

## POST-INDUSTRIAL LANDSCAPE EVOLUTION IN HUNEDOARA

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**Abstract.** – **Post-industrial landscape evolution in Hunedoara.** The development of steel industry in Hunedoara (1882-1989) had social and economic consequences, generating structural and functional changes in the geographical landscape in Hunedoara, with local, regional and national repercussions. The industrial landscape in Hunedoara took shape around the steel industry, a platform that supported the entire local community (by employment) and galvanized the economic relations with other cities in the county of Hunedoara (Deva, Călan, Hațeg, Petroșani, Brad, Orăștie), and also with cities in the neighboring counties (Timisoara, Reșița, Sebeș, Alba Iulia, Tg. Jiu, Craiova, Sibiu). The changes that occurred in the economic policy in Romania, after 1989, have resulted in major structural changes in the landscape of Hunedoara. The process of de-industrialization left a significant mark in the physiography of the landscape in Hunedoara and its functionality. The dismantling and demolition of the industrial platform (a pennant of industrial development in socialist Romania) led to the abandonment of a steelworker lifestyle, to retraining, to migration of specialized workforce and especially young people, to other destinations. The city today is looking for a new identity, embracing the steel industry tradition and tourist resources of the area.

**Keywords:** steel, industrial plant, industrialization, de- industrialization, geographical landscape

### 1. INTRODUCTION

The industry produces the most profound changes in the geographical landscape through the production and distribution infrastructure of the industrial products, and by storage of the natural resources and waste resulting (Irimuș et al., 2009) from their processing (dumps), thus creating a new physiography of the geographical landscape, with new features (Irimuș, Muresan, 1994), that is, a new typology (the industrial landscape). “The existence of an industrial activity in a particular area is normally governed by the interaction between three groups of factors: the presence of natural resources, topographical features and the humans which harnessed these for industrial production.” (Palmer, Neaverson, 1998).

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The industrial landscape components can represent a single phase of the industrial development or can be a result of several phases of evolution (Palmer, Neaverson, 1998). The industrial landscape is characterized by strong concentration of the technical infrastructure, consisting of the enterprises themselves, their service units (warehouses for raw materials and finished products, transportation networks, power and water supply), their retail units, and the associated habitat units (Cocean, 2002).

The used technologies generate energy and material flows, which cause environmental imbalances globally or locally, by accidental pollution or by the effects produced by various pollutants (Irimus, Kirschner, 1995). The variety of industries has led to a wide variety of industrial landscapes (Cocean, 2002).

The industrial landscape in Hunedoara is the result of the spatial and temporal dynamic of the steel industry. The specifics of the steel industry, such as being intensively resource- and space consuming, polluting, but with an important socio-economic impact particularly through the employment generated, was reflected on the organization of the geographical space (Labasse, 1966), with remarkable effects on the landscape.

## **2. DATA AND METHOD**

Geographical landscape analysis involved the identification and analysis of its components: the share in the landscape, the structure and dynamics of landscape components, their resilience to human impact, and landscape's status in the postindustrial or de-industrialization era (the case of Hunedoara). The interpretation of spatial dynamics of the industrial landscape in Hunedoara was carried out in two directions: the spatial, or territorial dynamics, and the internal dynamics of the landscape, i.e. the functional dynamics (restructuring of the landscaping functions following changes occurred after 1989).

Studies on industrial landscapes have diversified in the last 40 years worldwide and in the past 20 years in Romania. Foremost attention was given especially to the geographical landscape resource management and heritage conservation, whereas some studies targeted the state of de-structuration or contamination of the landscapes and initiation of environmental rehabilitation measures with the purpose of regeneration, and others discussed the economic recovery of degraded urban and rural areas (Palmer, Neaverson, 1998). Programs initiated after the Conference in Rio de Janeiro (1980) have resulted in a better understanding of the factors that shaped the post-industrial landscapes. The steps recommended (Palmer, Neaverson, 1998) for the analysis of an industrial landscape would consist of: determining the purpose or the objectives of the location of businesses, the interpretation of changes occurring over time, and the examination of the spatial relationships of the industrial units within the perimeter of the model of the development of settlements and of the transport system.

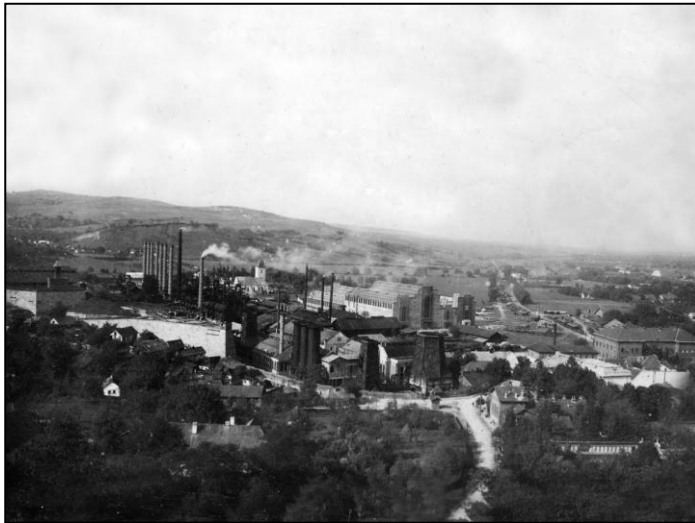
### 3.RESULTS AND DISCUSSIONS

#### 3.1. Hunedoara industry dynamics

The construction of “Uzinele de Fier Hunedoara” was prompted by increasing demand for cast iron and steel for railways and the machine industry, and also because the old workshops had become unprofitable.

Hunedoara was chosen as a place for the future plant as a result of the natural resources present nearby, traditions, as well as the support of the local community (Chindler et al., 1974). The unit development was based on the resources of Poiana Ruscă Mountains (iron ore, beech forests to produce charcoal, and limestone as flux) and the upper basin of the river Jiu (coking coal).

Hunedoara steel industry has developed over several phases, which began with the construction of the first blast furnaces, and ended in 1989.



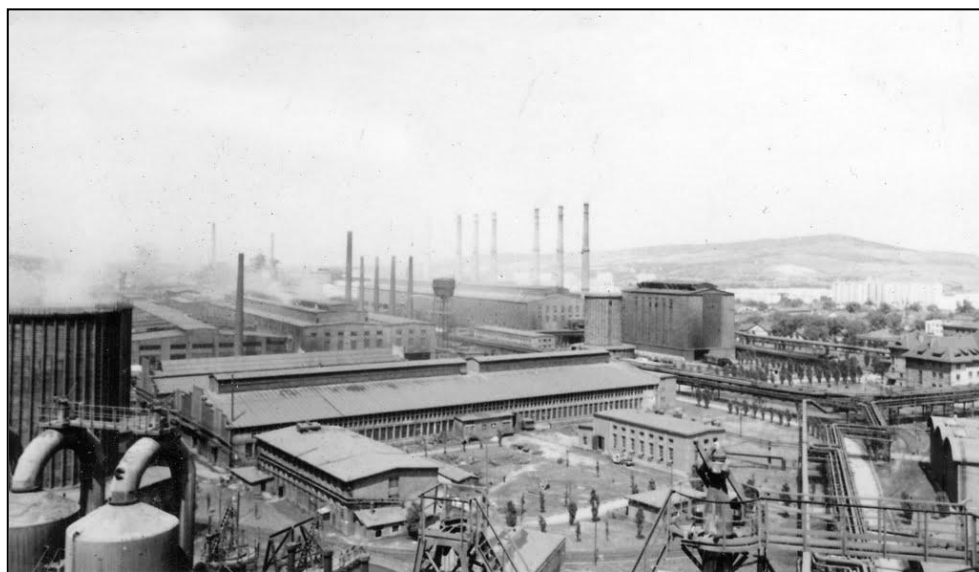
**Foto 1.** Iron plant Hunedoara, 1904  
(Source: [www.panoramio.com](http://www.panoramio.com))

The first phase, 1882–1919, begins with the construction of the first two furnaces of 110 m<sup>3</sup> (August 1882). Also, the ground for uploading furnaces was prepared; the warehouses for charcoal were built as well as an iron workshop, also used for maintenance activities. The first two furnaces (placed in service in 1884 and 1885) were using charcoal as fuel. Other units were subsequently put into operation: a 140 m<sup>3</sup> blast furnace (1890), which used a mixture of coke and charcoal, and two furnaces of 288 m<sup>3</sup> (1895 and 1900), which used coke (foto 1). Steel production began in 1886, in

the iron workshop, and in 1892 a steel mill was taken into service (Chindler et al., 1974).

The second phase, 1919-1944, brought about, at “Uzinele de Fier ale Statului” in Hunedoara the cast iron processing sectors development (1927-1937) by starting the operation of the foundry sector, consisting of four halls for casting pieces of cast iron and bronze, cast iron tubes, and steel parts, for preparation of the molding mixture, a mechanical workshop and a metallic constructions workshop. Subsequently, 1937-1941, a complex metallurgical cycle has been achieved by building of the Martin steel plant, the electrical steel plant, and the 800 mm reversible rolling mill (Chindler et al., 1974).

The industrialization period in Hunedoara, between 1945 and 1975, was marked by a series of reorganization measures and distribution of steel production (“Întreprinderile Siderurgice de Stat din Hunedoara”, 1948; “Combinatul Siderurgic Hunedoara”, 1953), while the production activities were structured in factories (foto. 2).



**Foto 2.** Hunedoara steel plant, 1966 (Source: [www.panoramio.com](http://www.panoramio.com))

The coke plant had four coking batteries and entered into service during 1955–1961 (Chindler et al., 1974).

Furnaces-Agglomeration plant was modernized through the commissioning of modern blast furnaces: the 450 m<sup>3</sup> blast furnace (1952), the 750 m<sup>3</sup> blast furnace (1956) built to replace the furnace no. 5 and three 1,000 m<sup>3</sup> blast furnaces (1962, 1966 and 1971). Commissioning of the modern furnaces caused the closure of the old

furnaces: furnace no. 1 in 1965, furnace no. 3 in 1969, and furnace no. 2 in 1971. Two iron ore agglomeration plants were put into service (during 1954-1955 and 1963-1972, respectively), as well as the ore crushing and sorting station (1971), two wet slag granulation plants (1955 and 1962), whereas the slag expansion facility began operating in 1962 (Chindler et al., 1974).

Steel mills-Refractory plant complete the reconstruction of the Martin steel plant no. 1 (1954) and in 1958 started the production in the Martin steel plant no. 2, whose capacity was increased in the period 1960-1964; the furnaces of the electric steel plant no. 1 are turned on in 1957 and 1969 (Chindler et al., 1974).



**Foto 3.** Rolling mill unit, 1970  
(Source: [www.panoramio.com](http://www.panoramio.com))

The 800 mm rolling mill of the Rolling mills plant was modernised and north of the city a rolling mill unit was built (fig. 3): Blooming 1,000 mm and 650 mm rolling mill (1958), Blooming 1,300 mm in 1968 (Chindler et al., 1974), rolling mill for light profiles and rolling mill for wire no. 1 (1962), rolling mill for semis no. 1 (1963), rolling mill for medium profiles and strips in 1964 (Ioan, 2007).

The maintenance, services, and transport activities were also organized into factories: Repairs and Spare Parts, Production, Transportation and Energy Distribution (with three power plants); Railway Transport (Chindler et al., 1974).

The period 1975-1989 marks the commissioning of the electric steelmaking furnaces no. 2 in 1978 and 1979, the rolling mill for wire no. 2 (1975), rolling mill for wire no. 3 and rolling mill for semis no. 2 in 1979 (Ioan, 2007); the bases for storage and preparation of raw materials, maintenance and repair, energy, transport network,

laboratories and research facilities have been developed, and a design center and the electronic calculation center were set up.

The year of 1981 is distinguished by the stopping of the band flow and moving it to Iași (Ioan, 2007), whereas in 1988 the Agglomerate no. 1 is transferred into conservation (Primăria municipiului Hunedoara, 2007).

The steel industry employed the male workforce and, to ensure the integration on the labor market of the female workforce, industrial establishments of light industry profile were developed: the bread factory (1952), the section of the “Vidra” Orăștie furriery plant in 1971 (Chirică, Răceanu, 1976), the shoe factory (1976), and wool knittwear factory in 1979 (Primăria municipiului Hunedoara, 2007).

After 1990, the steel mill activity was low due to diminished demand and losses caused by high consumption costs. In 1991 “Combinatul Siderurgic Hunedoara” was reorganized and “Siderurgica” Hunedoara was founded. A process of restructuring and modernization was started, through which production capacities were closed, and the connected activities became independent economic units (Ioan, 2007).

The production capacities from Coke plant are stopped in 1990, the Martin steel plant no. 1 and partially Martin steel plant no. 2 were stopped in 1992. 1,000 mm blooming mill ceased operations in the 1990s, rolling mill for wire no. 1 in 1995, rolling mill for wire no. 2 in 1998, and rolling mill for semis no. 2 in 1999 (Ioan, 2007).

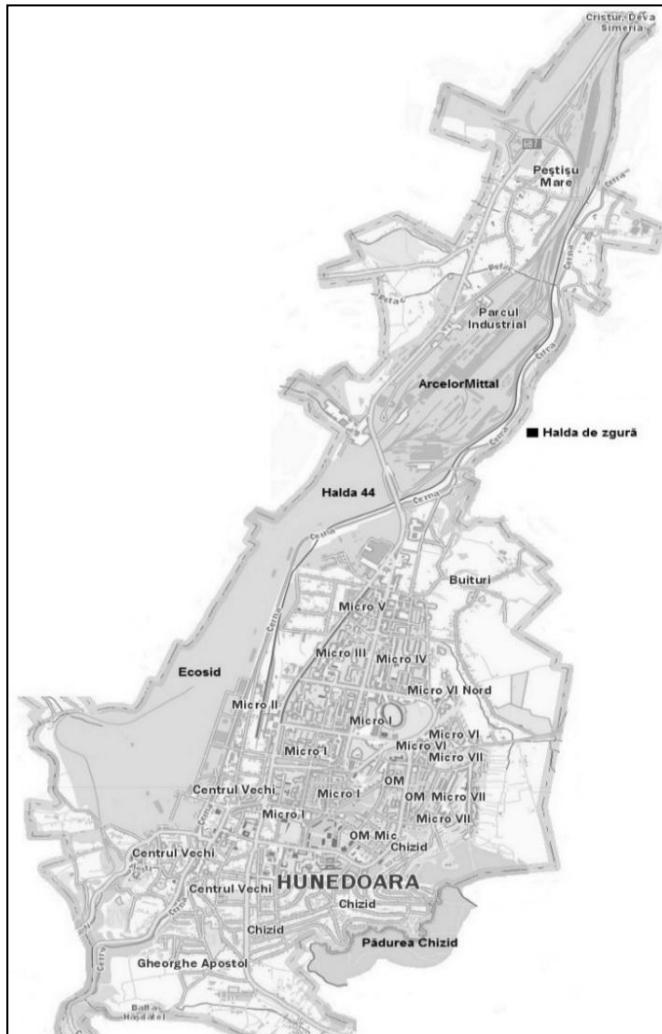
The year of 1999 marks the “death” of steel industry in Hunedoara by permanently stopping the primary flow. Steel production facilities in the Martin furnaces and the facilities that provided the raw material (agglomeration, blast furnaces, coke and deposits of raw materials) were closed. A land area of 119 ha, industrial buildings and warehouses, with associated facilities, occupying over 42 ha, railways, factory roads, production, transportation and energy distribution facilities, water supply and sewage networks were all taken out of service. The equipment was dismantled and the scrap metal has been used in steel production. The recovery and greening of the closed flow are performed by “Ecosid”, established in 2004 (Ioan, 2007).

The Steel industry in Hunedoara was represented in 2000 by two electric steelworks and six rolling mills. A continuous casting machine was put into production in 1998 at the electric steel plant no. 2, and in 2002 the furnace no. 3 is placed into service (Ioan, 2007).

“Siderurgica” Hunedoara joined the group LNM Holdings in 2004 and became “ArcelorMittal Hunedoara”. The electric steel plant no. 1 and the rolling mills have been stopped, with the exception of the 650 mm rolling mill, and the equipment and facilities were dismantled. In 2012 the production of economical profiles started at the new rolling mill built on the site of the 650 mm rolling mill (Ioan, 2015). Maintenance activities, services, canteens and transport were transformed into subsidiaries; subsequently, some were privatized (Ioan, 2007).

The decrease in activity of the steel industry led to the development of other activities leading to the diversification of the industrial profile of Hunedoara. Currently,

the industry in Hunedoara produces equipment and machines for production of steel, sorting stations and equipment for sorting stations, metallic constructions and parts of metal structures, metallic doors and window frames, various metal products, hardware, electrical systems and components for automotive, electronics and optical products, electrical lighting equipment, cooling and ventilation equipment for non-household use, clothing and footwear, food (bread, canned meat).



**Figure 1.** Hunedoara, city and industrial platform  
 (Source: *Primăria Municipiului Hunedoara*)

### 3.2. The dynamics of the industrial platform

Industrial and service units were placed on a platform stretched over a length of about 7 km; the steel platform was developed in the area of the Hunedoara municipality, on the left bank of the Cerna River, which separates it from the city (fig. 1).

The development of the industrial activity led to the extension of the steel platform from south to north. Starting from an area of approximately 20 ha located near Corvin's Castle, the platform was developed to the west of the city and then north of it; the platform surface has increased to 704 hectares of which 297 hectares were held by productive units.

The industrial platform stages of expansion corresponded to the stages of development of steel industry. Thus, during 1882-1919, as the commissioning of furnaces started, the industrial platform was expanded slightly northward. The extending of the platform continued in the period 1919-1945 as a result of the putting into operation of the new industrial facilities. The strongest expansion of the industrial platform occurred during 1945-1975, following the commissioning of new industrial units. The platform has expanded strongly, west and north of the city, reaching the maximum area; the industrial facilities put into service subsequently have occupied the remaining available spaces from the perimeter of the platform. The constructions for light and food industries were located inside the municipality of Hunedoara, integrated into the urban landscape.



**Foto 4.** Industrial Park Hunedoara (Source: *replicahd.ro*)



Since 2003 the steel related work is carried out only on the platform situated north of the town. Also north of the city, on a decommissioned area of the steel platform, the Industrial Park Hunedoara was set up (foto 4), where economic units operate within the machine building and metallic structure industry, and light industry.

The platform in the west is subjected to greening activities; the equipment and industrial halls were demolished (foto 5), and the resulting materials were capitalized. Some buildings were sold and used as production facilities and offices.



**Foto 5.** Demolition on the steel platform (*Source: evz.ro*)

### **3.3. Economic and social consequences of industry dynamics in Hunedoara**

Hunedoara steel industry development has led to numerous industrial facilities that have altered the landscape, locally and regionally. One result was the disappearance of the old workshops for extraction and processing of iron from the valleys of Cerna, Govăjdia and Zlaști.

The iron ore mining facilities from Ghelari and Teliuc were expanded both at surface and underground and new ones were opened after 1950, while other mines operated at Vadu Dobrii and between Teliuc and Ghelari. At Teliuc a factory that produces iron ore concentrate for steel mill was built (1964). New quarries were opened for exploitation of limestone and dolomite in Crăciuneasa, Teliuc and Zlaști, and talc underground mining at Cerișor and Lelese. After 1990, the mining facilities at Ghelari and Teliuc, as well as the construction stone quarries were closed or transferred into conservation; currently, only the Teliuc and Zlaști quarries for dolomite exploitation are in use. Large areas of forest were cut to obtain charcoal until 1895, when production of cast iron based on coke started.

The hydropower facilities of Cățânaș and Govăjdia (1910-1911) were built during the steel plant construction and an accumulation of water was created on the Zlaști brook. To meet the increasing water demand, the Cinciș-Cerna hydro-technical facility was opened in 1964 (Cinciș Lake, located 7 km upstream of Hunedoara, has an area of 2.61 km<sup>2</sup> and a volume of 43 million m<sup>3</sup>).

The railway Simeria – Hunedoara was built and the railways of the factory were connected to it. Iron ore was transported by railway Retișoara – Hunedoara, by funicular lines Vadu Dobrii – Ghelari – Hunedoara and Teliuc – Hunedoara, and on the strip from the raw materials warehouse Peștiș (Chindler et al., 1974). The transport network comprised also of high voltage power lines and large pipelines along the river Cerna.

The technological processes have generated huge amounts of slag stored in a slag dump with an area of 70 ha, located in the north-east of the city (Buituri). The slag dump is currently exploited and the slag is used for roads construction.

The city has developed concurrently with the development of industry. The population in Hunedoara grew until 1990, the biggest jump being recorded in the period of industrialization. In 1880 the town's population numbered 2,303 inhabitants, in 1910 there were 4,520 inhabitants, and in 1948 the population reached 7,018 inhabitants. In the period 1948-1989 there is a genuine “demographic explosion”, the number of inhabitants reaching 90,129; the average annual growth rate was very high (95.65 % between 1948 and 1956, 48.23 % between 1956 and 1966, 30.40 % between 1966 and 1977 and 21.85 % between 1977 and 1989). The number of inhabitants begins to fall in 1990, reaching 60,525 in 2011 (fig. 2).



**Fig. 2.** The numerical evolution of the population in Hunedoara (Source: INS)

The city has expanded onto Sânpetru Hill, around the Corvin's Castle. In the first half of the nineteenth century the city consisted of the streets in the vicinity of the castle and on the right bank of the river Cerna. During 1882-1919 the city has expanded slightly along Cerna river, on the right bank, and to the north and Buituri Hill. Between 1919 and 1944 the city has grown by extending the network of streets from the "old town" on the right bank of the river Cerna, and consisted of areas of "old town", Chizid, Ceangăi and Buituri. Since 1945 the city has expanded strongly eastward by building neighborhoods around the "Casa de cultură" area, and the O. M. neighborhood (O.M. Orasul Muncitorilor, Workers' city); then the Micro 3 district was built, along the road to Deva, and after 1965 the villages Zlaști (southwest) and Buituri (north) are incorporated into the city.

The period 1971-1975 was marked by the appearance of the districts IV, VI and VI Nord in the hearth of the city. 1975 marks the start of the modernization of the city's civic center, and building of the district V, which was completed in the 1980s (Primăria Municipiului Hunedoara, 2007). After 1989, urban development was limited to parks improvement, church construction, and improvement of a residential area, with villa type construction near the Chizid forest (Fig. 4), or of holiday houses in the vicinity of the lake Cinciș.

The disappearance of Hunedoara's steel industry profile has been marked by profound changes in the environmental function of the city, industrial spaces being replaced by green spaces, while the environmental policies increasingly support new directions within the labor market (ecotourism).

### Industrial dynamics impact on the environment

The main consequence of the industrialization process is the presence of pollutants generated by industrial activity. The pollutants' actions occur through polluted air, water, and soil, and also their effects on the health of the population, the vegetation cover, the constructions (Irimuş, Kirschner, 1995). The reduced activity of the steel industry led to a radical improvement of the environmental quality.

Concerning the air pollution, by 1990, the maximum permissible concentration (M.P.C.) was exceeded for powder, while gaseous pollutants were maintained below it. The decreasing steel industry activity led to the decrease of air pollution levels (Table 1), and now the average annual values of pollutants are below M.P.C. (Sofia, Irimuş, 2015).

**Table 1.** The main air pollutants in 1991 and 2010\*

| Year                 | M.P.C.                        | 1991   | 2010     |
|----------------------|-------------------------------|--------|----------|
| Polluting substance  |                               |        |          |
| Suspended particles  | 0,15 mg/m <sup>3</sup>        | 0,1840 | 0,029452 |
| Sedimented particles | 17,00 g/m <sup>2</sup> /month | 35,97  | 7,080555 |

\*(Source: Agenția pentru Protecția Mediului Hunedoara)

The Cerna river was polluted by mine water from the mining area Ghelari – Teliuc, by water discharged by the plant for ore processing and the steel plant, and by wastewater from the households; Zlaști brook brought also wastewater from the dolomite plant into the Cerna river. Thus, downstream Teliuc, Cerna waters were completely degraded, creating an abiotic environment. After 1990 the pollution was significantly reduced and river Cerna has good ecological potential (Agenția pentru Protecția Mediului Hunedoara, 2015).

The consequences of pollution on plants are manifested through injury and premature leaf fall, growth disorders, drying of standing trees, destruction of parts of plants, and even disappearance of species. Sporadic vegetation favored the development of erosion processes.

Metal constructions are affected by corrosion, thus reducing their life; paints change color and composition.

### **3. CONCLUSIONS**

The industry generates the strongest concentration of economic activities in the territory and the most visible environmental effects.

The industrial landscape is materialized by buildings and industrial facilities, access roads, service areas (supply of raw materials, electricity, and water), etc. It has common characteristics with other landscapes, but also a number of own characteristics: the particular physiognomy, differentiated according to the industry, distinctive functionality, and evolutionary character.

Hunedoara industrial landscape was shaped by the development of the steel industry. It has developed over several phases, from the construction of the first blast until 1989. After 1990 the steel industry was reduced and began a process of restructuring and modernization: most of the production capacities were closed and those remaining in operation have been expanded and upgraded. The decline of steel industry has favored the emergence of other industrial activities: machine building and metallic structures industry, light industry.

The steel industry area, separated from the city by the river Cerna, has extended from south to north, along with the development of the industry. Currently, industrial activity is conducted on the area north of town, where an industrial park was built. The area on the west side of the city is subjected to greening activities and capitalizing on industrial assets.

The industrialization process had positive and negative consequences at local and regional level: urbanization of Hunedoara, intensification of the iron ore and construction rocks exploitation, commissioning of industrial facilities, extension of the transport network, rural depopulation, deforestation, pollution, and landscape degradation.

De-industrialization led to improved environmental quality, cessation of mining, closure of industrial facilities, negative population and settlements dynamics.

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