



Original article

Coal mining as a determinant of the development of economic and settlement structures in the Dąbrowa Basin (Southern Poland): a historical perspective

Weronika Dragan

University of Silesia in Katowice, Faculty of Natural Sciences, Institute of Social and Economic Geography and Spatial Management, 60 Będzińska Str., 41-200 Sosnowiec, Poland
E-mail address: weronika.dragan@us.edu.pl
ORCID iD: <https://orcid.org/0000-0003-1531-2464>

ABSTRACT

The coal industry, alongside manufacturing, was one of the key industries that determined the settlement-economic development of the Upper Silesian Coal Basin (USCB). This research focuses on the economic potential of the eastern part of the USCB, i.e. the Dąbrowa Basin (DB), and covers the period of industrialization up to 1918. At that time, there were over 160 coal mines, both deep and open-cast, operating in the region. The largest number of former hard coal mines were located in the present area of Sosnowiec (41,1%) and Dąbrowa Górnicza (28,6%). This research attempts to clarify the role of coal mining in the transformation of the DB's economy and settlement network. In order to understand the mechanisms contributing to the accumulation of economic growth in certain places, the influence of a group of interdependent causal factors (spatial, economic and institutional) was analysed. Reference is made to the theory of poles of development and Myrdal's process of cumulative causation. Several dozen archival cartographic materials (mainly topographic maps and mining field plans) were used to analyze settlement and functional changes in the DB area from an evolutionary perspective. This allowed for a discussion on the connection between coal mining and other factors driving changes in economic and settlement structures in DB. An attempt was also made to stage the transformation process of the studied towns and to determine their genetic and morphological changes. The transformation of the rank of localities stemming from the emergence of specialized central places is also described.

KEY WORDS: hard coal mining, central functions, economic development, archival cartographic sources, Dąbrowa Basin

ARTICLE HISTORY: received 17 August 2025; received in revised form 2 December 2025; accepted 4 December 2025

1. Introduction

In Europe, coal mining played a significant urban area-forming role, especially in the period from the 18th century to the end of World War I. Mining settlement developed in many coal regions, including South Yorkshire, Tyneside, Wallonia, Nord-Pas-de-Calais, Ruhr Basin, and the Upper Silesian Coal Basin (USCB). The cities in these regions became central to the metallurgical and heavy processing industries, and their development no longer depended solely on access to rivers, but also on thermal coal deposits

(COUCH, 2016). As ANTROP (1997) points out, this was a period of intense and crucial change in the evolution of traditional landscapes.

These changes also involved economic ties between centres, as well as transformations into settlement structures. Our article emphasizes the synergy that developed at the time between the impact of coal mining and the transformation of settlement structures. Coal mines had significant urban area-forming potential in creating new settlement forms, especially during the Industrial Revolution. In economic terms, an industrial plant

can be considered a “growth cluster”, according to [BEGUIN](#) (1963). In addition, the location of mines frequently determined the expansion of transportation networks ([COOLEY](#), 1894), thus linking the resource extraction sites with distant markets ([GEYER](#), 1989).

The expansion of mining contributed to the emergence of new links between the network of workplaces (shafts, mine) and the network of small residential colonies around them (cf. [CZARNECKI](#), 1965; [RUNGE](#), 2020). These new settlements often featured the characteristics of highly urbanized centres without actually gaining town status ([KRZYSZTOFIK](#), 2014), thus contributing to the gradual homogenization of the landscape ([ANTROP](#), 2000). [GEDDS](#) (1915, p. 34) introduced the term “conurbation” for a set of several urban settlement units adjacent to each other and formed under the impact of industry and mining. Industrialization also influenced the transformation of feudal cities, which expanded beyond their previous boundaries ([MALISZ](#), 1966; [MURPHY](#), 1966).

Urbanization processes in the USCB followed a similar pattern. During the period of industrialization (from the end of 18th century to the interwar period), the area was intersected by national borders: Upper Silesia fell within the Kingdom of Prussia, the Kraków Basin in the Austro-Hungarian Monarchy, and the Dąbrowa Basin (DB) within the Russian Empire (Fig. 1). The different national affiliations contributed to the socio-economic diversification of these three areas of USCB. The Kraków Basin, being part of the backward agricultural region of Galicia, was the least economically developed. Upper Silesia, on the other hand, constituted an important economic region of the German Empire, where heavy industry, infrastructure, and urban networks were systematically developed. The Dąbrowa Basin represents an intermediate case. As DB belonged to the Kingdom of Poland and was located near the border, the Russian Empire imposed many restrictions limiting the development of cities, settlements, and the economy in the region.

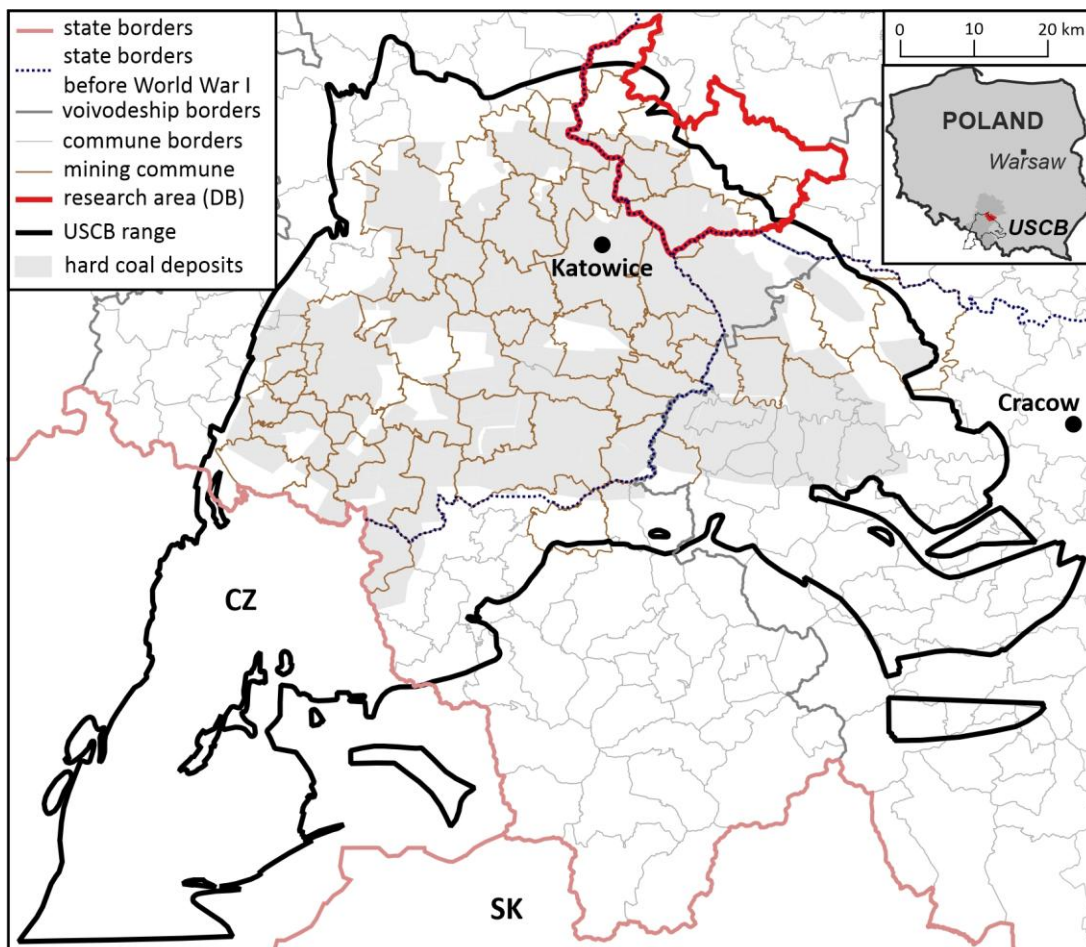


Fig. 1. The Dąbrowa Basin against the backdrop of the Upper Silesian Coal Basin (Source: the author, based on data from PGI-NRI)

The period of research into how coal mining influenced the formation of polycentric settlement-economic structures was taken as the period of DB's political isolation. From the mid-19th century, the Western Mining District of the Kingdom of Poland (the Eastern District was the Old Polish Basin) was in operation, and the name was formed in reference to the geological location of the coal deposits, the central place of which became Dąbrowa Górnicza (ŁABĘCKI, 1841; TURNOCK, 1989). It was under such diverse political and economic conditions that the Industrial Revolution took place, modifying the settlement network of what is today the Katowice conurbation. The purpose of this research is to determine the role of coal mining in shaping the settlement and economic structure of the Dąbrowa Basin during the period of industrialization. In this context, the following research question was posed: What elements determined the process of transformation of economic and settlement structures under the influence of mining? Questions about the past are also important in the context of today. Contemporary research increasingly focuses on the just transition of coal-mining regions (DROBNIAK, 2022; KRZYSZTOFIK, 2022; DRAGAN & ZDYRKO, 2023; FRANTÁL ET AL., 2025; WYRZYKOWSKA & JANISZEK, 2025), but there is still a research gap in analyzing the impact of mining on the formation of functional and settlement structures in these regions.

2. The city-forming potential of coal mining. A theoretical approach

The influence of the industrial revolution on the development of economic and settlement structures of the USCB is well recognized (e.g. HARTSHORNE, 1933, 1934; ZIÓŁKOWSKI, 1957; POUNDS, 1958; JAROS, 1965; RAJMAN, 1977; PIERENKEMPER, 1979; KRZYSZTOFIK, 2012). This research starts from the assumption that the city-forming potential generated by coal mining has a tendency to concentrate in selected DB sites. These were formed as a result of the concentration of industrial activities in coal mining areas and the convergence of several causal factors. Therefore, the classical theory of central places is insufficient to explain the transformation of the settlement network for the industrial period. BIRD (1977, p. 122), points out that "It is possible to consider all settlements in the light of only one of these concepts, as is the case with classical central place theory. But if this is carried out, 'noise' occurs with those settlements and functions that do not

'fit in'." Mining settlements can be such units. On the other hand, coal, metal and factory industries can be regarded as having the power to transform the structures of a region (BEGUIN, 1963). This process occurs through economic growth, which is concentrated in selected places, i.e. poles (HIRSCHMAN, 1958; GRZESZCZAK, 1999), where a pole is a centre that stands out above the average (LASUÉN, 1969). In the industrial context, a pole will be formed by a group of developing industries that will simultaneously contribute to the economic stimulation of the entire zone of influence (HANSEN, 1970, p. 21). It will only drive the regional economy when it reaches a significant economic size and its growth rate is faster than in other places, while maintaining links with other sectors (DARWENT, 1969). At the same time, it was also assumed that more of this type of "growth pole" may exist in the region being studied (LASUÉN, 1971). This is emphasized by LASUÉN (1973, pp. 163–164), who states that as the determinants of polarization differentiate these centres in terms of size and composition, they therefore contribute to different types of poles. The author goes on to say that an analysis should be applied not only to specialized industrial links, but also to central place structure.

City-forming potential in the case of mining and manufacturing activities can appear in selected places with a favourable geographical location (quality/quantity of coal deposits, location in the settlement network and transportation). In places where such favourable development factors are concentrated, in the so-called city-forming niche, urban centres can be formed (cf. KRZYSZTOFIK, 2014). Often, the presence of a resource base or a convenient location will contribute to the creation of an industrial city despite its considerable distance from the urban centre (DEN VAN BERG ET AL., 1982). To assess the development mechanisms of these selected sites, reference was made to Myrdal's model of cumulative causation (KEEBLE, 1967). In addition, it is worth noting the concept of "initial advantage" introduced by PRED (1966). This may refer to the initial assumption of this article that the timing of the start of operations will prove advantageous for certain settlement units. MYRDAL (1957) states that the power generated by a centre is related to the positive effect of the initial operation. In addition, it is crucial for the formation of new development centres to overcome the negative effect of older centres (MYRDAL, 1957). MYRDAL (1944) defined these mechanisms as the interaction

process. Over time, this potential is amplified through emerging interdependencies and the intertwining of causal factors. This is due to the principle that a change in any of the elements entails a change in the other components of the system. **RAJMAN** (1970) developed a feedback model in which the assumptions of an economic plan are derived from location, and influence, among other things, employment growth. This triggers a network of connections between investment outlays, population growth, and, subsequently, economic and then spatial and demographic urbanization. The stage of urbanization thus achieved is the transition point to the next stage. Our article considers the development of settlement structures in connection with the location of a mining plant, which is a regional innovation in terms of the organization of work and the mining techniques used, and which can contribute to further significant economic and spatial changes. At the same time, the interdependence of mining with other contributing factors is highlighted, including distance from settlements, local commercial outlet, development of railway and metallurgical

industry, all of which influence the development of settlement and economic structures.

3. Methods and materials

This article is empirical and explanatory in nature, with reference to Myrdal's process of cumulative causation. Therefore, case studies are intended to help illustrate the process of transformation of the region's economic and settlement structures. The research covered the reconstruction of the development stages of the region and settlements using interpretation of archival materials and fieldwork. QGIS software was used to visualize the results of the qualitative assessment of map content in order to digitize spatial development. Most of the cartographic materials used were georeferenced (using Web Map Service spatial data services from the following databases: Atlas Fontium, ORSIP of the Silesian Voivodeship). However, in the case of the remaining raster maps, those necessary for visualization, calibration was performed in the EPSG:1992 coordinate system.

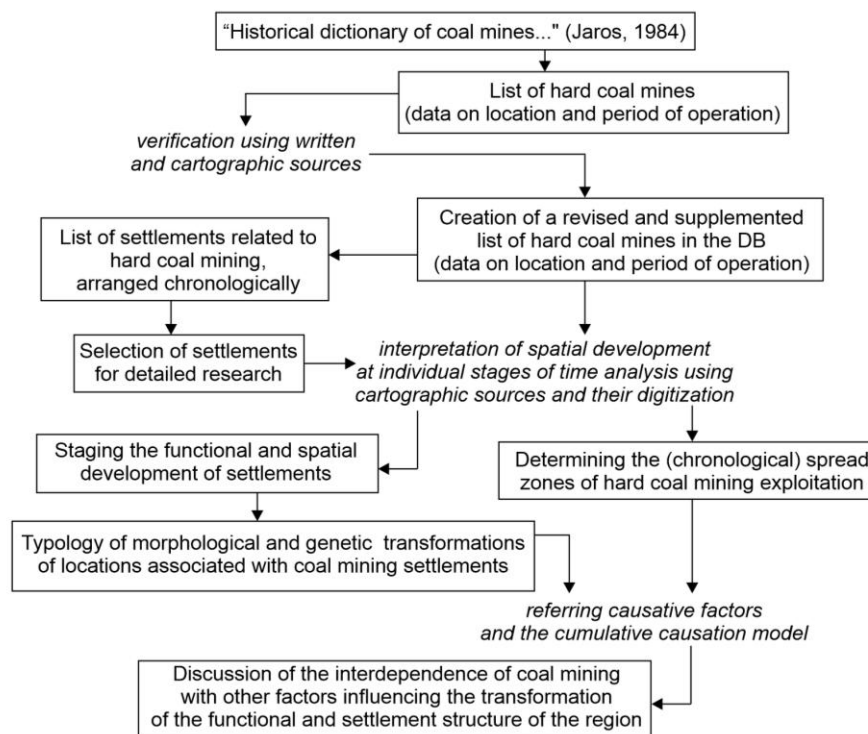


Fig. 2. Research procedure scheme (Source: the author)

The starting point of the research process was to create a list of hard coal mine locations along with the year when mining operations began (Fig. 2). The primary source of information for this list was

„*Słownik historyczny kopalni węgla...*” [“Historical dictionary of coal mines...”] (JAROS, 1984). However, the data contained there required verification using written sources (*Dziennik Handlowy...*, 1788; LABĘCKI,

1841; SULIMIERSKI ET AL., 1880–1902) and cartographic sources (Appx. 1) in order to provide more detailed information of this location at a level below that of a city district or village (referring to a specific shaft, mining area, or mining field). The degree of accuracy in determining the location resulted from the available cartographic sources, which made it possible to verify and supplement the list of mines published by JAROS (1984). More than 160 coal mines established between 1795 and 1944 were identified. A broader time frame was adopted for identifying mining sites, which made it possible to indicate its proper extent and economic potential for the location. The period of the relevant causal analysis instead focuses on the years 1795–1918.

Based on the data on the start of mining at a particular mine, the extent of mining development in DB was determined according to the adopted time frames: up to 1800, 1801–1850, 1851–1900, 1901–1918, 1919–1944 (Fig. 3A). Coal mining occupied a belt from the northwest to the southeast with 2 foci in the area of Czeladź and southern Sosnowiec. Relating the data to modern administrative boundaries, Sosnowiec had the largest share of DB mines (41,1%), followed by Dąbrowa Górnicza (28,6%), Będzin (13,7%), while Psary (7,7%) stands out among the rural municipalities, (Fig. 3B). A crucial step was also to identify the locations of mining settlements in the DB, after which the two lists were correlated to determine the impact of mining on urbanization.

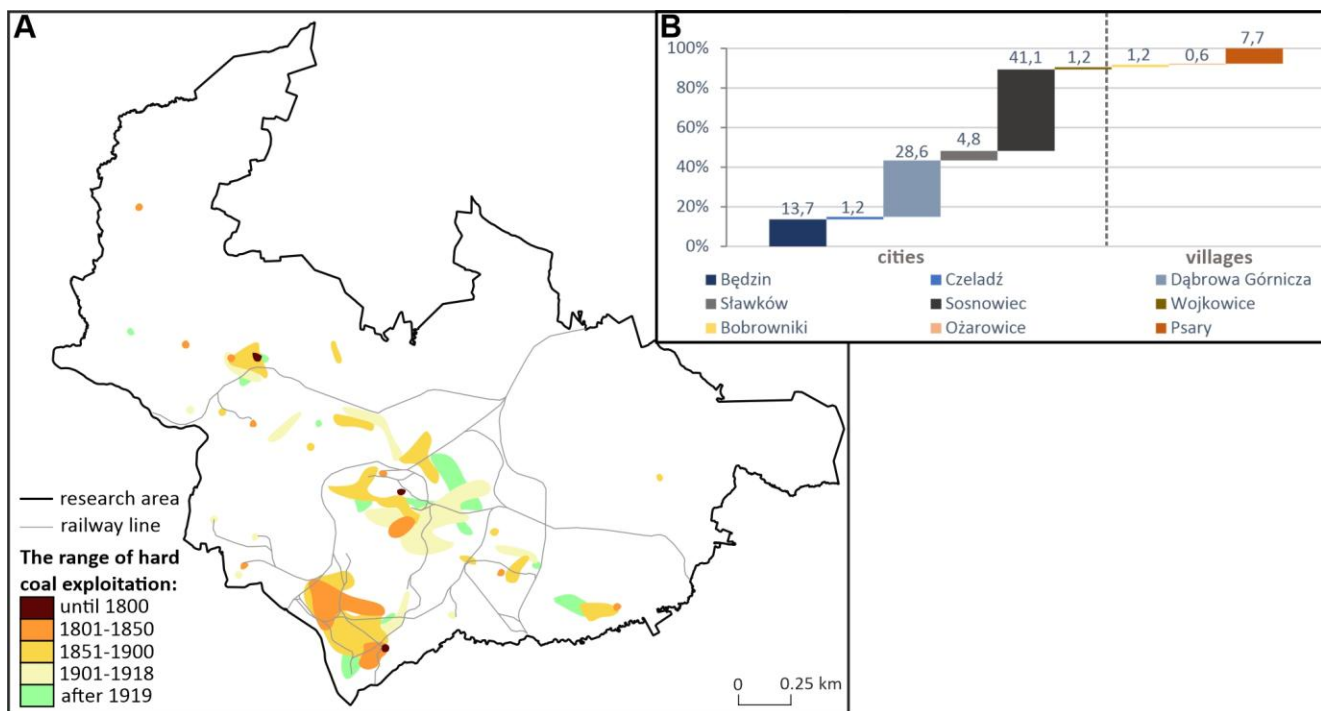


Fig. 3. The extent of hard coal mining in DB (A) and the distribution of mines by community (B) (Source: the author, based on Jaros, 1984)

To conduct an empirical analysis assessing the state of spatial development in the region, qualitative research of archival cartographic materials was used. Therefore, transformations and the economic situation were analyzed based on numerous cartographic materials arranged chronologically. Furthermore, the year the hard coal mining began in the 18th century did play a role in selecting areas for detailed empirical analysis (Fig. 2). Key to the analysis and interpreting DB processes was the identification of causal factors in the development of mining and industrial processing. This served as an attempt to causally

explain the transformation of the settlement network. The impact of two groups of mining-related city-forming factors was assumed: “Primary causal factors”, i.e. those that are necessary at the initial stage of forming the spatial relations of mining with the environment; and “Supporting causal factors”, which contributed to the strengthening of the primary urban-forming forces of a given place.

In connection with this research procedure, the following hypotheses were formulated:

(1) Areas of concentrated coal mining and places at the early stages of coal mining development may

have the greatest city-forming potential, assuming the emergence of other industrial innovations and technological progress.

(2) The formation of regional development poles was influenced by a combination of interdependent causal factors (e.g., railways, local commercial outlet, construction of new industrial plants) that lead to the concentration of city-forming potential in selected places.

4. The city-forming potential of the area of initial hard coal mining

At the turn of the eighteenth and nineteenth centuries, organized coal mining took place in three DB regions: in the vicinity of Psary village, near the village of Dąbrowa, and the settlement of Bobrek (EISLER, n.d.) (Fig. 3A). The preliminary research hypothesis assumes these places to be where mining contributed to the emergence of the greatest urban area-forming potential. The development of coal mining in the DB took a sinusoidal course and was influenced by external political and economic factors. After the Third Partition of Poland, DB belonged to Prussia (1795–1807) as part of the New Silesia province, and then to the newly created Duchy of Warsaw. Only after the Congress of Vienna in 1815 did it come under the rule of Tsarist Russia. Russia's influence was associated with introducing new legal and economic conditions: a new mining law was passed allowing the exploitation of coal on private property without the owner's consent, but most importantly, protective duties were imposed

on such items as coal, pig iron and metal processing products from abroad. As a result, investment in the DB's industry was made with foreign capital (mainly German and French) (Dumała, 1974).

4.1. The area of the villages of Strzyżowice and Psary

The first mining activity took place in the villages of Strzyżowice and Psary (CAHR, sign. 187-1), which formed the northwestern periphery of the DB (Fig. 3A). Geologically, the area was referred to as the Strzyżowice Basin (ŁABĘCKI, 1841; HEMPEL, 1856). KANTOR-MIRSKI (1932), on the other hand, believes that this name should refer to Psary. The first mine in the area was still active in the late 1880s and early 1890s, most likely in the area of the Wielonka watercourse on the Psary side. According to ŁABĘCKI (1841), the “Andrzej” coal seam in Strzyżowice was discovered in the early 19th century during the construction of the “Werner” drift for the Tadeusz (Hoym) mine (Fig. 4). In 1797, the mining area was moved slightly towards Psary and was modernized by the introduction of a steam engine. A small mining settlement, later named Tadeusz, was established along with the plant (HEMPEL, 1856; CAHR, sign. 565-13) (Fig. 4). By 1918, there were 7 mines operating at different times in these villages, across an area of approximately 3.5 square kilometres. The mines operating the longest were “Andrzej II” (1883–1922) and Tadeusz (Hoym) (1797–1910, with interruptions). As ŁABĘCKI (1841, pp. 479) points out, the latter mine produced coking coal – the only one to do so in the DB.

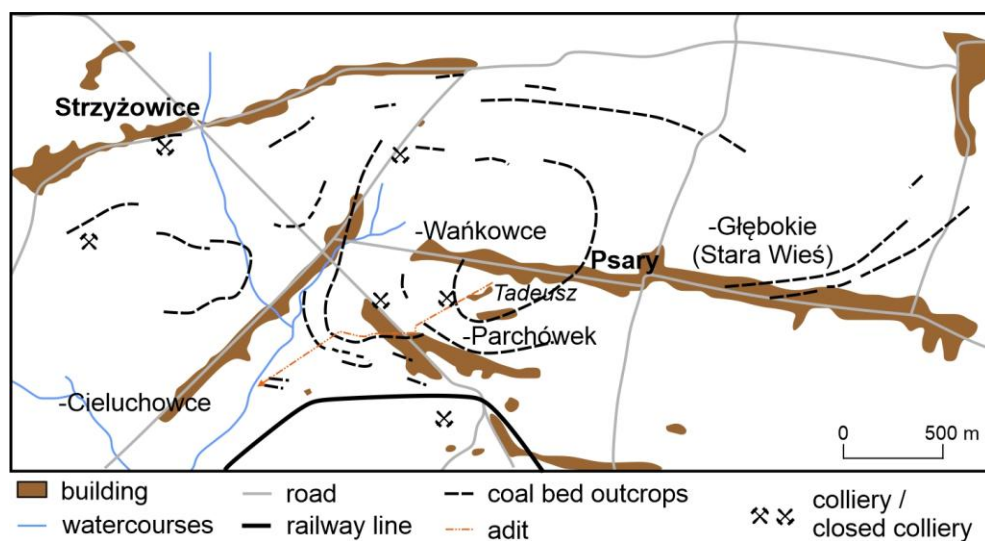


Fig. 4. Spatial development in the Strzyżowice - Psary area in 1918 (Source: the author, based on Łempicki, 1891; *Karte des Westlichen Russlands*, 1914; Doktorowicz – Hrebnicki, 1934)

The direction of spatial development in the settlement was determined by mining. Strzyżowice spread along the axis of the road from west to north-east and was separated from Psary by mining areas (Fig. 4). The Wielonka watercourse was taken as the boundary between the villages (CAHR, sign. 208-1), which was also reflected in the direction of Psary's spatial development. The stages of Psary's development included:

I. The "proto-patronage mining settlement" stage (until approximately 1850) – development in the area of the Tadeusz mine. This constituted a proto-patronage mining settlement with buildings for mine workers and officials, along with gardens (CAHR, ref. 187-1).

II. The "mining and settlement expansion" stage – this process occurred up to the middle stage of the coal mining activity, creating the hamlets of Wańkowce and Parchówek. In addition, the impact of mining in the Strzyżowice area also contributed to the establishment of a third hamlet, Czeluchowce, on is this in the village border (Karte des Westlichen..., 1914). This resulted in Psary being the most populous village by the end of the 19th century with 854 residents and 46 in the mining settlement, while Strzyżowice had 398 residents (SULIMIERSKI ET AL., 1888, 1890).

III. The "slowdown of development" stage – Psary took over most of the economic potential from this rural mining region; however, the mines depended on the Dąbrowa Village smelters. The necessity of transporting coal over a significant distance, the lack of railway connections, and the absence of a local outlet market led to a gradual decline in the importance of mining in this region.

4.2. The southern potential of the Dąbrowa Basin

The southern area of the DB was characterized by its peripheral location, as it was located at the forks of two national borders reinforced by a natural barrier to form a wedge. Due to the area's border location, these towns were characterized by incomplete facilities. As a result, the emerging industrial plants lacked labour force reserves, and there were limited opportunities to sell raw materials and industrial products. In addition, these cities did not develop in terms of services to an extent that would have made them an important factor focusing the economic and social potential of the region. The transportation system was formed

by two roads from Modrzejów through Dębowa Góra towards Sielec and from Niwka through Dandówka to Dąbrowa village.

Factors determining the economic and settlement development of the "Niwka wedge" were the location of coal deposits and the distance from the strong service-industrial centre of Sosnowiec, developing from 1859 as a gateway. Of additional significance was the route of the Ivangorod–Dąbrowa railroad line (1887), which provided an impetus for the development of local industry, and cut through the area from east to west, closing it in from the north (Fig. 5A).

In the "Niwka wedge", there were 28 coal mines in operation at various times until 1918, which were small and mostly associated with shallow mining. The origin of organized mining in the area was located in Bobrek settlement (EISLER, n.d.). The establishment of the first mine most likely took place as early as the 18th century, which seems to be confirmed by an entry in the "*Dziennik Handlowy...*" (1788, p. 684) about the finding of shallow coal seams in the Klimontów estate near the Przemsza River. Exploitation activities expanded from the rivers and Dańdówka to the centre of this network, where mines were not sunk until after 1918 (Fig. 5B).

The development of settlements followed a similar direction of expansion to coal mining. The exception was Dębowa Góra, whose buildings were unified with Sielce, spreading along the road only in the northern direction (behind the railroad) (Fig. 5A). As early as 1902, this hamlet was absorbed into the administrative boundaries of the emerging city of Sosnowiec.

On the other hand, on the second axis, there was centripetal development resulting from "budding" new mines that drew in residential areas from existing settlements. In this area, three stages of the formation of the settlement and economic processes can be distinguished:

I. "inbreeding" (until the 1830s) – each settlement took benefits from its original location.

II. "creation of economic ties" (1830s–1840s) – this period was characterized by the growth of Niwka's structures through top-down government investment decisions. A zinc smelter was established north of the village, and with it a factory settlement for the incoming labour force (due to the lack of local resources). The smelting works quickly collapsed, and the homes in the factory settlement were gradually settled by miners (Fig. 5A).

III. “slow expansion” (until 1918) – after absorbing the settlement of Henryków, Niwka spread further towards the Jerzy mine (later Niwka). This mine became the area’s primary colliery and a relatively small focal point for the development of settlement (Fig. 5A).

A factor inhibiting the economic – and settlement development of the “Niwka wedge” was the prohibition of building and repairing houses in the

border strip (ZIOŁKOWSKI, 1960). In addition, the peripheral-frontier location only allowed Niwka to expand to the north. In addition, the close proximity to the development pole of Sosnowiec contributed to this part of the DB being polarized (cf. HIRSCHMAN, 1958). The influence of the second regional pole – Dąbrowa village, which took over some of the skilled labour force, was also evident (DUMAŁA, 1974).

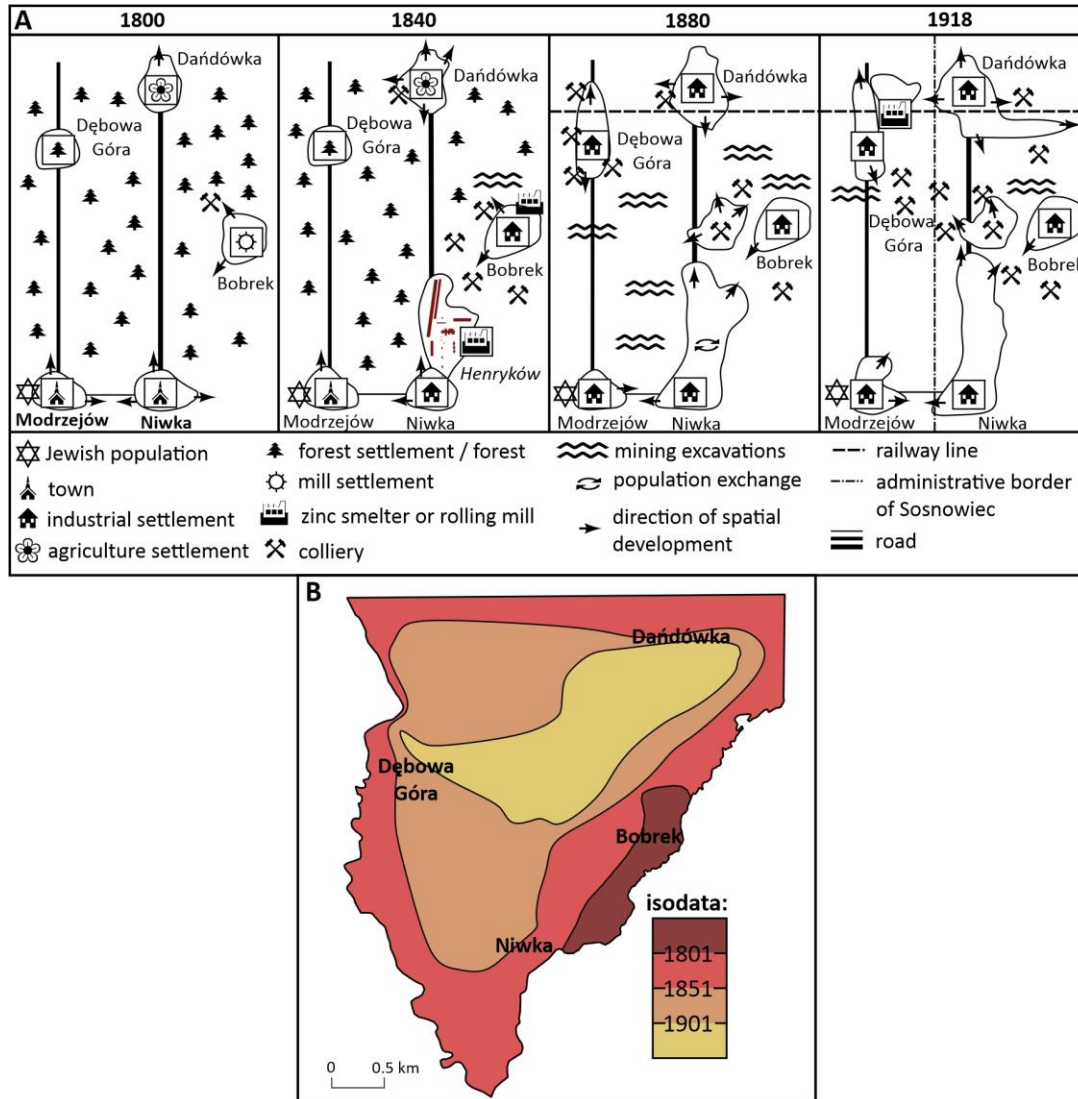


Fig. 5. Scheme of the settlement and economic development of the Niwka area (A) and the spread of the colliery-refers to the beginning of extraction (B) (Source: the author)

4.3. At the junction of the town of Będzin and the villages of Dąbrowa and Gołonóg

The second city-forming niche was selected near the “Reden” coal mine (1795), located between the villages of Gołonóg, Dąbrowa and the town of Będzin. The next significant investment took place in 1816,

when construction started on the large zinc smelting works “Konstanty”, which used local coal. This boosted housing construction for skilled workers in the “Reden” mining and steel-working colony (CAHR, sign. 200-11) (Fig. 6). Construction was completed in 1839, and thus part of the workforce moved from the surrounding villages to the newly established

settlement. Moreover, in the suburban areas of Będzin, new investments were established from the 1820s onwards: the “Huta Będzińska” zinc smelter (CAHR, sign. 201-2) and the “Ksawery” mine. This triggered further mining settlement movements, though on a smaller scale. The settlements of Ksawery, Mydlice, and Nowa Kolonia were established at that time. A much bigger development impulse came with the construction of the state-owned ironworks “Huta Bankowa” (1834). A few years later,

another factory settlement for miners and steelworkers was completed. The entire investment on the land of the village of Dąbrowa (Stara) necessitated the expropriation of land, which in turn delayed the work (CAHR, sign. 200-11, 200-12; DUMAŁA, 1974). These delays resulted in miners settling in the surrounding villages and mining settlements while waiting for a place in main settlements - the Reden or the Huta Bankowa (Fig. 6).

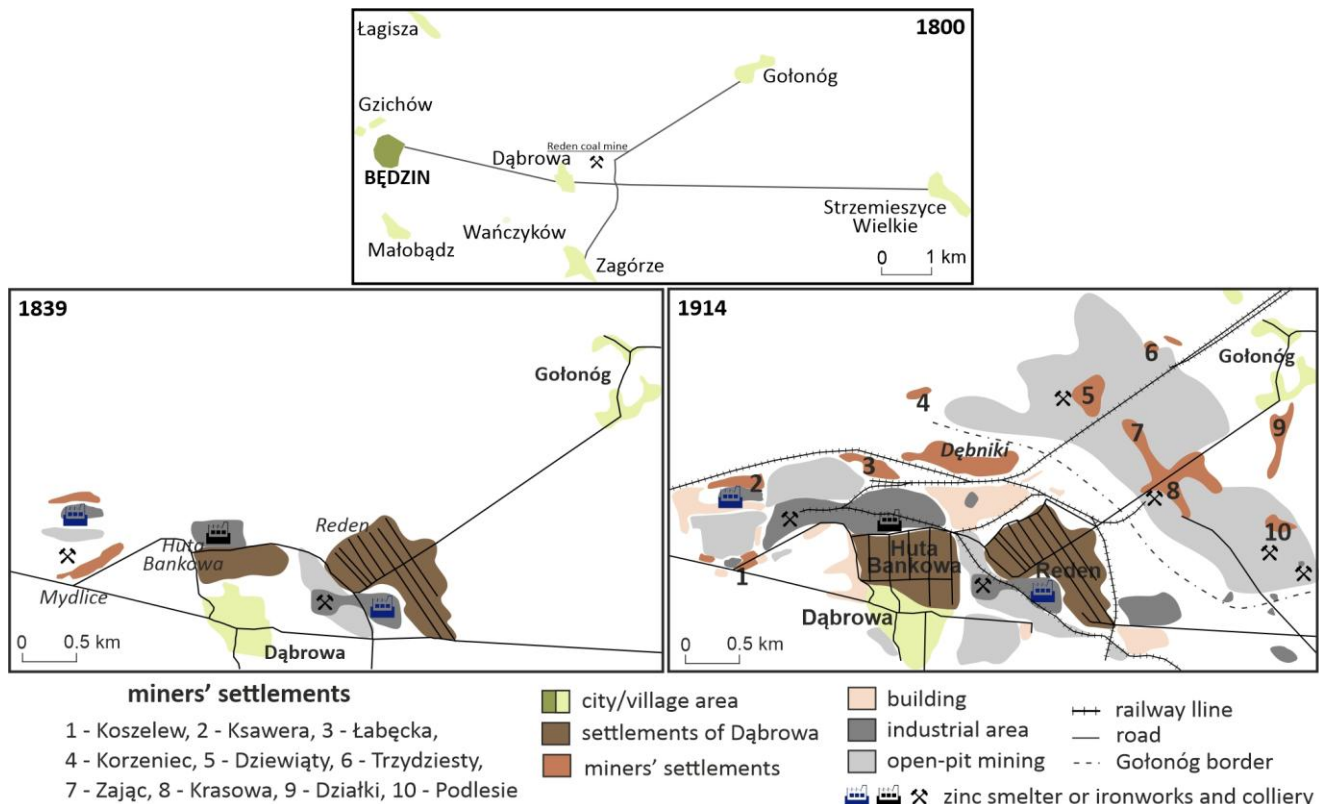


Fig. 6. The formation of industrial settlements in Dąbrowa Górnicza (Source: the author, based on Topograficzna Karta Królestwa Polskiego, 1843, Karte des Westlichen Russlands, 1914)

The establishment of the metal processing industry contributed to coal mines being opened, with further mining colonies being built. Along with industrial investments, access roads were built to the sites of iron ore, zinc and coal excavation, as well as metal processing centres (from Dąbrowa village towards Psary, Wojkowice, Olkusz, and Niwka). However, connecting a branch line of the Warsaw-Vienna (1859) and Ivangorod-Dąbrowa (1885) railways was of the greatest importance in accelerating economic growth. This enabled coal and metal products to be sold in the Warsaw Industrial District and the Łódź Industrial District, among other areas.

The accumulation of metallurgical and mining investments was also influenced by the head-

quarters of the Western Mining District being founded in Dąbrowa village. This contributed to an influx not only of skilled labourers, but also of technical intelligentsia. From the very beginning, the Reden settlement and the Huta Bankowa established schools (later also the Mining School), hospitals (including the Central Mining Hospital of DB), casinos, inns, a post office, financial institutions and commercial intermediaries. Although Reden was granted the status of a settlement with the right to hold a weekly market (DUMAŁA, 1974), in reality, the service, trade and craft facilities were located in Będzin. The merging of the colonies took place when the smallest administrative formation was established (1866) with its seat in Dąbrowa

village, i.e. the municipality of mining settlements covering initially only the settlements of Reden, Huta Bankowa and the post-mining colonies of Koszelew and Cieszkowski. In 1874, a new "Mining" municipality was created, which additionally included Dąbrowa village and some villages – Zagórze, Modrzejów, Niwka, Dańdówka, Bobrek, Klimontów (ZINBERG, 1877). The formal merger of the mining settlements took place in 1916 with the acquisition of municipal rights under the name Dąbrowa Górnicza.

In the case of Dąbrowa Górnicza, three stages of development of functional and spatial structures can also be distinguished:

I. The "development of rural areas" (until 1830) – this period was associated with an increase in the population of the villages of Gołonóg and Dąbrowa, as well as the construction of new mining and metallurgical settlements from scratch: Reden and Ksawery. At the beginning of the 19th century, the first company-owned residential buildings were built in the Reden settlement.

II. The "creation of interconnected mining and metallurgical structures" (1830–1860) – this period was linked to the influence of state capital and the establishment of the "Huta Bankowa" (ironworks). During this time, mining was also developing dynamically, resulting in the expansion of settlements towards Będzin and Gołonóg. Towards the end of this period, the newly created railway line also began to play an important role in shaping economic connections.

III. The "significant blurring of boundaries between settlements" (after 1860) – the continued development of industry together with service and residential buildings contributed to the gradual development of previously undeveloped areas between settlements and villages. The first administrative changes also took place, as well as the expansion of settlements into the eastern and northern peripheries of Dąbrowa Górnicza.

4.4. Industrial poles of development

Under the influence of industrialization, almost every village was transformed into an urbanized point forming a conurbation (BRÜGGEMEIER, 1994), especially as coal mines were located outside the boundaries of existing cities, i.e. in the peripheral zone. In the DB, 65 mining colonies and settlements were established (until 1918), which contributed to the amalgamation of settlements, villages and towns into a densely populated urban-industrial

space (Fig. 7A). The highest density of individual mining colonies was in the area of Dąbrowa Górnicza, Sosnowiec and Niwka. On a micro scale, this contributed to the formation of polycentric cities typical of the industrial period – Dąbrowa Górnicza, but also Sosnowiec. In 1870, an administrative reform was introduced that stripped most of DB's smaller centres of city status: Czeladź, Sławków, Niwka, Modrzejów. As a result of the development of the mining, metallurgical and factory industries, by 1918 a matrix with a polycentric settlement pattern was formed with three centres performing various specialized central functions (Fig. 7B). Będzin was the region's commercial and administrative centre, while, as a result of top-down decisions, Dąbrowa Górnicza emerged as the region's mining management centre. Sosnowiec had the most diversified commercial and transportation central functions. Industry also played an important role in the economic structure of the cities: Będzin had no predominant branch, Sosnowiec developed various branches of industry on a significant scale, while Dąbrowa Górnicza developed metallurgy and mining.

In both discussed cases of city-forming niches, the position of the urban centre in the settlement network increased, but not all of these places generated sufficient city-forming potential. The Niwka area, on the other hand, developed both spatially and economically, although it remained in the shadow of Sosnowiec. Sosnowiec city has slowed down the economic and functional growth of the "Niwka wedge." Similarly, Dąbrowa Górnicza, as the centre of heavy industry, had an inhibiting effect on other industrial settlements.

By summarizing the functional and settlement transformations in the DB, an analysis was conducted of the original and morphological transformations and the intensity of this process in the towns where mining settlements were established (Table 1). Będzin and Czeladź were identified as transformed feudal towns. However, the latter only experienced significant development at the end of the 19th century with the establishment of the Czeladź and Saturn mines and the construction of mining settlements in Piaski and Zarzecze. Both Sosnowiec and Dąbrowa Górnicza constituted agglomerated urban forms, and their further spatial development continued through the incorporation of subsequent settlements. Another morphological and original type consisted of mining settlements established from scratch, of which Kazimierz developed most intensively.

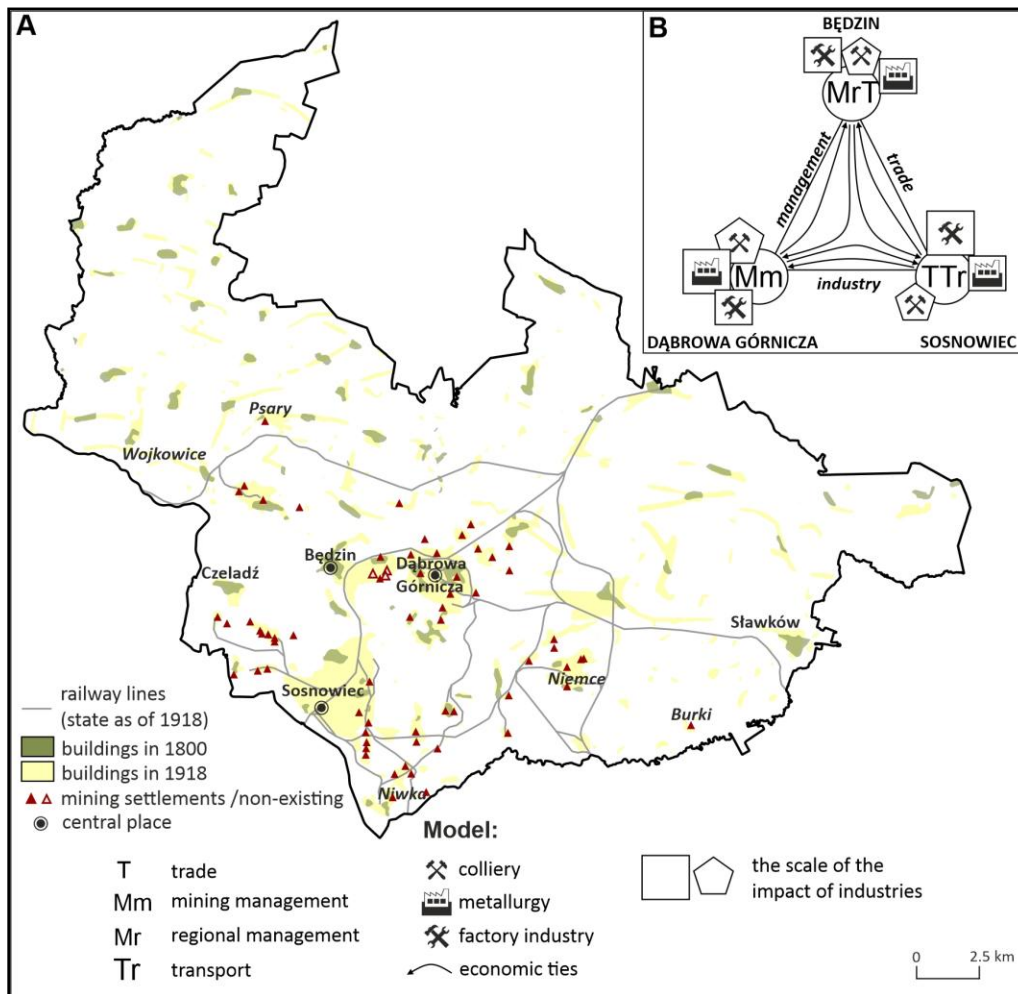


Fig. 7. Scheme of the settlement network transformation (A) and the distribution of mining-settlements for workers until 1918 (B)
(Source: the author)

4.5. Outline of the situation in the interwar period

To broaden the perspective on the changes taking place, the settlement and economic situation of the DB during the interwar period is briefly outlined here? This period was characterized by further industrialization of the settlements and towns formally considered as villages. New company-sponsored housing developed in only a few locations, such as Gołonóg, Strzemieszyce Wielkie, Sosnowiec, Niwka, Dańdówka, and on a larger scale in Kazimierz, Czeladź, and Wojkowice. In addition, a new mining settlement – Juliusz – was created in the area of the village of Porąbka. However, a widespread type of substandard individual housing developed, associated with the settlement of unemployed miners who worked in bootleg pits (temporary shafts used for illegal coal mining). This practice encompassed the entire Dąbrowa

Basin and was linked to shallow coal outcrops. This resulted from the fact that many mines were closed or had their production suspended during this period. New mines were small and very often operated for only a short period (a few months). The reasons for this situation include: inflation, the exploitative economy of the occupiers, a wave of strikes, and political changes resulting in the emergence of Poland on the map (the Dąbrowa Basin and the Kraków Basin became part of the newly reborn state) (RIPPEL, 1960). After the plebiscite (1922), a part of the heavily industrialized Upper Silesia was also annexed to Poland, at which point the DB lost some of its importance. The fact that the mining industry was largely owned by foreign capital (German, French, Belgian, and Russian) was also not without significance (Przegląd Górniczo-Hutniczy, 1920), which resulted in a lack of new investments.

Table 1. Original and morphological typology of settlements associated with coal mining in the DB in 1918 (Source: the author)

Settlement	Original and morphological type	Specificity of the settlement transformation process (1800-1918)	Functional transformations (1800-1918)
Będzin	FTt	intense	feudal town (1358) → industrial and service town
Bobrek	S(m)t	declining	mill settlement → mining and metallurgical settlement
Burki	S(f)t	very slow	forest settlement → mining settlement
Czeladź	FTt	intense	feudal town (before 1281) → market settlement (1870) → industrial and service town (1915)
Dąbrowa Górnicza	S(mm)t(aggl.)	very intense	mining and metallurgical settlement → industrial and mining town (1916)
Dańdówka	S(a)t	intense	agricultural settlement → mining and metallurgical settlement
Feliks	MS(bfs)d	slow	mining settlement
Garbocin	S(a)t	slow	agricultural settlement – mining settlement
Gołonóg	Vt	intense	agricultural village → industrial settlement
Grodziec	Vt	intense	agricultural settlement → mining and industry settlement
Józefów	S(a)t	declining	agricultural settlement → mining settlement
Juliusz	MS(bfs)d	slow	mining settlement
Kazimierz	MS(bfs)d	intense	mining settlement
Klimontów	Vt	intense	agricultural village → mining settlement
Korzeniec	MS(bfs)d	slow	mining settlement
Łagisza	Vt	intense	agricultural settlement → mining settlement
Niemce	Vt	intense	agricultural village → mining and metallurgical settlement
Niwka	T(g-w)t	intense	gateway town (1787) → mining and metallurgical settlement (before 1801) → mining and industry settlement
Porąbka	Vt	slow	agricultural village → agricultural and mining village
Psary	Vt	intense	agricultural village → agricultural and mining settlement
Sosnowiec	S(g-wi)t(aglo.)	very intense	gateway and industry settlement → gateway and industrial town (1902)
Strzemieszyce Wielkie	Vt	slow	agricultural village → industrial and agricultural settlement
Wojkowice	Vt	slow	agricultural village → agricultural and mining settlement
Zagórze	Vt	intense	agricultural village → mining settlement

Explanations: (year) – obtaining or losing town privileges; original and morphological type: Vt – transformed village; MS(bfs)d – developed mining settlement built from scratch; FTt – transformed feudal town; S(mm)t(aggl.) – mining and metallurgical settlement transformed into an urban agglomeration; S(g-wi)t(aglo.) – gateway and industry settlement transformed into an urban agglomeration; S(a)t – transformed agricultural settlement; S(f)t – transformed forest settlement; S(m)t – transformed mill settlement; T(g-w)t – transformed gateway Town

5. Discussion

During the industrial period, a network of economic links was superimposed on the existing settlement structure, among which coal mines were the initiating points of development. This relates to [HELMUTH'S](#) (2009) research on the Ruhr Basin, who states that the feudal urban network set the spatial footprint for industrial transformation. Under the influence of institutional and economic factors, a reshuffle occurred among the cities fulfilling central functions. The previously presented model of central hubs indicates the emergence of two new cities in the industrial period, creating a system of three cycles of regional development until 1918. This echoes [LASUÉN'S](#) (1973) assumptions about the emergence of several specialized growth poles. A similar process took place in the Ruhr Basin (cf. [VON HOUTUM & LAGENDIJK](#), 2001). In the case of DB, Będzin retained the management and commercial functions for the region, attracting links to the burgeoning industrial settlements of other cities ([KUREK](#), 2012). Dąbrowa Górnicza had management functions in the mining industry, and Sosnowiec had gateway functions. This trend is reflected in [BIRD'S](#) (1977) model, which depicts the possibility of a gateway centre evolving into a central hub. In addition, in order to keep its position in the region, after the disappearance of mining activities, an industrial city should develop a diversified structure in the initial stages of development, especially towards services ([BRUCHMAN](#), 2004; [KAMETE](#), 2012). In turn, the urban niche in the Dąbrowa Górnicza region could turn into a growth pole due to the diversification of industrial branches, which, through a network of connections, influenced the development of the entire region (c.f. [HANSEN](#), 1970).

The construction of a coal mine does not in itself constitute a city-forming force sufficient for economic activation. Only a powerful surge in mining activity can transform a place into a niche that attracts further city-forming potential ([BROWN](#), 2018). The chance of creating a new city increases when there is a synergy between several factors ([BIRD](#), 1977). As [MYRDAL](#) (1944) assumes, there is no single root cause, since everything is interrelated. However, it is possible to identify the key factors that should exist for there to be an accumulation of city-forming potential due to mining activities. Among the initial causal factors was the geographical location of the site in relation to existing settlements, especially cities. This is a significant factor fostering or inhibiting an

area's socio-economic potential and has already been discussed in the first empirical section using Psary and Niwka as examples. Niemce, on the other hand, was located far enough away not to be stifled by Dąbrowa village, yet close enough to coalesce profitably with its industry. In addition, the relationship between Będzin and Dąbrowa Górnicza can be cited as an example of symbiosis. As the mining and metallurgical settlement grew, Będzin gained a market for craft products and developed a metal processing industry. Dąbrowa Górnicza, on the other hand, benefited from its proximity to a commercial and service centre. In other European regions, industrialization contributed to the emergence of many settlements and new industrial cities close to the existing network of older cities ([BLUMIN](#), 2006), to which their success is attributed ([POMERANZ](#), 2000; [Clark & JACKS](#), 2007). This was situation different in the case of the Appalachian region, as new mining towns were established by companies far from human concentrations. Once the reason for opening these mines ceased to exist, these towns died out ([BROWN](#), 2018; [KEANE](#), 2000).

The second important aspect was the possibility of introducing new technical solutions at the mining plant itself. This related to improving the production capacity of the mine, but also the financial capacity to maintain the interdependent plant. For instance, zinc smelters (later also iron smelters and factories) were erected next to mines in the DB. This pattern was repeated in many localities, including Bobrek, Dańdówka, Dębowa Góra, and Zagórze. An example is Niemce, where the private owner of the smelter (and mine) was forced to cede ownership to the government due to excessive maintenance costs. The technological change that occurred in the industry (mining) contributed to the reduction of extraction costs ([CLARK & JACKS](#), 2007) and accelerated technological progress in other sectors ([SKOTT & AUERBACH](#), 1995), determining economic growth ([HELMUTH](#), 2009).

As a third factor, access to local markets should be mentioned. Initially, coal was used as fuel for heating homes, as well as smelting iron and in distilleries. Technological developments in metallurgy and the use of the steam engine in industrial processing expanded the pool of potential local customers for coal. The more diversified the local market of customers, the greater the resilience of mines to slumps and economic crises. There was also an interdependent relationship between the availability of cheap coal and the marketability of

that coal. In Europe, similar relationships also occurred in the metallurgical, textile, ceramic and glass industries (STRIKWERDA, 1991; SUGDEN ET AL., 2018; TURNBULL, 1987; MOISLEY, 1951).

Further transformation of the locality into a pole of development stemmed from the need for *enabling causal factors* to exist. These very often emerged from the area's original potential, such as the modernization of roads and the development of railroads, which reduced transportation costs (BIRD, 1977; TURNBULL, 1987). Modernization of infrastructure was often a consequence of the economic and settlement process (RAJMAN, 1977). Good transportation connections also expanded the region's labour base by facilitating daily commuting. Residents of towns like Sławków, located far from the centre, but along rail lines, gained the possibility of commuting daily to work (MATUSZCZYK, 2001). Break points in transportation were an important factor in locating new industrial investments (COOLEY, 1894; BLUMIN, 2006), as in the case of Sosnowiec (DRAGAN, 2021). In turn, a good transportation location facilitated cooperation between coal mine and heavy processing-factory industry. Interdependencies emerged, resulting in the accumulation of potential related to new economic activities (industrial, services), which were crucial to the growth of the locality's stature. Other industries often developed close to mining (JOHNSTON, 1982). In the case of the DB, the institutional factor also played an important role in increasing industrial development, both of the region and of individual localities. During the Prussian period, this was associated with the establishment of the first coal mines (Psary, Dąbrowa Górnicza), while during Russian rule it was associated with the establishment of metallurgical and coal combinations (in Niwka, Dąbrowa Górnicza and Niemce). A number of legal regulations were also introduced by the Russian Empire in the second half of the 19th century.

6. Conclusions

With the help of industrialization, functional intra-regional links are modified, and at the same time, there is a change in the rank of the existing cities and villages that make up the settlement network. This study shows that the places where economic innovation appeared (the first organized forms of coal mining) and their concentration in a small area did not always have enough city-forming potential. Thus, the first research hypothesis could not be

fully confirmed. The example of Psary demonstrates that western peripherality of this village in relation to the DB's exploitation centres (the city of Będzin – Dąbrowa Górnicza) limited this possibility. Niemce, another area of state investment (alongside Psary, Dąbrowa Górnicza and Niwka), had better chances of establishing a settlement with an urban character. Mining, zinc smelting, support industries and social infrastructure developed here. However, no significant exogenous branch was established. Niwka, on the other hand, was suppressed by the potential of the new city of Sosnowiec, with its service-industrial functions. In each case the success, regression or stagnation of a given locality was determined by a combination of various causal factors.

Firstly, the creation of DB settlement structures during the Industrial Revolution was first associated with the existence of new “development mechanisms” and city-forming forces. They had a centrifugal effect on the region's existing urban centres (KRZYSZTOFIK, 2014). There was a dispersion of city-forming potential in the agricultural hinterland zone and this was associated with the transfer of part of the population-economic potential. This led to a gradual blurring of differences between centres (cf. GEDDS, 1915). Secondly, the processes of coal mining concentration were strongest around the time the first mines were opened in the area of Psary, Dąbrowa, Bobrek-Niwka, and Niemce. The formation of the poles of development was determined by the interdependence of causal factors, which confirms the second research hypothesis. The location of the exploitation zone in relation to the existing settlement, the financial capabilities of the entrepreneur, or the local sales market were key factors. The accessibility of transport connections, emerging economic interdependence between the plants and the institutional factor were also significant.

The interwar period was characterized by further industrialization of the settlements which were formally considered villages, but without significant territorial changes. Attempts were made to reorganize their spatial structure and the development of workers' settlements, primarily of low or substandard construction.

The development of functional and settlement structures in the DB, linked to coal mining, represents an intermediate example between the Kraków Basin, where extensive agglomerated settlement and economic structures did not develop, and the Upper Silesian part of the USCB, characterized by intensive settlement and economic

transformations. Currently, mining in the DB no longer exists (the last mine was closed in 2015). Today, the dominant industry is metal processing, which developed alongside mining from the beginning of industrialization. In contrast, other areas of the USCB still have active mines. It is however a declining industry. In the case of the Kraków Basin, individual large power plants and refineries also play an important role. Similarly, in Upper Silesia, industrial processing is also a significant sector.

References

- Antrop M. 1997. The concept of traditional landscapes as a base for landscape evaluation and planning. The example of Flanders Region. *Landscape and Urban Planning*, 38: 105–117.
- Antrop M. 2000. Changing patterns in the urbanized countryside of Western Europe. *Landscape Ecology*, 15: 257–270.
- Beguín H. 1963. Aspects géographiques de la polarisation. *Tiers-Monde*, 4, 16: 559–608.
- Bird J. 1977. *Centrality and Cities*. Routledge & Kegan Paul, London.
- Blumin S.M. 2006. Driven to the City: Urbanization and Industrialization in the Nineteenth Century. *OAH Magazine of History*, 20, 3: 47–53.
- Brown K.L. 2018. *Gone Home: Race and Roots through Appalachia*. University of North Carolina Press, Chapel Hill, NC.
- Bruchman C. 2004. Two Coal Towns in 1900 Bureau County: Seatonville and Ladd. *Journal of the Illinois State Historical Society*, 97, 3, 226–237.
- Brügge-meier J.F. 1994. Nature Fit for Industry: The Environmental History of the Ruhr Basin, 1840–1990. *Environmental History Review*, 18, 1: 35–54.
- CAHR (The Central Archives of Historical Records in Warsaw), sign. 187-1. 1840–1860. Cartographic collection.
- CAHR (The Central Archives of Historical Records in Warsaw), sign. 208-1. 1848. Cartographic collection.
- CAHR (The Central Archives of Historical Records in Warsaw), sign. 565-13. 1820. Cartographic collection.
- CAHR (The Central Archives of Historical Records in Warsaw), sign. 201-2. 1843. Cartographic collection.
- CAHR (The Central Archives of Historical Records in Warsaw), sign. 200-11. 1843. Cartographic collection.
- CAHR (The Central Archives of Historical Records in Warsaw), sign. 200-12. 1843. Cartographic collection.
- Clark G. Jacks D. 2007. Coal and the Industrial Revolution, 1700–1869. *European Review of Economic History*, 11, 1: 39–72.
- Cooley Ch.H. 1894. The Theory of Transportation. *American Economic Association*, 9, 3: 13–148.
- Couch Ch. 2016. *Urban planning: An Introduction*. Palgrave, London-New York.
- Czarnecki W. 1965. *Planowanie miast i osiedli: Miejsca pracy i zamieszkania*. Vol. 2, Państwowe Wydawnictwo Naukowe, Warszawa.
- Darwent D.F. 1969. Growth Poles and Growth Centers in Regional Planning – A Review. *Environment and Planning*, 1, 1: 5–32.
- den van Berg L., Drewett R., Klaassen L.H., Rossi A., Vijverberg C.Ch.T. 1982. *Urban Europe: A Study of Growth and Decline*. Pergamon Press, Oxford.
- Doktorowicz-Hrebniński S. 1934. *Grodziec. Szczegółowa mapa geologiczna Polskiego Zagłębia Węglowego*, Scale 1:25 000.
- Dragan W. 2021. *Kształtowanie układów urbanistycznych i przestrzennych dawnych granicznych ośrodków kolejowych Polski*. Wydawnictwo Uniwersytetu Śląskiego, Katowice.
- Dragan W., Zdyrko A. 2023. The spatial dimension of coal phase-out: Exploring economic transformation and city pathways in Poland. *Energy Research & Social Science*, 99: 103058.
- Drobniański A. (ed.). 2022. *Sprawiedliwa transformacja regionów węglowych w Polsce. Impulsy, konteksty, rekomendacje strategiczne*. Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, Katowice.
- Dumała K. 1974. *Przemiany przestrzenne miast i rozwój osiedli przemysłowych w Królestwie Polskim w latach 1831–1969*. Ossolineum, Wrocław.
- Dziennik Handlowy y Ekonomiczny: Zawierający w sobie wszystkie okoliczności, Pisma, Uwagi, y Myśli Patryotyczne do Handlu Fabryk i Ekonomiki ściągające się*. 1788. Vol. 3, Towarzystwo Handlowe, Warszawa.
- Eisler R. b.d. *Plan Von der Gegende bei Czelleie, Bendzin, Niwka, Slawkow, und Siewir in Neu-Schlesien, mit cenneca, rinbesinelichen Versuch Arbeiten, Stein Kohlen Gruben, alten Bley une Eisen Erz Baue*. Scale abt. 1:100 000.
- Frantál B., Chodkowska-Miszczuk J., Alexandrescu F., Stölzel, F., Klusáček P., Konečný O., Süsner D., Lewandowska A., Zieliński D. 2025. With coal forever? Conflicted attitudes of residents in coal mining areas in the Czech Republic, Germany and Poland to coal phase-out. *Resources Policy*, 101, 2025: 105476.
- Geddes P. 1915. *Cities in evolution: An introduction to the town planning movement and to the study of civics*. Williams & Norgate, London.
- Geyer H.S. 1989. The terminology, definition, and classification of development axes. *The South African Geographer*, 16, 1/2: 113–129.
- Grzeszczak J. 1999. *Biegun wzrostu a formy przestrzeni spolarzowanej*. IGI PAN, Warszawa.
- Hansen N.M., 1970. How Regional Policy Can Benefit from Economic Theory. *Growth and Change*, 1, 1: 20–27.
- Hartshorne R. 1933. Geographic and Political Boundaries in Upper Silesia. *Annals of Association of American Geographers*, 23, 4: 195–227.
- Hartshorne R. 1934. The Upper Silesian industrial district. *Geographical Review*, 24: 423–438.
- Helmuth A. 2009. *Economic Diversification of a Mining Town: A Case Study of Oranjemund*. Master's Thesis. Rhodes University, Grahamstown.
- Hempel J. 1856. *Karta geognostyczna Zagłębia Węglowego w Królestwie Polskiem*, Scale 1:20 000.
- Hirschman A.O. 1958. *The Strategy of Economic Development*. Yale University Press, New Haven.
- Jaros J. 1965. *Historia górnictwa węglowego w zagłębiu górnośląskim do 1914 r.* Zakład Narodowy im. Ossolińskich–Wydawnictwo PAN, Wrocław–Warszawa–Kraków.
- Jaros J. 1984. *Słownik historyczny kopalni węgla na ziemiach polskich*. Śląski Instytut Naukowy, Katowice.
- Johnston R.J. 1982. *The American urban system: ageographical perspective*. Longman, London.
- Kamete A.Y. 2012. Of prosperity, ghost towns and havens: mining and urbanisation in Zimbabwe, *Journal of Contemporary African Studies*, 30: 589–609.

- Kantor-Mirski M. 1932. *Z przeszłości Zagłębia Dąbrowskiego i okolicy: szkice monograficzne*, 2, 1–20. Wydawnictwo Towarzystwa Naukowego Zagłębia Dąbrowskiego, Sosnowiec.
- Karte des Westlichen Russlands, Scale 1:100 000. 1914.
- Kean J.L. 2000. The Towns that Coal Built: The Evolution of Landscapes and Communities in Southern Colorado. *Yearbook of the Association of Pacific Coast Geographers*, 62: 70–94.
- Keeble D.E. 1967. Models of Economic Development. [in:] R.J. Chorley, P. Haggett (ed.) *Socio-Economic Models in Geography*. University Paperbacks, Methuen–London: 243–302.
- Krzysztofik R. 2012. *Umieszczenie obszaru Polski od XIII do XXI wieku: interpretacja geograficzno-historyczna*. Śląsk, Katowice.
- Krzysztofik R. 2014. *Geneza aglomeracji miast na obszarze Polski*. Wydawnictwo Uniwersytetu Śląskiego, Katowice.
- Krzysztofik R. 2022. The socio-economic transformation of the Katowice conurbation in Poland. [in:] W. Cudny, J. Kunc (ed.), *Growth and Change in Post-socialist Cities of Central Europe*. Routledge, London: 195–216.
- Kurek R. 2012. Początki i rozwój przemysłu w Czeladzi. [in:] J. Drabina (ed.), *Historia Czeladzi*. Vol. 1, Muzeum Saturn w Czeladzi, Czeladź: 415–468.
- Łabęcki H. 1841. *Górnictwo w Polsce. Opis kopalnictwa i hutnictwa polskiego, pod względem technicznym, historyczno-statystycznym i prawnym*. Vol. 1, Julian Kaczanowski, Warszawa.
- Lasuén J.R. 1969. On growth poles. *Urban Studies*, 6, 2: 137–161.
- Lasuén J.R. 1971. *A Generalization of the Growth Pole Notion*. Paper for the International Geographical Association Meeting, Vitoria. Brasil.
- Lasuén J.R. 1973. Urbanisation and Development – the Temporal Interaction between Geographical and Sectoral Clusters. *Urban Studies*, 10, 2: 163–188.
- Łempicki M. 1891. *Plastovaja karta pol'skago kamennougol'nago bassejna: Strzyżowice – Psary*, Scale 1:10 000. R. VI. I. 3.
- Malisz B. 1966. *Zarys teorii kształtowania układów osadniczych*. „Arkady”, Warszawa.
- Mapa topograficzna Terenu Przemysłowego Zagłębia Dąbrowskiego*, Scale 1:10 000. 1926.
- Matuszczyk Z. 2001. W czasach niewoli narodowej. [in:] F. Kiryk (ed.) *Dzieje Stawkowa*. Secesja, Karków: 181–347.
- Moisley H.A. 1951. The Industrial and Urban Development of the North Staffordshire Conurbation. *Transactions and Papers*, 17: 151–165.
- Murphy H.E. 1966. *The American City: An Urban Geography*. McGraw-Hill Book Company, New York.
- Myrdal G. 1944. *American dilemma: The Negro problem and modern democracy*. Harper & Brothers Publisher, New York–London.
- Myrdal G. 1957. *Economic Theory and Underdeveloped Regions*. Gerald Duckworth, London.
- Pierenkemper T. 1979. Entrepreneurers in Heavy Industry. Upper Silesia and the Westphalian Ruhr Region 1852 to 1913. *Business History Review*, 53, 1: 65–78.
- Pomeranz K. 2000. *The Great Divergence: China, Europe and the Making of the Modern World Economy*. Princeton University, Princeton, NJ.
- Pounds N.J.G. 1958. *The Upper Silesian Industrial Region*. Indiana University, Bloomington, IN.
- Pred A.R. 1966. *The spatial dynamics of U.S. industrial growth, 1800-1914: Interpretative and theoretical essays*. MIT Press, Cambridge, Mass.
- Przegląd Górniczo-Hutniczy*. 1920. Kronika bieżąca. Narodowość właścicieli kopalni węgla kamiennego w zagłębiu Dąbrowskim. 12, 1: 28.
- Rajman J. 1970. Kryteria i mierniki urbanizacji. *Rocznik Naukowo-Dydaktyczny WSP*, 40: 175–184.
- Rajman J. 1977. Rozwój Górnośląskiego Zespołu Miejskiego. Wybrane problemy osadnicze i społeczno-demograficzne. *Rocznik Naukowo-Dydaktyczny WSP w Krakowie*. No. 62: 5–21.
- Rippel E. 1960. *Studia i materiały: Wydobywanie węgla kamiennego w kopalniach Zagłębia Dąbrowskiego w latach 1919-1939*. Polskie Towarzystwo Ekonomiczne, Katowice.
- Runge J. 2020. *Złożony układ osadniczy - tradycyjny region ekonomiczny – przestrzeń społeczno-kulturowa*. Wydawnictwo Uniwersytetu Śląskiego, Katowice.
- Skott P., Auerbach P. 1995. Cumulative Causation and the "New" Theories of Economic Growth. *Journal of Post Keynesian Economics*, 17, 3: 381–402.
- Spezialkarte der Oberschlesischen Bergreviere unter Angabe der Lage der verliehenen Bergwerke*, Scale 1:1000. 1880.
- Strikwerda C. 1991. Interest-Group Politics and the International Economy: Mass Politics and Big Business Corporations in the Liege Coal Basin, 1870-1914. *Journal of Social History*, 25, 2: 277–307.
- Sugden K., Keibek S., Wells J., Shaw-Taylor L. 2023. Adam Smith revisited: the relationship between the English woollen manufacture and the availability of coal before the use of steam power. *Continuity and Change*, 38: 163–191.
- Sulimierski F., Chlebowski B., Walewski W. (ed.). 1880-1901. *Słownik geograficzny Królestwa Polskiego i innych krajów słowiańskich*. Druk „Wiek”, Warszawa. 1–15.
- Sulimierski F., Chlebowski B., Walewski W. (ed.). 1888. *Słownik geograficzny Królestwa Polskiego i innych krajów słowiańskich*. Druk „Wiek”, Warszawa, 9: 246.
- Sulimierski F., Chlebowski B., Walewski W. (ed.). 1890. *Słownik geograficzny Królestwa Polskiego i innych krajów słowiańskich*. Druk „Wiek”, Warszawa. 11: 491.
- Topograficzna Karta Królestwa Polskiego: Stawków*, Scale 1:126 000, Kol.IISek.VIII.1843.
- Turnbull G. 1987. Canals, Coal and Regional Growth during the Industrial Revolution. *The Economic History Review*, 40, 4: 537–560.
- Turnock D. 1989. *Eastern Europe: An Historical Geography 1815-1945*. Routledge, London–New York.
- von Houtum H., Lagendijk A. 2001. Contextualising Regional Identity and Imagination in the Construction of Polycentric Urban Regions: The Cases of the Ruhr Area and the Basque Country. *Urban Studies*, 38, 4: 747–767.
- Wyrzykowska A., Janiszek M. 2025. Models of Post-Mining Land Reuse in Poland. *Sustainability*, 17, 20: 9069.
- Zinberg I. 1877. *Skorowidz Królestwa Polskiego*. Vol. 2, Warszawa.
- Ziółkowski J. 1957. Z problematyki przestrzennej i gospodarczej Górnośląskiego Okręgu Węglowego. *Przegląd Zachodni*, 17: 257–279.
- Ziółkowski J. 1960. *Sosnowiec: Drogi i czynniki rozwoju miasta przemysłowego*. „Śląsk”, Katowice.

Appendix 1. Selected cartographic sources used to verify the list of hard coal mines (Source: the author)

No.	Name of map	Years
1	Flözkarte vom nördlichen Theil des Oberschlesischen Steinkohlenbeckens	1901-1913
2	Grodziec. Szczegółowa mapa geologiczna Polskiego Zagłębia Węglowego (Doktorowicz – Hrebnicki S.)	1934
3	Grubenriss von dem Abbau im Redenflötz des Grubenfeldes „Friederike No. 163“ in Sosnowice der Gewerkschaft „Gr. Renard“	1920
4	Karta geognostyczna Zagłębia Węglowego w Królestwie Polskiem (Hempel J.)	1856
5	Karte des Deutschen Reiches (Generalstabskarte)	1893; 1933
6	Karte des Westlichen Russlands	1914
7	Kopalnia Lech	1918
8	Mapa dóbr Bobrowniki, Psary, Sąszów, Siemonia	1848
9	Mapa gruntowa wsi Niwka i Najdówka	1835
10	Mapa polskiego zagłębia węglowego z okolicami	1922
11	Mapa topograficzna WIG	1924-1939
12	Mapa wsi Dąbrowa Górnicza	1843
13	Mapa topograficzna Terenu Przemysłowego Zagłębia Dąbrowskiego	1925-1926
14	Plan części lasów starostwa Będzin	1803
15	Plan kopalni Orion	1928
16	Plan kopalni węgla kamiennego Jarosłwa, Alwina I-II i Barbara w Nivce	1925
17	Plan kopalni węgla kamiennego Wańczyków w Józefowie	1923
18	Plan kopalni węgla we wsiach Strzyżowice i Psary w powiecie będzińskim	1820
19	Plan Von der Gegende bei Czelleie, Bendzin, Niwka, Slawkow, und Siewir in Neu-Schlesien, mit cenneca, rin besinelichen Versuch Arbeiten, Stein Kohlen Gruben, alten Bley une Eisen Erz Baue (Eisler R.)	b.d.
20	Plastovaja karta pol'skago kamennougol'nago bassejna (Łempicki M.)	1891
21	Spezialkarte der Oberschlesischen Bergeviere unter Angabe der Lage der verliehenen Bergwerke	1880
22	Topograficzna Karta Królestwa Polskiego	1839-1843
23	Topograficzna mapa specjalna Zagłębia Dąbrowskiego	1914-1918
24	Topographische Karte (Messtischblatt)	1942

These materials are the resources of the following institutions and portals: MAPSTER, Silesian Library, State Archives in Katowice; The Central Archives of Historical Records, State Mining Authority