas were built for workers and their families, which consisted of multi-family houses, schools and often hospitals. Such working-class housing estates are a valuable architectural heritage of the past years, being additionally a witness of the concept of planning at those times. Unfortunately, a vast majority of such colonies is neglected and inhabited by the poor but still alive, because it continuously performs its housing function.

Some of such housing areas, at the beginning discovered by artist, photographers and filmmakers for their own use, were finally fortunate, supported by adequate promotion, to occur in collective awareness as a valuable, characteristic for that region type of constructions. Chosen architectural objects or their groups – monumental housing buildings or post-mining buildings – according to the above mentioned possibility of revitalization, may begin to fulfill completely different functions, realizing particular social objectives. Properly prepared inferiors may become exhibition centers, theatres, may serve as a gallery or educational and scientific centers. Separate buildings or their groups can be also prepared in order to give them the functions of museums or open-air museums of technology.

Synthesis of results of mining activity and directions for developing the post-mining areas shows figure 8.4.

8.5 EDUCATION OF SPECIALISTS

A requirement for elaborating an adequate conception of land development is its natural, geological-mining and social-environmental recognition. Land assessment may be only conducted by professional personnel. Figure 8.5 shows schematic representation of stages of converting devastated areas.

The cycles of lectures and workshop, being a basis of specialists’ training, should be supported by trips to chosen terrains, representative from the point of view of development. On such lands, similarly to a lens, there is the whole range of problems concentrated which often appear where the mining industry used to be a centre of functioning. Training the professional personnel allows to increase the significance and attractiveness of such lands efficiently and effectively due to their development. Revitalization proceeded in a proper way provides benefits in various aspects for local councils, municipalities and residents of the developed lands, for example creating new work places. Aspects creating attractiveness of the area transformer according to the guidelines of sustainable development shows figure 8.6.

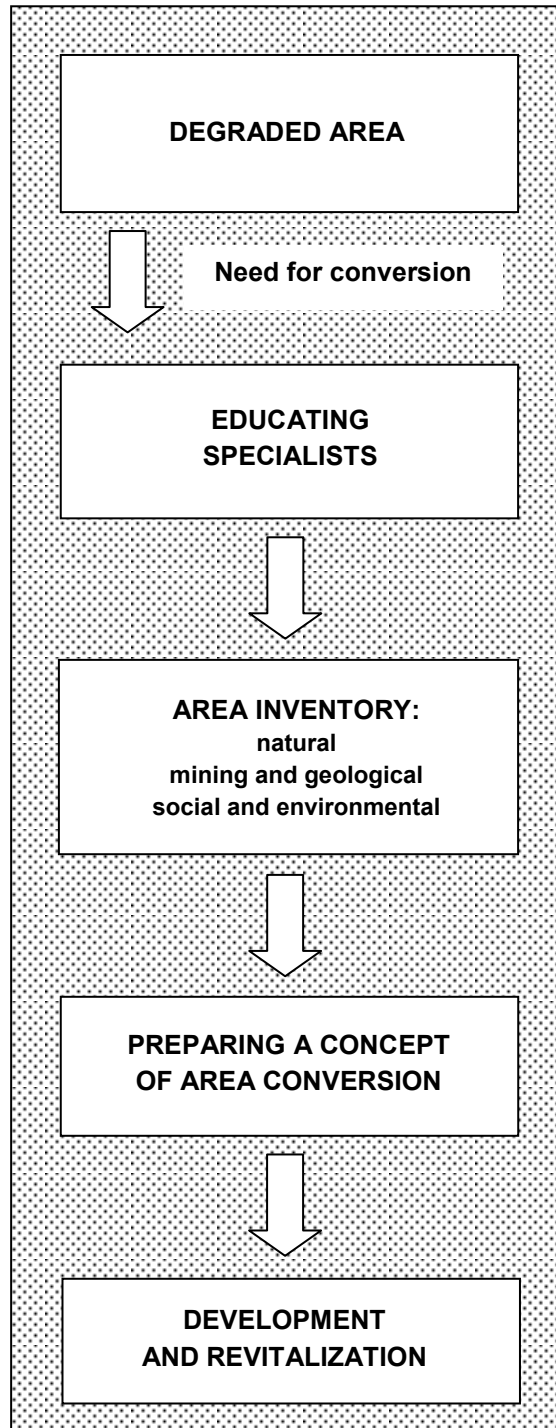


Fig. 8.5 Schematic representation of stages of converting devastated areas

Source: own work

The basic problem in Poland, including Silesian Province, is not sufficient information about post-industrial lands, therefore the data about the selected area must be created almost from the basis. However, it is worth to confront the research and search query results with the data gathered in Regional Spatial Information System [7], grounding on data provided by city, municipal councils and county offices. Full and reliable data constitute valuable information sources for potential investors as well, thus they may contribute to supporting changes on commercial rules [8].

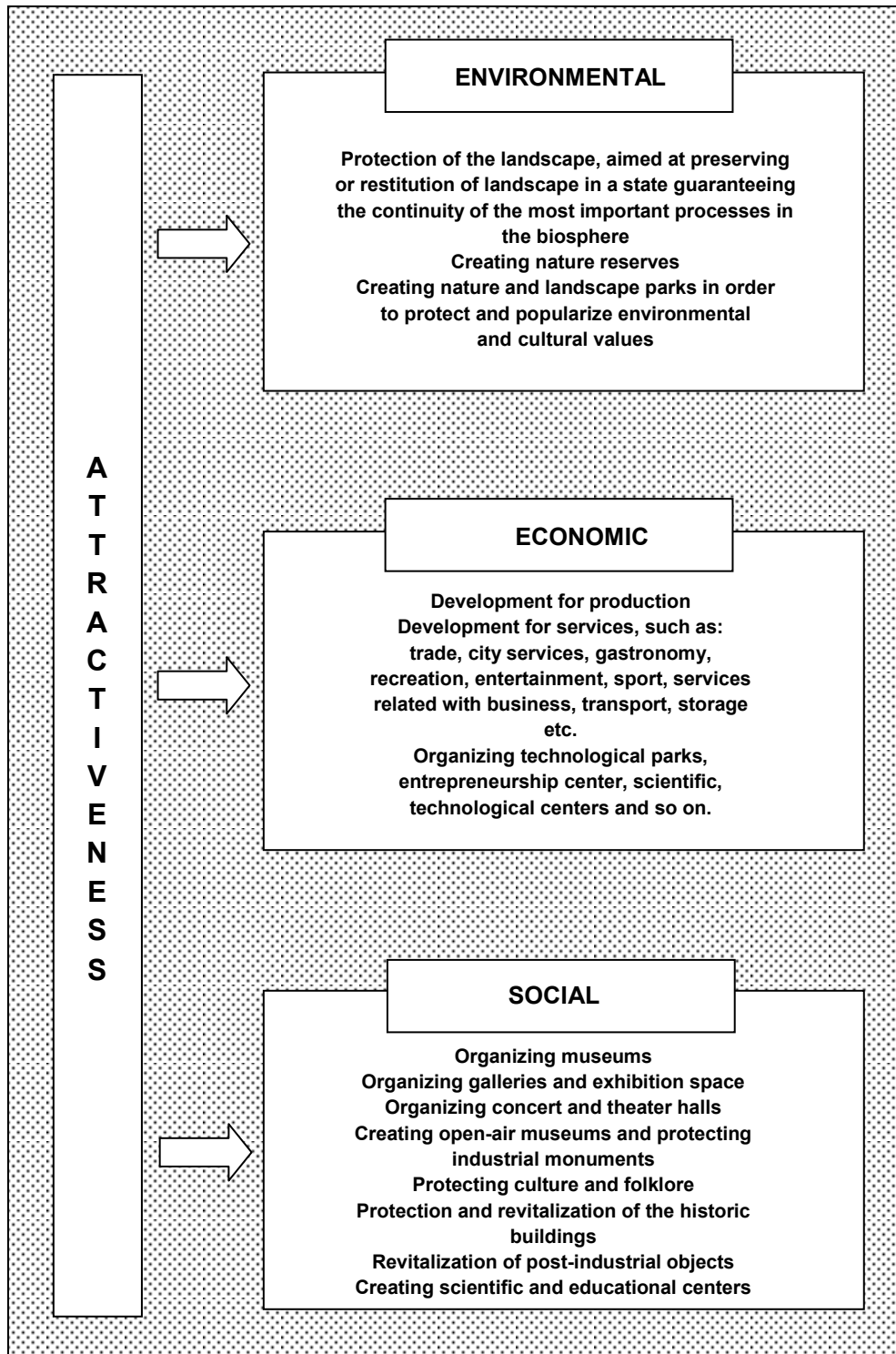


Fig. 8.6 Aspects creating attractiveness of the area transformer according to the guidelines of sustainable development

Source: own work based on [9]

A restraint of revitalization processes of the lands that stopped to serve economic functions is their unregulated legal-owner status. There is a lack of legal foundations visible necessary for engaging local governments and administration on a province level [8].

Efficient conduction of revitalization, next to support by a developed information base, should be characteristic for activity and cooperation of local governments and administration

of different levels, cooperation of local governments with scientific-research centers and also exchange of experiences of European Union countries which have successfully implemented interesting solutions. A significant transfer channel of development conceptions concerning borderland areas is trans-border cooperation [2]. It gains a special meaning in case of elaborating ways of revitalization in post-mining terrains; this may considerably affect the qualitative change of post-industrial landscape – landscape in a holistic understanding, related to esthetic and natural aspects as well as to the quality of life of societies connected with the land. Although areas being in the borders of other countries are specific for various legal regulations, the way of exploitation or organization culture contra these factors influenced on a different degree or character of conversions of similar areas in terms of geology, geography or nature. Consequently, disseminating good practice may find its use not only in revitalization or development of lands that bear the effects of mining activity but also when implementing a wide range of actions of preceding character.

CONCLUSIONS

The area of Silesian province, Upper-Silesian Industrial Basin and Rybnicki Coal Basin in specific constitute the most devastated areas in the scale of the whole country. Intensive exploitation and processing of mineral resources have contributed to this situation as it was conducted with a lack of consciousness about its impact on environment and with poor management of waste accompanying the mining and processing activity. Despite a progressive process of mines liquidation, the results of negative conversion and environment pollution are still noticed [1]. One of the ways of retrieving or providing environmental, economic and social attractiveness for such areas is their complex development. Educating competent personnel is extremely important who could conduct a necessary natural, geological-mining and social-environmental cataloging in the selected area. Next, there should be conceptions of their conversion elaborated from environmental, economic and social point of view.

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Abstract: *Mining activity in Silesian province contributed and still contributes to changes in natural environment, also concerning social and economic relations in a significant area. Such lands undergo a conversion, also their land morphology changes, vegetation is devastated and residential process is halted as well.*

In order to provide or retrieve natural, economic and social attractiveness of such lands it is necessary to develop them properly. Therefore, it becomes important to train competent specialists who will elaborate adequate conceptions of using post-mining areas, profitable from environmental, economic and social view.

Key words: *Devastated post-mining lands, land development, revitalization, conversion.*

PRZEKSZTAŁCANIE TERENÓW ZNISZCZONYCH DZIAŁALNOŚCIĄ GÓRNICZĄ

Streszczenie: *Na znacznym obszarze województwa śląskiego dają się zauważyć zmiany w środowisku naturalnym, a także w stosunkach społecznych i gospodarczych, spowodowane działalnością górnictwami. Obszary te ulegają przekształceniom, zmienia się morfologia ich powierzchni, degradacji ulega szata roślinna, zahamowany zostaje również rozwój osadniczy.*

Przywrócenie lub nadanie atrakcyjności środowiskowej, gospodarczą i społeczną tych terenów możliwe jest poprzez ich właściwe zagospodarowanie. Kwestią o dużym znaczeniu, zatem, jest wykształcenie kompetentnych specjalistów, potrafiących opracować korzystne z punktu widzenia środowiskowego, gospodarczego i społecznego, koncepcje wykorzystania terenów pogórnictwami.

Słowa kluczowe: *Zdegradowany teren pogórnictwami, rekultywacja, rewitalizacja, przekształcanie terenu*

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