Chapter 38

Miner's Cities and Rehabilitation of Industrial Areas: Comparing Ruhr and Zonguldak Region

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Abstract

With the decrease in production, some of the industrial zones are closed and lose their original function. In the case of Zonguldak, there is a Brownfield problem in city center as a result of the loss of industrial function. Former industrial zones have turned into abandoned areas, and rehabilitation or re-functioning approaches have not yet been implemented. Like Zonguldak, many industrial facilities have lost their original function in Ruhr region. However, rehabilitation and re-functioning of the settlements became the main strategy of transformation of Ruhr. This approach points out not only physical sustainability with adaptive reuse but also social sustainability with new livelihood opportunities. In this study, the transformation which offers new recreational solutions and economic options in Ruhr region will be studied to understand rehabilitation process and reuse potential of the Brownfield areas. General information about study will be given in first section. In second section, as a former Industrial region Ruhr will be introduced in terms of economic, social, and physical conditions. After explaining to transformation approaches in Ruhr in third section, two examples, Ruhr and Zonguldak will be compared according to differences and similarities in fourth section. In conclusion, new transformation strategies of Zonguldak will be suggested for new livelihood opportunities.

Keywords: brownfield rehabilitation, sustainability, adaptive reuse, Ruhr, Zonguldak

1. Introduction

Zonguldak is the only city with hard coal production in Turkey that the production cycle is included in the urban life which depends on heavy industry. When the production curve is examined, it is seen that the coal production of the city has decreased over the years and accordingly, the number of mine workers decreased. With the decrease in production, some of the industrial zones are abounded. In addition, with the growth of the city and the increase of the population, the industrial areas in the city centre are moved to the city boarders. It is important that the old industrial zones in Zonguldak need to be transformed into recreational activities and settlements that allow the creation of the city's new economic options. Because it reveals the new economic activity option and responds to the culture, art, and sports activities, which are required by the locals. The future scenario for Zonguldak is variable. There are three different scenarios in the future projection,

such as the continuation, decrease, or termination of production. However, in all scenarios, the sustainability of the industrial areas contributes economic and physical opportunities to the city.

As a mining region, The Ruhr basin is one of the best examples in which production has decreased over the years. Although it has been an important heavy industry region with its high production capacity until the 1960s, after 1960s production has decreased due to different variables and it is almost ended. Many industrial facilities have lost their function. However, rehabilitation and re-functioning of the settlements have became the main strategy that transformed the Ruhr region. It is observed that many industrial areas in the Ruhr basin are transformed into recreational areas that these areas continue to live as breathing mixed-function settlements of the city. Although large-scale industrial settlements Zollverein, Duisburg Landschaftpark, Hansa Cooking Plant end their hard industrial activities, today they are transformed in culture, sports, and entertainment-oriented campus. Therefore, the transformation which offers new recreational solutions and economic options to the Ruhr region should be researched as a successful example for Zonguldak. Because, it has been beneficial to discover new livelihood strategies and reuse strategies of former industrial areas after end of hard coal production in Zonguldak.

2. Introduction of Ruhr region

Ruhr region is known that it is third biggest metropol of Europe after Paris and London. It has 53 city and towns and the biggest ones are Duisburg, Oberhausen, Mülheim an der Ruhr, Bottrop, Essen, Gelsenkirchen, Herne, Bochum, Dortmund, Hagen, and Hamm (**Figure 1**). With production coal and ironworks, it is the one of the biggest industrial zone in Europe that chemical and textile industries are located in region beside hard industrial production. The industrial complexes along the Emscher use the river for transporting products and draining waste. High labour and common railways contribute to the large volume of production. Between 1930 and 1940, the region has shown a rapid development in order to serve the German army and the basin is considered as the most important business area of the country and Europe until the 1970s [1].

When the region is evaluated, it can be seen that Ruhr region is divided into five periods according to economic situation. These five periods are examined as before and after industrial revolution, First and Second World War, after Second World War, and after 1960 until today (**Table 1**). Before 1840, small coal, steel, and textile companies

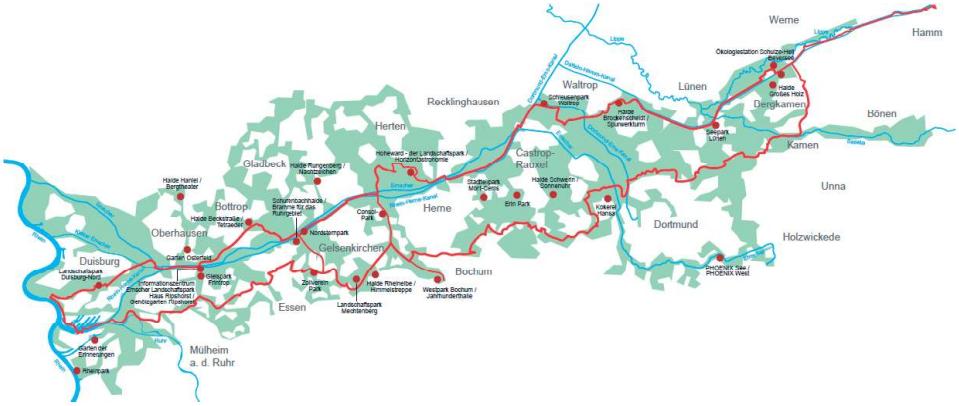


Figure 1.
A map of Ruhr region [2].

Time	Phase	Characteristics
Before 1840	Pre-industrialization	Small coal mines, iron and textile factories
		Agricultural areas with low population density
From 1840	Industrialization with strongest growth phase between 1894 and 1914	Large scale coal mining and development of cola chemistry
		Introduction of mass production of iron and steel
		Foundation of large enterprises
		Strong immigration
1914–1945	First signs of crisis	Economic depression, World Wars I and II, dismantling of product lines after WW II
		End of product cycle of coal mining
1945–end of 1950s	Rapid growth	Temporary demand pull due to reconstruction and Korean war caused overcapacities
1960s–today	Restructuring and transition	Crisis of coal mining and closure of pits: international competition and location disadvantages due to changed technology
		Absorption of workers in other sectors (1960s)
		Steel crisis in 1974 with overall decline of the region

Table 1.
Phases of economic growth and decline in the Ruhr area [3].

are seen in pre-industrialisation period. In this period, there were agricultural areas with low density population. Between 1814 and 1914, companies started to grow, coal and steel take part in mass production and there is a strong immigration in region. After the First World War, the first sign of economic crises can be seen. Production of coal and steel decreases and product cycle of coal mining ends. After Second World War, again there is a rapid growth because of temporary demand pull due to reconstruction and Korean War caused overcapacities. After 1960, coal and steel crises emerged. Because of these crises, workers were absorbed by other sectors. Also, production of coal and steel started to rise in Far East country because of cheap workforce [3].

After 1960, a transformation process was started. That transformation process can be divided into five phases. Until 1970, employment of coal and steel industry decreased. In this period, two milestones are important, which are 1957 and 1974 steel crises and Opel investment in Bochum. Between the end of 1970 and 1989, service sector started to grow and new branches occurred. In that period, there was an economic crisis of Hoesch and closure of steel plants in Rheinhausen and Hattingen. Between 1990 and mid of 1990s, there was a productivity growth in traditional sectors. Also, world economic crises 1992/93 were occurred. After all periods until today, we can mention cluster approach and diversified industrial structure as a development and indicator [3].

3. Transformation approaches and sustainability of mining identity in Ruhr region

The mining and iron and steel industry, which had reduced its affect after 1960, completely finished their activity for the Ruhr basin after 1990. With the shifting of livelihood resources to other sectors, industrial structures serving mining and iron steel were evacuated and the mining identity began to lose its influence. In addition to the production of new livelihood strategies in the basin, which contains about 300

mines, it is aimed to ensure the sustainability of the buildings and the mining identity. For this reason, physical, economical, and social sustainability of the Ruhr basin has been supported by transformational projects and conceptual expansions of mining identity. The potentials in the region were evaluated in physical and social context and development strategies of the basin were determined after mining industry [4].

It is aimed to bring industrial areas together under a project and to ensure economic transformation in this context (**Table 2**). Projects related to transformation can be grouped into five main groups with 274 special projects [5, 6].

In the Ruhr basin, the industrial context of the past has been evaluated with new meanings after ending hard industrial activities. The facilities belonging to the industrial revolution have been re-interpreted in the axis of culture and art, and urban transformation activities were carried out to increase social welfare. In the transformation of former industrial areas, the keyword has been defined as "living space", and projects have been developed on human life-oriented transformation rather than rent. Because mining and industrial complexes have been transformed into science, art, sport, and recreation centre. With the industrial heritage route in the region, 25 industrial and cultural places in the region are connected to each other by a network (**Figure 2**). Fifty-two cultural monuments with different characters within the framework of the industrial heritage route are located on this network [6].

The preservation of the industrial history as convincing for the future can be achieved by reflecting this industrial reality and by seriously protecting the quality. In this sense, the Ruhr region has shown a successful policy, the region has been revitalized with different livelihood strategies at a time, when coal and steel production have been reduced and turned into de-industrialization, and the region has continued to migrate instead of emigrating.

3.1 From hard industry to urban park: the Emscher Park International Building Exhibition (IBA)

After 1960, many industrial areas were abandoned with the decline of hard industrial production. Within the scope of the environmental and urban rehabilitation of the Ruhr region, the Emscherpark IBA project, which began in 1989, aims to transform many industrial areas with new functions and change the conceptual structure of the region. Landscape design and urban development have led to ecological, economical, and social renewal in an area of 800 km^2 as a former industrial zone. The project

Principles	Introduction
1. Development axis formation	East-West development is the axis. Three of them represent the riverbed, and one of them represents the roadway. By means of these axes, the settlements are aimed to be connected to each other and to advance on a common ground of development
2. Development of urban areas	It was aimed to improve the quality of city centres and regions, and to restore modern and liveable features of cities in the late industrial period
3. Development of building layout	It is aimed to develop high-quality industrial and commercial settlements for all region, to link industry sectors and their open spaces to recreational and cultural activities
4. Development of investments	By creating favorable conditions for private investors in the development areas, it is aimed to transform old industrial structures for large- or medium-sized companies into attractive opportunity
5. Improvement of life quality	It is aimed to increase recognition in the international platform by changing the structure of the zone with high quality activities, large-scale stage activities

Table 2.
Five principles in the Ruhr region for transformation strategies [5].

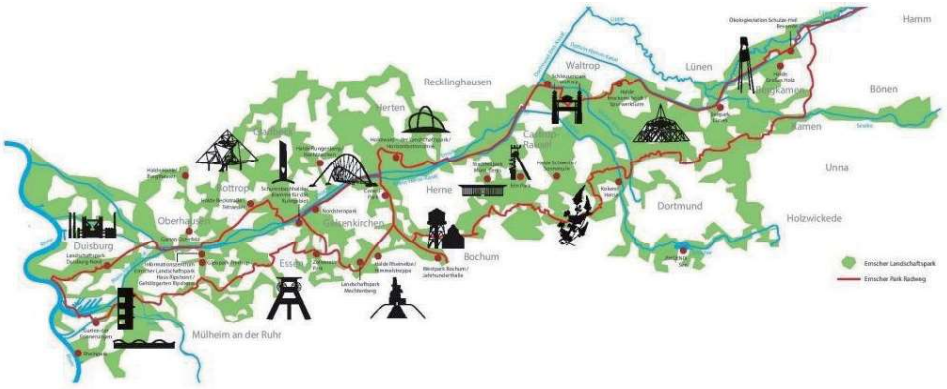


Figure 2.
Industrial heritage route in Ruhr [7].

carried out under the leadership of Prof. Karl Ganser, points to a regional approach beyond housing and the city planning. After the mining identity, landscape design and architecture has been accepted as the new element that constitutes the regional identity. In the region, 117 projects were carried out in 17 cities and these projects contributed to the restructuring of the region. Main concepts of IBA projects are:

- Working in the park
- New buildings and modernizing housing estates
- Ecological renewal of Emscher system
- Promotion of urban development
- Social stimuli for urban development
- Establishment of regional park structure (Emscher Landscape Park [8]).

The Emscher Park project is a 10-year project that serves 2.3 million people. With the project, industrial lands have been accepted as nature reserves and seen as opportunities to create new landscapes. Six different green corridors connected to main green corridor on the Emscher river, which runs along the 120 km east-west axis, is the main idea of the project (**Figure 3**). These green corridors, shaped on industrial heritage, aim to complete the region's ecological restoration. This restoration process has planned together with the structural elements and the industrial areas reunited with nature. At this point, the concept of industrial nature has been created for the first time in the literature. According to this, the industrial areas have surrendered to nature and have started to serve new functions with natural elements. Former industrial areas and structures have turned into symbols. This new understanding has created the concept of industrial landscape. The former industrial structures have reinstated after the new functions and the industrial landscape created the new identity of the region. The IBA Emscher Park project, which has achieved worldwide success, has opened a different perspective in the approach to the former industrial zones with its structural and cultural projects and pioneered the European Capital of Culture Ruhr 2010. To finance this project, more than 40 subsidy programs have been put together. The state of North Rhine-Westphalia has launched the program, especially the German government, and the

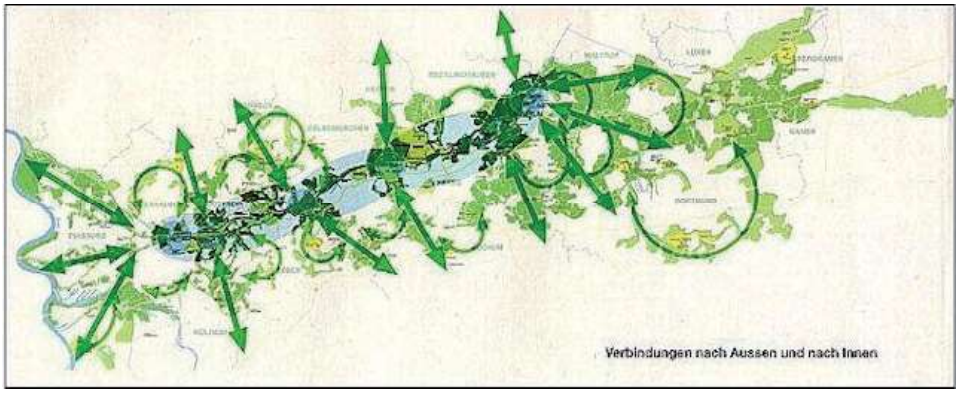


Figure 3.
IBA Emscher Park design principles with green corridors [10].

Figure 4.
Duisburg-Meiderich ironworks [12].

EU provides funding. Two of the most prominent projects are the Zollverein Coal Mine Complex in the UNESCO World Heritage List and successful example of the ecological restoration is Duisburg Nord Landscape Park [8, 9].

3.2 New approaches about adaptive reuse and ecological restoration: Duisburg Nord Landscape Park

Duisburg-Meiderich ironwork, which ended its activities in 1985, is located in an area of approximately 200 hectares (**Figure 4**). The company, which has been operating for 82 years, has left behind contaminated soils and rivers due to waste after the withdrawal of the industry from the region. In addition, large scale buildings with different functions were abandoned. Within the scope of IBA projects, it is aimed to be transformed from a barren industrial land into a fertile landscape park by Peter Latz and Partner. Due to the potentials and opportunities of places, former industrial structures have been transformed into new functions focused on culture, art, and sports. The facilities have been preserved as an industrial monument and accepted as a heritage. However, these structures continue to serve new functions beyond being only monument. Controlled and wild growth is proposed for polluted and barren soil and the vegetation is spread spontaneously. Thus, the soil has been rehabilitated

by natural elements. Channels have connected to the Emscher river cleaned with mechanical and natural purification systems that the living space is provided for the new water organisms in the rising water oxygen level. Examples of adaptive reuse of industrial buildings in the park are given in **Table 3**. Accordingly, it is observed that

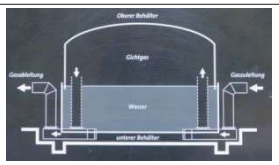
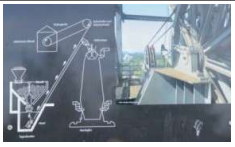
Original function	**Space opportunity**	**New function**
Former ore bunker	Thick and high concrete walls	Climbing park
		
The Gasometer	Filled with 20,000 cubic metres of water	Diving centre
		
Blast furnace	High ceiling, wide interior for high number of spectators	Theatre, opera, and film hall
		
Workshops	Whole and high spaces with service units	Exhibition and events
		
Steel towers for production	Durable steel structure and high towers	Observation points to all landscape
		
Brown fields	Rehabilitation of soil with vegetation	Fertile spaces for growing vegetables, art gardens
		

Table 3.
Duisburg Nord Landscape Park original and new functions according to space opportunity.

the magnitude values provided by the space can meet the needs of different functions. Different transformation approaches can be seen: from former gasometer to diving centre, from warehouses to climbing walls, from workshops to exhibitions and events hall, from tower to observation points, from polluted soil to gardens filled with different species (**Table 3**). Also, these gardens have influenced Europe's landscape design approach. The Duisburg Landscape Park project provides guidance on how to achieve both physical and social sustainability of a former industrial area rather than just only building [2, 11].

4. Similarities and differences between Ruhr and Zonguldak

Ruhr and Zonguldak region have similarities about production history. Although in Ruhr region, production ended, in Zonguldak, coal production continues. Although the coal production continues, it is seen that it decreases day by day. When production and employment in Turkish Hardcoal Enterprises are examined, it can be seen that unemployment comes out because of the reducing coal production. According to data by Turkey Hard Coal Enterprises, which was established in 1982, coal production fell from 4,108,382 to 948,537 tons in 2015. According to the data of 2016, the number of employees, which is 10,598 at the end of the year, has decreased to 9573 at the end of the year (**Table 4**). Thus, the region needs new livelihood strategies and job opportunities. Like Ruhr, Zonguldak needs to transformation projects according to adaptive reuse principles [13].

In the Northwest of the Turkey, there is a hard industry region with three cities named Zonguldak, Bartın, and Karabük. Today some colliery complexes are in Bartın borders and one of the ironworks is in Karabük boarders. In this study, all cities get together under the name Zonguldak Region.

All mining areas in the world have some common characteristics with regard to building stock. When we study in Ruhr area and in local, for example Zonguldak, we can see a lot of similarities. Railways, collieries, workshops, administration buildings, and harbours are also recreational elements that show us mining cities have a special design approach because of their work practices. When the similarities between Ruhr and Zonguldak are pointed out, opportunities of Zonguldak region can be discovered.

4.1 Geography

Ruhr and Zonguldak regions have similar different geographic characteristics. Both of them have oceanic climate. They have also stream and rivers but just only

Table 4.
Coal production amount and workers number according to years in Turkish Hardcoal Enterprises [13].

Ruhr region's rivers are available for transportation. In addition, they have different land features. When Ruhr has a plain area, Zonguldak has much more rough area with mountains. They have similar flora but Zonguldak has more areas covered by forests.

4.2 Industry

Coal mining and iron works are main industries in both regions. But today hard industry activity is stopped in Ruhr but another sector's activities have risen like chemical, service, or technology. In contrast, hard industrial activity has continued in Zonguldak but not as much as before 25 years. The production is declining in every year and some collieries have been closed. Today beside the hard industry, forest industry (paper or furniture factory), textile, chemical, industry related to soil (cement or ceramic factory), and shipping construction are operated in Zonguldak.

4.3 Transportation

Ruhr area has well developed railway system. Not only transportation of products but also passenger transportation can be provided by high speed or regional train. Beside to railway, river way is also used for transportation because of suitable depth of rivers. Although Zonguldak has a railway, it is not so effective for passenger transportation. Generally, hard coal is transported by train to Karabük and by seaway to Ereğli.

4.4 Tourism

Both of them have natural areas with nature tourism potential. Also, they have some historical settlements for cultural tourism. Although they have similar tourism opportunity, they have different potentials. Because of that Zonguldak has natural shore sea tourism that is available for that region. However, both have industrial heritage, Ruhr area is more successful about reusing them than Zonguldak. Thus, industrial heritage tourism is mentioned only for Ruhr region (**Figure 5**).

4.5 Education

Both of them have universities and high schools. Ruhr region has five universities named Ruhr University, University of Duisburg-Essen, Technical University of

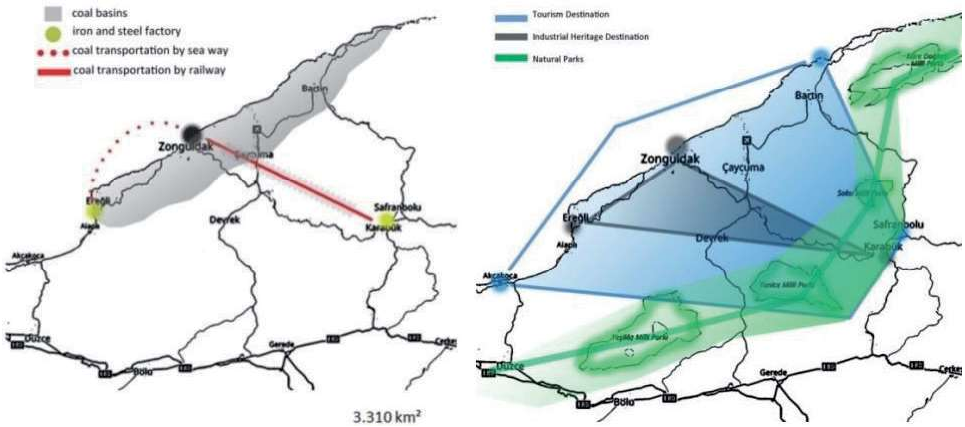


Figure 5.
Transportation of coal to ironworks and natural destinations in Zonguldak region.

Dortmund, Folkwang University of the Arts, and Witten/Herdecke University. The first university for Ruhr was established in 1961 named Ruhr University [3]. On the other hand, Zonguldak Region has three universities today named as Bülent Ecevit University, Karabük University, and Bartın University. Bülent Ecevit University was established in 1992 as a first university for Zonguldak region.

4.6 Architectural elements

As hard industry regions, both of them have colliery complexes and iron works with their facilities. In addition, their miner's colonies near to industrial complexes show characteristics of regions. Not only industrial buildings and miners' colonies but also monuments, infrastructural and recreational elements show identity of cities in both regions. Therefore, so many architectural similarities can be found in these regions. In below, some similarities are shown in terms of industrial heritage.

As it can be seen in **Table 5**, both regions have some similarities in point of physical and social elements. These similarities can be a potential for new transformation strategies in Zonguldak region. After reducing production of coal, unemployment has risen in Zonguldak region. Reducing of coal production causes not only unemployment but also to treat missing region identity. According to data about coal production, 40 years later, Zonguldak shares a similar story with Ruhr.

Elements	Ruhr region	Zonguldak region
Physical elements		
Geography	Plain, 17.6% forests, rivers, oceanic climate, 4435 km^2	Mountains, 56% forests, sea and streams, oceanic climate, approx. 3100 km^2
Industry	Past: coal mining, ironworks Today: chemical, textile, service, technology	Past: coal mining, ironworks Today: coal mining, ironworks, shipping construction, textile, forest industry, and chemical
Architectural elements	Colliery complex, ironworks, workers housing settlements, monuments, infrastructural elements, recreational parks	Colliery complex, ironworks, workers housing settlements, monuments, infrastructural elements, recreational parks
Tourism	Nature, cultural, industrial heritage	Nature, sea, cultural
Education	Five university, high schools and primary schools	Three university, high schools and primary schools
Transportation of products	Railway or river transportation	Railway or seaway
Recreational elements	Viewpoints at the top of the hill (plain is available to create a panoramic view point)	Parks in city centre (because of rugged land it is hard to create panoramic view point)
Social elements		
Professional, livelihood	Mining, ironwork (before) technology, service sector	Mining, ironwork
Population	Get on immigration (after closing mines and ironworks, peoples were employed in other sectors)	Emigration because of unemployment (there is not so much option to work than mining)
Economy	Get better and stronger after changing with new sectors	Get worse because of noting have a new livelihood strategy

Table 5.
Similarities and Differences between Ruhr and Northwest of Turkey.

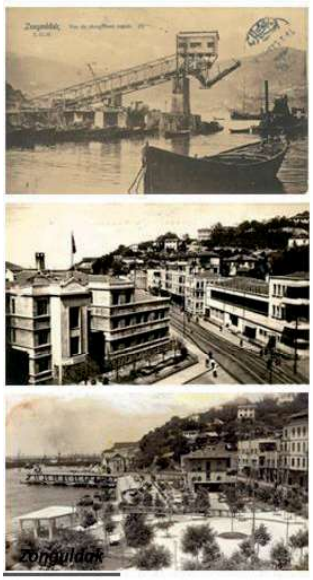
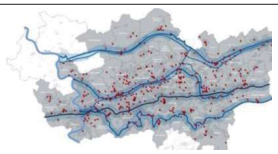
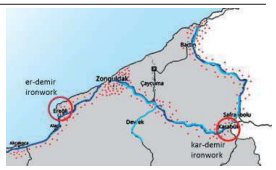
Duisburg in 1900's	Zonguldak in 1900's
	

Table 6.
Physical similarities in history between Zonguldak and Duisburg, Ruhr region.

Aims	Principles	Ruhr	Zonguldak
Development axis formation	East-west development is the axis. Three of them represent the riverbed, and one of them represents the roadway. By means of these axes, the settlements are aimed to be connected to each other and to advance on a common ground of development		
Development of urban areas	It was aimed to improve the quality of city centres and regions, and to restore modern and liveable features of cities in the late industrial period	 Duisburg innerhafen	 Zonguldak city center

Aims	Principles	Ruhr	Zonguldak
Development of building layout	It is aimed to develop high-quality industrial and commercial settlements for the entire region, to link industry sectors and their open spaces to recreational and cultural activities	 Waltrop schiffshebewerk	 Zonguldak Harbourduck
Development of investments	By creating favourable conditions for private investors in the development areas, it is aimed to transform old industrial structures for large or medium-sized companies into attractive opportunity	 Zollverein	 Zonguldak central colliery
Improvement of life quality	It is aimed to increase recognition in the international platform by changing the structure of the zone with high quality activities, large-scale stage activities	 Duisburg Landschafts	 Asma and Çatalağzi Colliery

Table 7.
Physical similarities between Zonguldak and Ruhr region today, potential of Zonguldak region.

Therefore, Ruhr region can be a guide for transformation of Zonguldak. After this part of the study, Zonguldak industrial heritage potential will be studied and compared with Ruhr. In **Tables 6** and **7,** potentials of Zonguldak have been summarized according to Ruhr transformation process to point out the importance of industrial identity of Zonguldak.

5. Conclusion

Changing economic and political approaches affect industrial cities in Turkey as well as in many parts of the world. Zonguldak which has been working with high

efficiency in the past has to look for new livelihood strategies nowadays because of the closure of collieries and decrease in the number of workers. Mining which constitutes the identity of the city is losing its effect day by day and job opportunities are decreasing. The closed mines and factories cause not only the unemployment but also abandoned industrial zones problem. Beside social and economic problems such as unemployment, also abandoned industrial areas indicate the architectural problems of the city.

The Ruhr region is one of the best examples of the world as a transformation approach of former industrial areas. The region, which was the centre of the heavy industry in the past, has now been transformed into a metropole which focuses on culture and art. Because the industrial heritage serves to new functions and creates new jobs. Livelihoods have shifted from heavy industry to service and technology sector. In addition, like other industrial facilities, workers' colonies are preserved and continue their functions as housing. These residential areas are the most important values reflecting the industrial identity of the region with their architectural structures and social life. The strategy of transformation of Ruhr region is to maintain the life of the buildings within the framework of the needs in order to protect the values. When Ruhr and Zonguldak regions are compared, many physical and social similarities can be discovered. Because both regions have experienced similar economic changes in different periods. Production in the Ruhr area has stopped, and the former production facilities continue to serve with different functions. Although Zonguldak is still a region where production continues, economic indicators show that production will end in a short time. Thus, Ruhr sets an example for the Zonguldak, which is likely to encounter the same scenario. If Zonguldak's industrial heritage and tourism potentials are discovered, new livelihood strategies can be developed. Also, migration can be prevented. According to Ruhr example, the following principles help to identify potentials and problems for Zonguldak;

- Collieries or ironworks whose activities have stopped or will soon be stopped should be identified and transformed into mining museums, culture and art oriented functions

- East-west and north-south development axes should be created between Zonguldak, Eregli and Karabük where iron and steel plants are located

- Industrial heritage axes should be established between collieries and ironworks. In this sense, infrastructure elements such as rail, bicycle and trekking roads should be developed between Zonguldak-Ereğli-Karabük

- The relationship between production and architecture should be examined. The effects of changing production capacity on the surface architecture of the region should be investigated. Unqualified construction should be rehabilitated in city centre

- While working practices are common, the Ruhr and Zonguldak region have a sociologic connection. Most of the families from Turkey who migrated to the Ruhr region after World War II are from Zonguldak. For this reason, cultural integration can be provided by developing joint projects focusing on culture and education between Ruhr and Zonguldak

Heavy industry is decreasing in Zonguldak over time so new strategies should be developed and different scenarios should be considered. It may be one of these scenarios that the region has become a centre for mining education. With various

training agreements with the Ruhr region, mining facilities can serve as practice area for mining education. Education can be promoted, and local awareness may be increased if the currently inactive part of these facilities is transformed into culture-art-oriented. The potentials of Zonguldak should be explored and new strategies should be developed. According to potentials the transformation projects should be created. Ereğli-Zonguldak-Karabük is an industrial heritage axis extending along the iron-steel and coal line, the national parks in the south and the coastline referring to sea tourism in the north, show new routes in different layers and show that the region has a high potential in the intersection of culture, art and tourism. For this reason, transformation projects should be implemented for new livelihood strategies and the Ruhr basin should be considered as a successful guide.

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