



# Diagnosis of the Wałbrzych post-mining area: pilot study using public participation



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## INTRODUCTION

Extraction of natural resources is usually carried out until the deposit resources are exhausted or further exploitation becomes unprofitable. Long-term mining activity leads to several changes, both environmental and socio-economic, and the challenges that arise during and after the mine closure depend on the factors that conditioned this decommissioning and, on the actions, taken throughout the life cycle of the mine. The International Council on Mining and Metals (ICMM) distinguishes three types of mine closures, considering the reasons that led to them. In addition to planned liquidation, it distinguishes between temporary and sudden closures. Sudden closures present many challenges and expedited actions that were often only in the conceptual planning phase. Due to the factors that led to this closure, some of these actions may not be partially or even fully applicable [1, 2]. The presented research provides an in-depth analysis of the case of the sudden mine closure and subsequent socio-economic, infrastructural and environmental changes in the surrounding region.

## STUDY AREA

Wałbrzych is an example of a city that experienced a sudden liquidation, where in the 1990s all hard coal mines were closed almost simultaneously. The rapid deindustrialization led to the collapse of the region, mainly related to the increase in unemployment and the reduction of the income of the inhabitants. As a result of emigration, the city began to shrink [3]. Over the years, the urban space has been progressively degraded and there are still abandoned and undeveloped post-mining facilities [4]. The liquidation of mines also led to changes in the natural environment [5-6].

## MATERIALS & METHODS

The diagnosis of the area was made based on a pilot survey consisting of three parts. The survey was conducted among diverse stakeholder groups and involved 116 respondents, 72% of whom were women. The survey was carried out both online and with the participation of interviewers. In the first part, basic information about the respondents was obtained. In the second part, respondents were asked to assess individual living conditions. The third part concerned the perceived social, environmental and spatial changes after the closure of mines.

The answers to the questions were given in a variety of ways: selection, description, indication using the Likert scale and mapping. The received answers were statistically processed. Questions that required mapping were processed using ArcGIS Pro software. Data from the database of topographic objects (BDOT10k) were used for spatial analyses. A vectorized map of the designated revitalization area made by Wałbrzych City Hall was used for comparisons.

## RESULTS

Among those surveyed, 87% admitted that, in their opinion, the liquidation of mines had an impact on the local community. For the remaining 13% of respondents, it was impossible to clearly indicate the answer. Among those who answered positively, 70% additionally believe that the impact was definitely negative (25%) or rather negative (45%). 79 respondents pointed to an increase in unemployment, 71 to an outflow of population and 72 to an increase in negative social phenomena (violence, alcoholism). In addition, the respondents pointed to a significant impoverishment of the society and an increase in mental problems.

## BIBLIOGRAPHY

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- [6] Wójcik J., **Antropogeniczne zmiany środowiska przyrodniczego Ziemi (I)**. Wydawnictwo Naukowe PWN.

## RESULTS

Respondents assessed the state of urban space on a 10-point scale, where 1 means the worst and 10 the best. Three aspects were assessed: the organization and development of urban space, the condition of housing development and the development of post-mining areas and facilities.

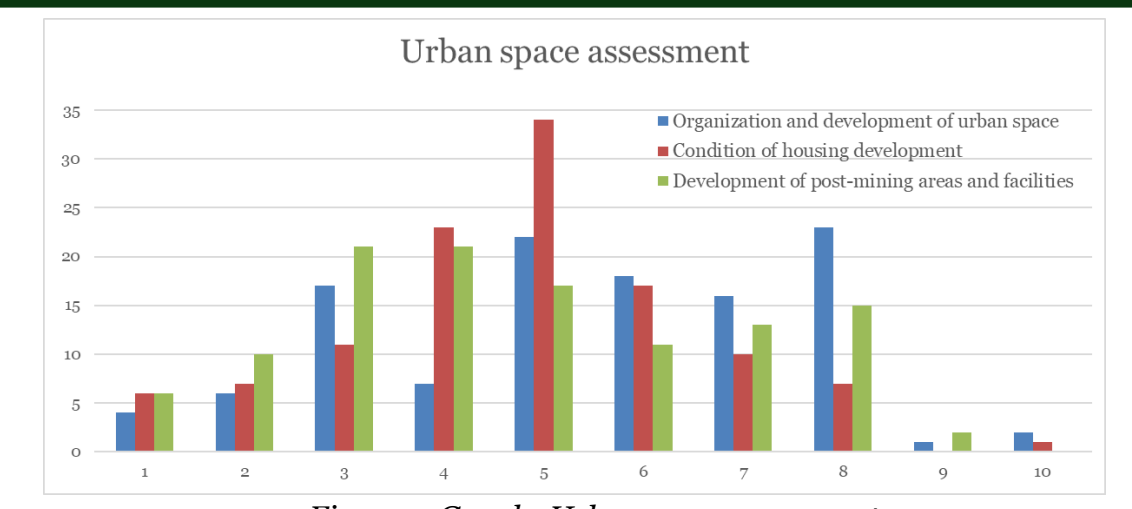


Figure 1. Graph: Urban space assessment

The distribution of ratings is shown in Figure 1. Additionally, 44% of the respondents believe that revitalization was started too late (35% have no opinion, 21% indicate that it was done at the right time). Only 40 respondents answered the question regarding the indication of a place that, in their opinion, requires immediate revitalization or development. Some places were indicated several times. In total, 28 different places have been indicated, 18 of which lie outside the revitalization area designated by the City Hall (Figure 2). Among the indicated places, many post-mining facilities can be distinguished: dumps, shafts, and a settling tank.

As far as the state of the natural environment is concerned, 79% of respondents believe that the mine closure led to its change. Of these, 53% assess the impact as positive (24% as negative and 23% did not give a clear answer). The most frequently indicated positive change is the improvement of air quality. Negative changes observed by the respondents along with the number of their indications are presented in Table 1.

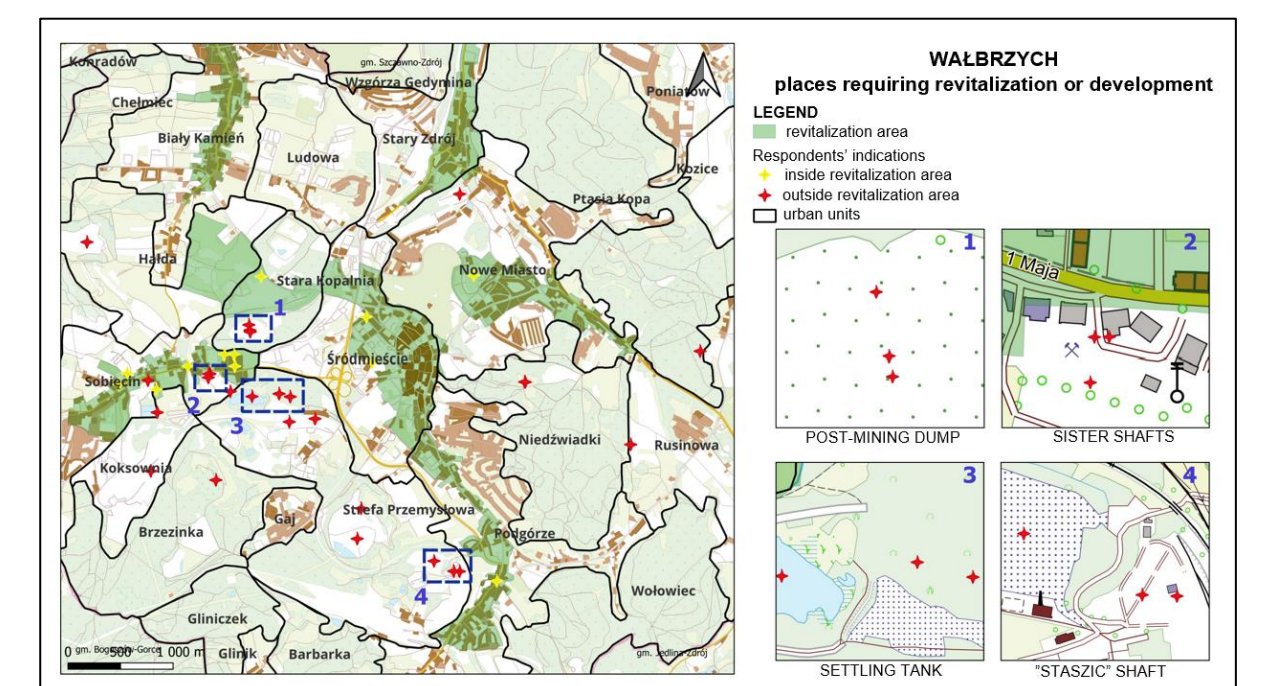


Figure 2. Respondents' indications: places requiring revitalization or development

Table 1. Phenomena observed in natural environment after mine closure

Observed phenomena	Number of indications
Surface deformations	71
Disturbance of water relations	26
Deterioration of surface water quality	16
Soil degradation	17

Considering all aspects, the respondents indicated the Sobięcín urban unit as the one where the most negative changes took place during the liquidation, and Stara Kopalnia as the one

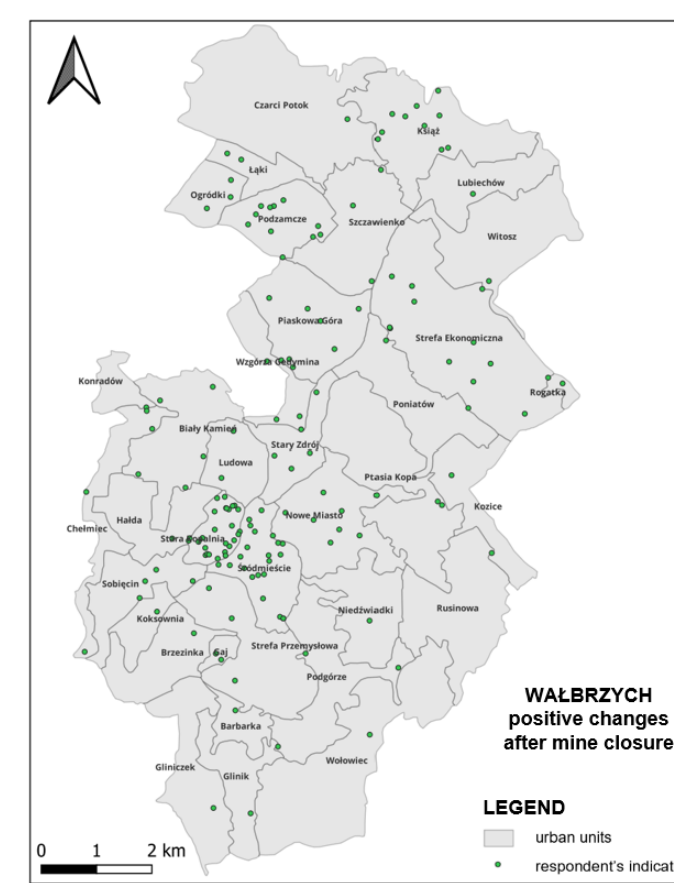


Figure 3. Positive changes after mine closure

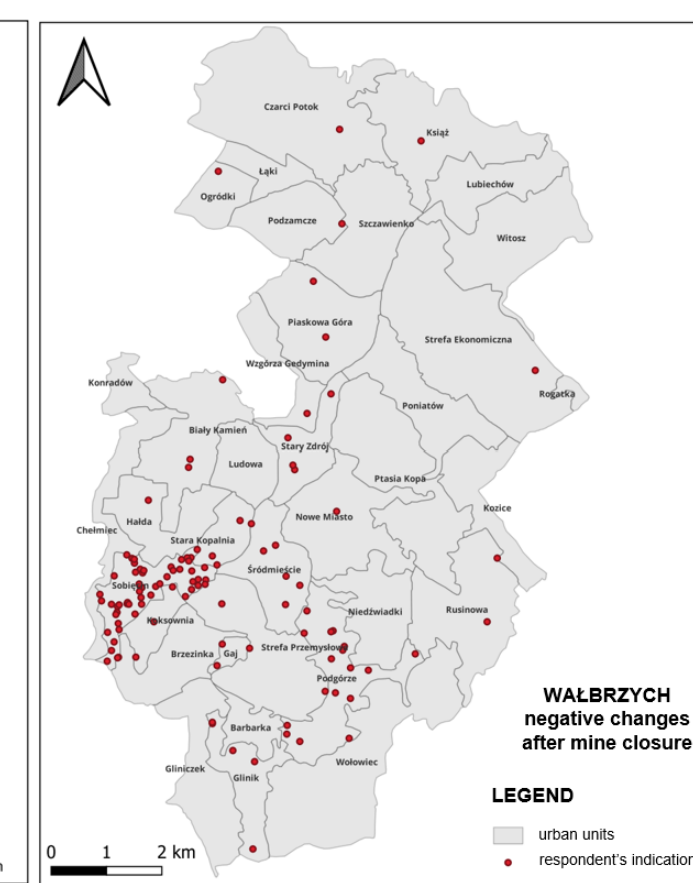


Figure 4. Negative changes after mine closure

where the changes were assessed most positively. The distribution of answers is presented on maps (Figures 3 and 4) using the dot method (one dot = one indication by the respondent).

## SUMMARY

The presented study used public participation to diagnose the post-mining area. The sudden liquidation of mines has led to many changes that relate to social, economic, infrastructural, spatial and environmental aspects. The conducted research shows that social changes are assessed most negatively. In addition, the respondents notice the deterioration of urban space and indicate that post-mining facilities and areas require development and revitalization. Environmental changes are dominated by positive assessments regarding the improvement of air quality or the increase in biodiversity.