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CONCEPT OF REDEVELOPMENT THE INUNDATIONS IN THE SZOTKÓWKA RIVER VALLEY IN MSZANA AND JASTRZĘBIE-ZDRÓJ LOCAL COMMUNITIES

1. Introduction

Changes in land surface evoked by mining excavation have been widely described in professional literature, while papers on geography, geology, biology and technical sciences in mining and environmental engineering represent the cognitive approach. However, there is also an interdisciplinary approach focused on management and spatial planning of areas degraded by mining activity, including landscape architecture, architecture and urban development, spatial planning, civil engineering and construction.

Among the many forms of changes classified by different fields of science engineering there are: under-land surface transformations including: quarry pits, workings, land subsidence, landslides. The first two types and their management have been frequently described. For example, quarry pits (especially smaller ones) have been subject of research (Saint Anna's Mountain, Kadzielnia) [4]. Post-sand workings, after abandoning the extraction works of sulphur and brown coal are subject of reclamation plans by excavation companies and destined for agriculture, forestry, water reservoirs or land fill areas. In Polish scientific publications there is still an on-going discussion on the workings of Tarnobrzeg sulphur workings, Konin, Turoszów and Bełchatów brown coal workings, and Silesian-Sosnowiec sandpits (for example, Uberman) [9]. On the other hand, landslides and mine-induced subsidence troughs have not so far received enough attention [1], as they cannot be pre-designed. Land subsidence usually occurs in areas which are not owned by coal companies, yet they pose hazards to civil engineering structures and the natural environment.

The central and southern part of Silesian Voivodship has been subjected to severe mining impacts evoked by the extraction of lead and zinc ores and hard coal,. The land subsidence

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in the discussed area reaches even scores of meters and their visible effects are caving sites and troughs. Many of them are filled with water and create blind or flow flooding. Although mine-induced land subsidence can somehow be forecast or even prevented (stowage, filling) , their reclamation and redevelopment requires a different approach in comparison with the methods used in workings and gobs management.

2. Description of the research problem

Intense development of coal hard mining in Upper Silesia, dating back to the 18th century caused irreversible damage to the land surface in many areas. Against such background, the landscape of Rybnik and Wodzisław districts are exceptional, with the abundance of small valleys intersecting the Triassic clay soils, and deep, long ravines formed by postglacial waters. One of the examples of landscape transformations evoked by industry is the Szostówka River Valley that belongs to the Oder River catchment¹. The river beds of the Szostówka River and its tributaries were built over with a hydro-technical infrastructure dating back scores of years previous, mainly to water dam the fish ponds and to achieve the proper water fall gradient to move the water-wheels of mills, cloth and forge mills (Fig. 1).



Fig. 1. Previous landscape of the Szostówka River Valley. Part of the map made by Christian Friedrich von Wrede dating back to about 1750²

With the passage of time the facilities and equipment were abandoned and the fish ponds liquidated because of severe water pollution by industrial sewage and post-mine waters,

- 1 The Valley is situated in the area of toe catchments: the Vistula and Oder Rivers. The watershed between the two catchment areas is in the northern part of Jastrzębie Zdrój. The Szostówka River has its spring in Świerklany, and constitutes the Olza River tributary in the vicinity of Godów.
- 2 Atlas Krieger-Carte von Schlesien. Maps in the atlas include the initial period of the twentieth century. Atlas is currently stored in Staatsbibliothek zu Berlin — Prussian Kulturbesitz [2].

which apart from chloride and sulphur compounds also contained suspended matters — clays and coal dust [5].



Fig. 2. Hydrographical map of Mszana local community [5]

Due to the deformation of the river-bed evoked by underground mining extraction, the subsidence of the Szotkówka River Valley caused erosion and deepening of the estuary sections, which, in consequence, led to increasing the capacity of their channels (Fig. 2). The mining activity conducted in the discussed area by Jastrzębska Coal Company mainly involves long wall extraction with roof caving, resulting in inundation and local flooding³ of the land surface. At the same time, the Szotkówka River valley has always been a refuge zone for the fish flora of regional importance⁴. The entire area must be reclaimed and properly redeveloped [6, 7].

In 2010 Jastrzębska Coal Company initiated activities aimed at land reclamation and redevelopment of some parts of Szotkówka River valley. The designated zone included sites exposed to the mining impact from the “Moszczenica” coal mine, and, in the next step, the “Jas-Mos” coalmine. One zone of the valley with the surface area of 110 hectares, is situated in the southern part of the Mszana local community; whereas another small piece of land in Jastrzębie-Zdrój, in the vicinity of the historical spa complex⁵. The surroundings of the

3 Inundations are typical features of areas subjected to the underground mining impact. The term “inundation” is understood as accumulation of water in the subsidized area; whereas, flooding is the process of extreme land watering, leading to losses in farm crops and forestry, water-logged buildings, but not necessarily manifested on the land surface as inundations.

4 The refuge of several Fish species, constituting the Fish resources of the Oder River Basin. The preservation of the fish fauna will depend on the maintenance of the Szotkówka River in relatively unaltered condition — http://www.2007.przyroda.katowice.pl/ostoje_ryb_minogow.html.

5 In 1859 brine sources were discovered in Jastrzębie-Zdrój, on and, consequently, in 1861 a spa was created. The Town developer and for a Chile became a renowned resort, reaching its popularity peak in the 1920s. After World War Two the town started to fall in decline, despite some renovation of its curative facilities. In the 1950s, following the discovery of hard coal deposits and the foundation of Rybnik Coal District it consistently changed into an industrial area. In 1962 the first coal mine was opened in the town, followed by another four commissioned into operation up to 1974. Finally, the coal mines contributed to the wastage of the brine sources and, consequently, in 1994 the spa activity was abandoned- <http://www.jastrzebie.pl/>

inundated zones are not urbanized, yet have convenient access by road both from Mszana and Rybnik Agglomeration (Rybnik, Wodzisław Śląski, Jastrzębie-Zdrój, Żory, Czerwionka-Leszczyny) and the border with the Czech Republic. The zones will also be connected with the wider surroundings of A1 motorway. As mentioned before, intense mining activity has been manifested on the land surface by subsidence zones, currently filled with water and, naturally, hydrology connected with the Szotkówka River. The zones have been subjected to discontinuous land surface deformations (Fig. 3). Currently land inundation zones are used by fishermen (fishing rod fans), and, in summer spells, by local inhabitants for recreation. In the course of local *in situ* inspections carried out with students beavers were spotted in the southern part of the discussed zones.



Fig. 3. Situation of the discussed zones contained within Mszana and Jastrzębie Zdrój local communities [3]

3. Search for the reclamation and management concept

In its attempt to devise a concept for reclamation, the Jastrzębska Coal Mining Company approached the Faculty of Architecture, Silesian University of Technology, as it has had good experience in the transformation of post-industrial lands and facilities. Works on the concept were initiated at the Department of Urban Development and spatial Planning by organizing students' contest. The solutions proposed by the participating students were supposed to focus not only on land reclamation, but also on the use of the qualities of the land in question for social and economic functions.

One of such functions was the deposition of waste rock, to reclaim and endow the area with high biological, landscape and commercial values, despite further mining activation activity. The contest projects had been preceded by general feasibility studies and by defining the functions that the Szotkówka River valley could serve in the future. The outcome were visions of land management including: golf pools, motor-cycling courses, yacht marina and a nature preserve. The concepts emphasized the commercial aspect of the undertaking and the need of utilizing the land all year round, taking advantage of good communication and transportation connections and adjustment of the projects to the previous form of the landscape, combining the protection of green areas with utility functions. The location, landscape and biological qualities of the Szotkówka River Valley enable land reclamation and adjustment of its parts to recreation and commercial functions and the students' contest results were assumed to provide sufficient grounds for defining its future redevelopment.

3.1. Concepts submitted for the contest

The outcome of the Contest, as proclaimed by its jury, were excellent concepts, views and proposals that could be implemented in such attractive, yet difficult area, and students' works brave visions of its future. The Main Prize was given for the most precise fulfilment of the conditions of the contest, accurate comprehension of the organizers' expectations and presentation of the most attractive solution. It was decided that the awarded energy-efficient, commercial recreation, sports and leisure project could be attractive both in the summer and winter time. Its other qualities were: feasibility and provision of the utilization and management conditions for waste rock (Fig. 4).

The first distinction (Fig. 5) was awarded for good use of the accessibility of transportation connections, correct zoning of the commercial and public utility functions, land formation taking advantage of embankments in accordance with the previous landscape and a sustained and attractive management program, taking into account the interests of the neighbouring communities.

The second distinction was awarded for a complex and comprehensive approach to the protection of green areas, even going beyond the borders of the studied area, and conjunction of the proposed management program with the old Spa Park, proper access and restriction of the proposed developments up to the protected zones, attractive educational and knowledge

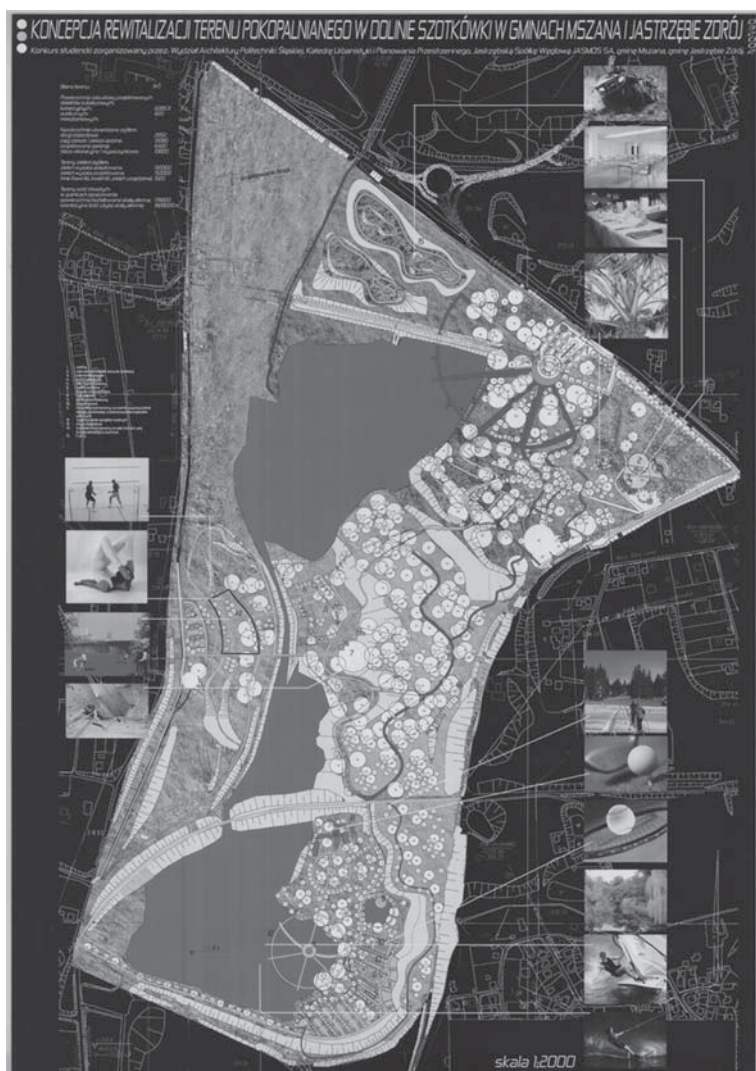


Fig. 4. 1st prize in the students' contest organized by the Faculty of Architecture, Silesian University of Technology and Jastrzębska Coal Mining Company, Mszana and Jastrzębie-Zdrój local communities (authors: B. Flak, K. Rudnicka, P. Wąs)

dissemination program (Fig. 6). Furthermore, the contest jury also took into account the values of other extensive, recreation and sport management projects that contributed to the discussion on shaping the landscape formation and management of open areas. High substantive level and professional presentation of the participants' projects should also be emphasized.

The recapitulation of the outcome of the students' contest led to the conclusions that its results should be made more precise to be used in the successive stages of the works on the

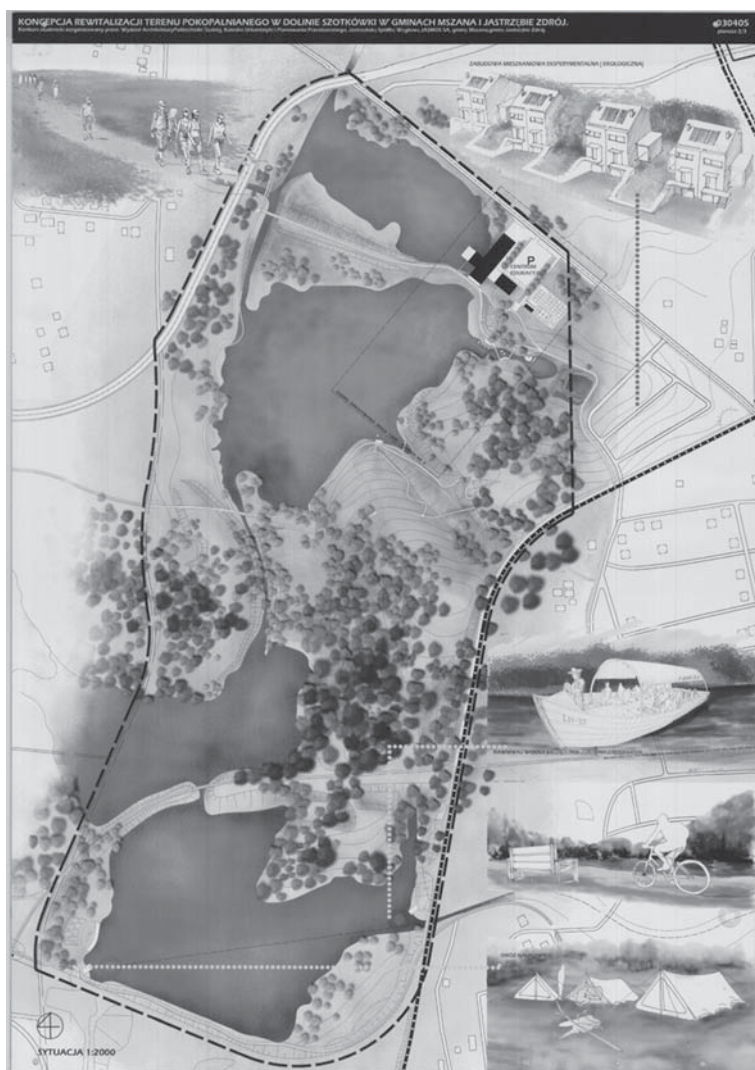


Fig. 6. The 2nd distinction in the students' contest organized by the Faculty of Architecture, Silesian University of Technology and Jastrzębska Coal Mining Company, Mszana and Jastrzębie-Zdrój local communities (authors: D. Lach, A. Król, A. Karaś)

functional zones were designated and SWOT analysis performed, to enable the determination of the principles of land management for the zones, in compliance with the strategic and planning guidelines of local, regional and national documentation and guidelines. The reached agreement combined the discussed management concept with local spatial and land development plan assumed by Silesian Voivodeship and local governments of Mszana and Jastrzębie-Zdrój.

4. Method of designating the modes of redevelopment of the Szotkówka River Valley

4.1. Expectations and restrictions

The above-mentioned students' contest for the conceptual design of the Szotkówka River Valley brought about abundant and various proposals. However, the estimation of their feasibility remains open- there is a need of synthesis and analyses of the conclusions. Yet, the presentations of the design solutions revealed both the expectations and the fears of all the parties concerned: the contest organizer, Jastrzębska Coal Mine Company and local governments of the communities situated within the land inundation area. The economic factor should not be ignored either as there were and still are plans and expectations leaning towards commercializing the reclaimed land.

Original and possitive solutions contained in the students' designs should be assessed in practical terms. It seems that several preference to locations appeared: commercial zones situated along access roads; whereas, quieter and leisure functions placed in more secluded lots, a few focused on investment cores instead of spread settlements, the need of zoning of the functions (Fig. 7). While the preferences and interests of the parties concerned should also be established: increase of the quantity of disposed waste rock, objectives and plans of the local governments, however first and foremost, forecasts provided by higher level planning authorities need to be considered.

There also arose a need for making a synthesis in the form of an architectural design commissioned by Jastrzębska Coal Company, which would consider the strengths and weaknesses of the assumed solutions and would be applicable to the local land use plans and legible for the parties representing the needs and plans of further mining operations. One of these authors' proposed [8], is the operational plan for the discussed area.

4.2. Role of the operational plan

The operational plan will be in the form of a planning document with stipulations similar to those provided for in the local land and spatial management plan, both in terms of its graphic part and the substance, yet made more specific by the inclusion of the following issues:

- Determination of temporary and ultimate managements of the investigated zones;
- Determination of the priority and second importance functional preferences, indication of supplementary functions;
- Indication of the opportunities for implementing the land development process in stages, implementation schedule that takes into account the availability and sequence of works to be performed;
- Indication of pioneer investment, on which further steps will be dependent;
- Specific information derived from the mining activity data, possibility of utilizing land-fills, time ranges for the planned activities;
- Selection of investors and financing sources, aid funds, etc.



Fig. 7. Studies on the functional preferences and land conditions
(the authors' elaboration)

— Appointments.

Concurrently, the operational plans and resolutions are not legally binding; however, should indicate the sites that require immediate alteration and may set directions for both planning and investment activities, making the sites available for investors and providing an additional study data usable for appropriate planning policy.

The last but not least aspect of such plan is the determination, possibilities and requirements concerning transportation and communication, enabling, among other issues, feasible level of commercialising the management activities.

4.3. Methodological assumptions

The methodology has been based on the assumption of the absence of an effective tool guaranteeing successful planning activity that takes into account changes in time and alternative land development and management options, depending on the implementation possibilities and temporary solutions. Hence, the main focus is on the preliminary transformation process and not its final outcome.

The above assumptions have been derived from the following rationalization steps of previous proposals:

- 1) Synthesis of the students' contest designs and the binding planning requirements, including forecasts and recapitulation of the expressed preferences;
- 2) Obtaining the information on investment objectives and opportunities, expectations of stakeholders, also, those that have not been previously openly stated;
- 3) Presentation of the syntheses results, consultations, workshops;
- 4) Selection of the functional zones, indication of the core and supporting functions, in-situ inspections of the locations, discussions and polemics;
- 5) Creation of the matrix of functional preferences for further decisions and draft of the operational plan;
- 6) Negotiation of the design project, analysis of objections and presentation of the planning description of specific functional zones.

5. General Principles of the selection and location of the functions

To determine the disposition of the discussed area for specific functions in a proper way seems to be zoning- designation of uniform features considering the location, functional capabilities and transportation access. Hence, separate zones should be demarcated for further research, without questioning the previous assumption of several focused activity points and avoidance of dispersed management solutions.

As mentioned before, the decisions undertaken had been based on previously determined methodological assumptions: location of the commercial facilities along roads, the so called: "quiet functions" at an appropriate distance from the traffic, transportation access as a decisive criterion of qualified and infrastructure functions.

Furthermore, proposals included in the students' contest designs, with special consideration of the awarded and distinction of winning works, were also used for designating five possible commercial functions, pointed by authors (Fig. 8), surely, open to further discussions:

- Commercial, sale, food and catering services, crafts, administrative and cultural services, with preference given to malls;
- Housing areas: detached and summer houses;
- Sports facilities: sport halls, ice-skating rinks, aqua parks as well as open areas: sports play fields, stadiums, etc.

- Green areas both for recreation and open sports grounds, as well as protected zones due to their specific qualities. This includes the inundation zones.

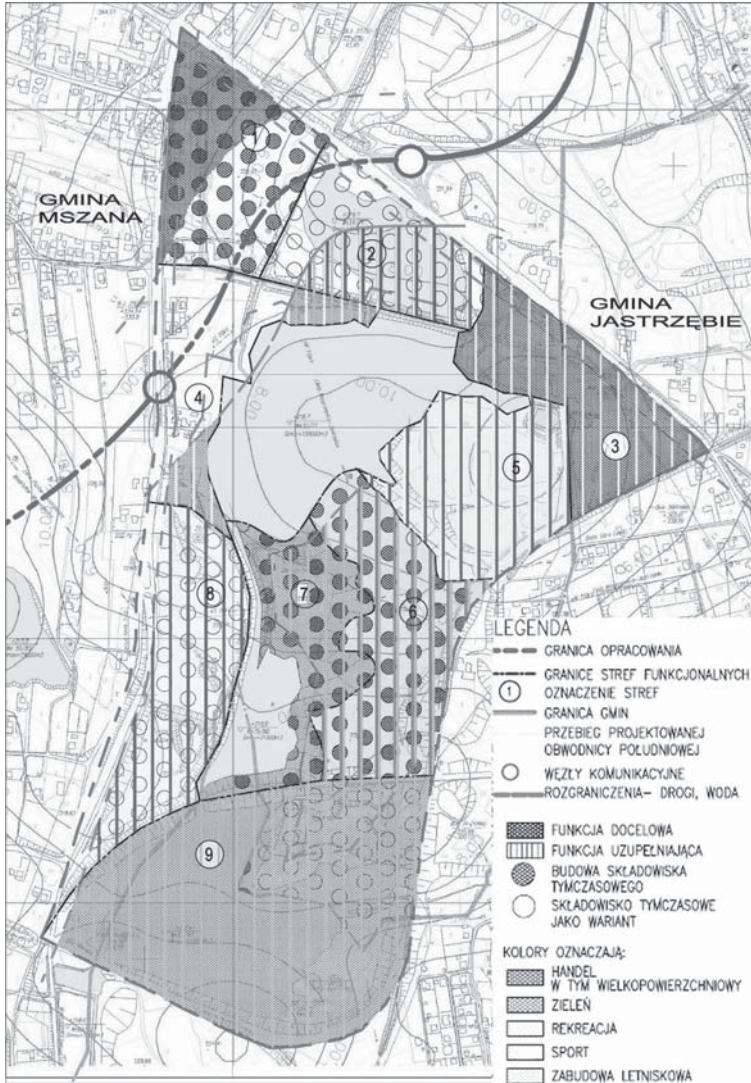


Fig. 8. Summary chart of the operational plan (the authors' elaboration) [8]

The subject of the analyses also included legal issues concerning mining activity and possible financing sources of the planned land reclamation and revitalisation activities.

As far as the mining damages are concerned, they may be subject of Article 94 of the Geological and Mining Law, the general stipulations of which are to reclaim the lands

exposed to the impact of mining to their previous functions — in accordance with the binding regulations. Decisions undertaken by the local governments of Mszana and Jastrzębie-Zdrój, leading to the resolution of Local Land Use Plans may constitute the starting point for further activities and initiatives, including, for example: appointment of a commercial entity that could implement the land reclamation and redevelopment proposals.

Another issue is the possibilities and financial titles, as well as financing the planned investments, which depend on, for example: the Voivodeship Fund for Water Management, Regional Operational Plan and Infrastructure and Environment Plan.

6. Summary

The outcome of the elaboration and operational plan proposals have revealed not only land management opportunities, but also expectations of stakeholders, including those that were not previously openly expressed. This unintended effect resulted from a less formalized mode of consultations in local spatial and economic development planning, which is a certain quality of such procedure. At the same time, it revealed that the Szotkówka River Valley is an area of conflict, where environmental, economic, administrative, planning and other issues which must be considered. It should also be stated that there is some disappointment towards the opportunities of implementing such investments that are strictly connected with the general economic, political and social condition of our country and even, the world-wide situation- these factors do not facilitate the determination of clearly set and time-based perspectives of the planned undertakings and their specific stages, evoking uncertainty and fear of the future.

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