Aluminium factory, Talum, 1953,
Kidričevo, Slovenija

Hlinikáreň, Talum, 1953,
Kidričevo, Slovinsko

Photo Foto: Sonja Ifko

Sonja Ifko

INDUSTRIAL ARCHITECTURAL HERITAGE – RE-EVALUATING RESEARCH PARAMETERS FOR MORE AUTHENTIC PRESERVATION APPROACHES

PRIEMYSELNÉ ARCHITEKTONICKÉ DEDIČSTVO – PREHODNOTENIE PARAMETROV VÝSKUMU PRE AUTENTICKEJŠIE PRÍSTUPY OCHRANY

Keď hovoríme o ochrane priemyselného architektonického dedičstva, je oveľa dôležitejšie, než pri iných kategóriách pamiatok porozumieť potrebe jeho začlenenia do širšieho kontextu rozvoja a poukázať na technologické, ekonomické, spoločenské, politické a kultúrne aspekty, ak uvedieme len tie najdôležitejšie. Vzniklo interakciou všetkých faktorov, ktoré ho ovplyvnili a, naopak, všetky tieto faktory sa podieľali na jeho vzniku. Priemyselné priestory sú východiskovým bodom, to značí základným prostredím a reflexiou mnohých procesov našej nedávnej minulosti. Je teda podstatné, aby sa pri rekonštrukcii zachoval ich autentický odkaz v najvyššej možnej miere. V kontexte veľkých architektonických úspechov, vrátane miest svetového významu, je väčšina priemyselného dedičstva často považovaná ako menej podstatná, ale napriek tomu dôležitá súčasť širšieho kontextu vývoja. Práve táto skutočnosť je dôležitá pre porozumenie úlohy rozvoja industrializácie a priemyselnej architektúry, ako aj priestorovej a materiálnej podstaty týchto procesov. Tento príspevok sa zameriava na priemyselnú architektúru prostredníctvom metód architektonickej archeológie, ktorá umožňuje odhaliť niektoré z jej kľúčových hodnôt aj napriek zložitosti jej stavieb. Faktom je, že regenerácia území priemyselného dedičstva je až príliš často objektom prikrášľovania a transformácie pôvodných priestorov, čo vedie k zníženiu autenticity, ktorá je kľúčom pamiatkovej hodnoty. Je potrebné na to pamätať, lebo kľúč ku komplexnej ochrane kultúrneho dedičstva spočíva v jeho celistvom pochopení. Príspevok načrtáva základné charakteristiky vývoja a význam priemyselnej architektúry v kontexte vývoja architektúry, ktorý je nevyhnutne prepojený so spoločensko-historickými, ekonomickými a technologickými aspektmi vývoja. Nasleduje prehľad kľúčových analytických parametrov umožňujúcich celistvé chápanie architektúry a tým jej náležitú ochranu. Napokon sú navrhnuté zásady, ktoré by umožnili celistvú ochranu autentických štruktúr aj v prípade rozvojových reštrukturalizačných projektov, kde prostý akt ochrany autenticity je oslabený snahou o príťažlivý návrh – týka sa to, nanešťastie, aj najzásadnejších prípadov kultúrneho dedičstva, čo je obrovskou stratou. Hoci realita projektov obnovy zahŕňa veľa kompromisov, ktoré sa líšia z prípadu na prípad, je dôležité, aby projekty vychádzali z dôkladného posúdenia pamiatkových hodnôt. Napokon, ako zdôrazňuje tento príspevok, to posledné sa ukázalo byť kľúčom ku všetkým kvalitným projektom nového využitia.

1. INDUSTRIALISATION – IMPACTS ON THE DEVELOPMENT OF ARCHITECTURE AND SPACE

In terms of social development, industrialisation represents the greatest change of all, not only because of the altered methods of production, but also because of its effects on all aspects of life. Industrialisation or the Industrial Revolution, as it is often called due to the intensive changes that occurred over a short period of time, primarily means the transformation of production processes. Handcrafts were replaced by large-scale production, resulting in the fall of prices for manufactured goods and the growth of wider consumption, which touched on almost every aspect of life. The changes were first evident in the organisation of manufacturing and the design of production facilities and sites; in the next stages, industrialisation dominated the tempo of social development and hence spatial development as well as architectural development. The latter change was reflected in the emergence of many new building types and a fundamental shift in basic design principles, as established by Modernism in Europe starting between the World Wars.

This chapter will discuss only some of the most significant cases, illustrating events began most intensively in the British Isles and later came to Continental Europe, spreading from the West to the East. The Central European and more specifically the Slovenian territory, which is the main focus of my studies, saw the beginnings of the Industrial Revolution in the second half of the 19th century, after the Austro-Hungarian Monarchy built the Southern Railway, which linked Vienna and Trieste in 1857.

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The development of Slovenian industrialisation and the resulting industrial architectural heritage until the end of the 20th century can be divided into five periods. The first one is characterised by early industrialisation and the operation of the world-renowned mercury mine, most intensively from the 16th century until its closing at the end of the 20th century; in 2012, the site was inscribed on UNESCO's World Heritage List /1/. The early industrialisation took place from about the mid-18th century until the arrival of the railway; it represents a stage when ironwork centres and companies from different industries came into existence. A distinct reversal was the building of the aforementioned Southern Railway, when the intensive second stage started. One of the development peaks was experienced as early as in 1863 when the Suedbahn Railway Company built the complex of workshops for repair and supply of trains in Maribor, including a workers' settlement, over an area exceeding 84.400 m^2 /2/. Industrialisation was no less intensive in the Zasavje coal-mining region, where coal mines were opened alongside, and supplying, the railroad. The next period was characterised by electrification, lasting from the turn of the 19th and 20th centuries to World War I, when several power stations were introduced. The Fala hydroelectric plant (1914 – 1918) near Maribor had the highest capacity, built to supply energy to Graz and its hinterland. After World War I, state boundaries were re-drawn and the Slav Kingdom of Yugoslavia was formed. The Fala power plant became the main industrialisation asset of north-east Slovenia, attracting many investors, mostly of German and Czech origin, who started with the construction of many textile mills in Maribor. The fourth period, wartime, is characterised by the development of the textile industry, and the successful operation of ironworks and paper production. The economic development of the post-war socialist state was characterised in its first year by directed political programmes following the Soviet model. Although in the Central European context Slovenia was industrially relatively weak, in the new socialist state it became a strong industrial centre. In line with the political planned economy and the plans for intensive electrification of the new state, it developed industries for HPP equipment and metalworking industry, as well as continuing the tradition of the pre-war textile industry in the nationalised companies. Later, the territory of the present Slovenia saw an intensive development of production of electrical equipment, household appliances, cars, and pharmaceuticals, the latter remaining one of the leading industries.

J. M. Prunner: Wool mill, Linz, 1722 – 1726. A case of early industrial architecture, with the design inspired by the architecture of city palaces

J. M. Prunner: továreň na vlnu, Linz 1722 – 1726. Príklad ranoindustriálnej architektúry, v štýle inšpirovanom architektúrou mestských palácov

Source Zdroj: Pevsner, N., 1976. A History of Building Types, London, p. 274

1.1. Buildings for industrialised production

In reviewing the history of industrial architecture's development, it is apparent that the design of the earliest industrial buildings followed the existing building types. For example, the factory in the city had the appearance of a palace, while in a rural setting it resembled a large farm building, or, in more ambitious cases, a countryside mansion or even a castle. This stage was surpassed relatively quickly: In the period of intensive industrialisation, the industrial architecture previously designed mostly by architects and builders passed into the domain of engineers – innovators and entrepreneurs who looked for new ways towards flexible and rational designs. Functionality

Source Zdroj: Archives of the Republic of Slovenia

The textile mill in Prebold, Slovenia, built in 1842, was semantically distinguished from the neighbouring castle only by its chimney, indicating that the trends in the design of industrial buildings reached the territory of Slovenia with a significant time lag

Textilná továreň v Prebolde, Slovinsko, postavená v roku 1842, bola sémanticky odlíšená od susedného hradu len svojím komínom, naznačujúc tak, že trendy v návrhu priemyselných stavieb prišli na územie Slovinska so značným časovým posunom.

became the guiding principle, decoration was gradually abandoned and within time, engineering design became the new foundation for designing industrial architecture.

Through industrialisation, industrial architecture established itself as a building type. The factory is, for the most time, the building typology through which newly developed materials and construction principles were first implemented, i.e. cast-iron and prefabricated skeleton structures, reinforced concrete, new skeletal systems, and shell structures, which were first developed at the beginning of the 20th century.

1. 2 New structures – industrial complexes and new building types

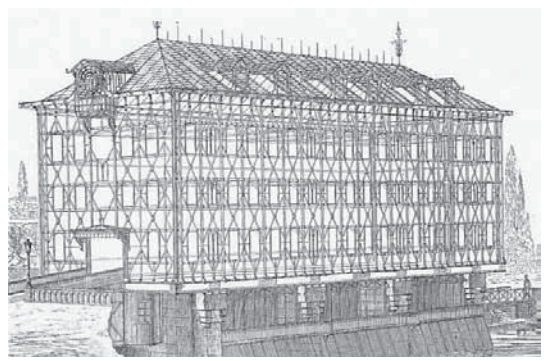
Industrial complexes are the basic physical-spatial components of the industrialisation process; in the early stages they even included housing areas for workers and owners next to production facilities, and commercial facilities, i.e. everything that optimised manufacturing. Later, some of these facilities were located off-site – first, the homes of owners, then parts of the administration facilities, and later, worker accommodations.

In the early stages, the complexes were produced in two ways: originating from functional logic and adaptation to natural conditions, and, secondly, on the basis of academic planning. The former is illustrated by the case of Robert Owen's New Lanark (1800), while an example of the latter is the Royal Saltworks of Chaux, designed by architect Claude-Nicolas Ledoux.

The New Lanark cotton-spinning mill complex is set in a narrow valley. To exploit the water power, it fully matches the terrain and follows the functional engineering logic of placement of structures. The design reflects all the postulates of functionalist urbanism, but in a spontaneous and unplanned way. In a systematic manner, this kind of planning was re-assumed by a new generation of modernists more than one hundred years later.

The design of early industrial structures is directly linked to the addressing of housing problems, caused by the need to concentrate workers in the immediate vicinity of the new factories. This very concentration and the struggle for profit led to practically unendurable conditions, which started to change only under pressure from the workers themselves; increasingly efficient organised-labour action united workers to stand against exploitation. The layout of the housing for workers in Nottingham, as presented by the Commission for Identification of Living Conditions after the 1845 field inspection, summarised by Leonardo Benevolo in the German edition of his work *The History of the City*, illustrates the conditions /3/.

Gradually, new types of residential buildings emerged, from densely packed terraced houses to multi-household dwellings built and managed by industrialists. Among others, one of the best known projects is that of André Godin, who in 1846 built a workers' community in Guise, France, inspired by the design of the utopian socialist Charles Fourier (1772 – 1837). Along with com-



Source Zdroj: http://upload.wikimedia.org/wikipedia/commons/2/25/Chocolaterie_Menier_moulin_Saulnier_1.jpg

The new building materials and principles were often first tested in architecture for industry: A: the first known iron skeleton in Menier chocolate factory by J. Saulnier, 1871 – 1872

Nové stavebné materiály a princípy boli často najprv preverené v architektúre priemyslu: A: prvý známy oceľový skelet v továrni na čokoládu Menier od J. Sauliniera, 1871 – 1872

fortable apartments, Godin's Familistère included a nursery, a co-op store, an elementary school, a library, communal washrooms, and garden allotments; in short, greatly exceeding the standards of most workers' living environments before the 20th century.

In Slovenia, a great number of workers' housing schemes emerged in the second half of the 19th century. These were mostly modest multi-household dwellings, while later, on a larger scale, apartment blocks were built. The period of socialism saw a substantive change, in which it was the state that strove to provide housing for each worker. However, due to economic difficulties this project invariably fell short of its goals, while the period of socialism also saw the growth of self-built housing

1.3 The industrial landscape

All these changes began to make their mark on the landscape, both urban and rural; rural areas grew intensively urbanised in the proximity of mining. The intensive processes were most clearly visible in Great Britain, as depicted in the sketch of the industrial landscape of textile mills in Manchester by K. F. Schinkel, 1826, perhaps the best-known visual depiction of this new environment.

In the cities, industry was mostly developed in the outskirts, along the watercourses that drove machinery and removed sewage. In urban designs of other parts of cities, utilitarian principles were intensified as the design baseline.

On the Continent, existing principles based on the tradition of academic planning were replaced on a large scale by rational engineering designs on the pattern of orthogonal grids, allowing for the rapid expansion and control of urban structures. In mining regions, subject to their own pattern of intensive industrialisation and urbanisation, the processes were adjusted to the presence of pit-heads and local topography. The most extensive structure of this typology began to develop in the early 19th century in Germany's massive Ruhr Valley coalfield, which developed into the largest European industrialised conurbation [4].

As for Slovenia, in addition to the region of Idrija, a mining centre from the 16th century onwards, the period until World War II saw the development of industrial landscapes in major railroad towns and on the outskirts of major cities, such as Maribor, Celje, and Ljubljana, where industries were intensively developed. Between the World Wars, the town of Kranj also saw intensive industrial development. The politics of socialism promoted the construction of factories ultimately in each settlement; however, there were not many other new centres with the dimensions of an industrial landscape. Let us mention the two examples of industrial towns of Velenje, Kidričevo, and Novo Mesto with the automotive and pharmaceutical industries.

1. 4 Impact of industrial architecture on the development of 20th century modernist architecture

Along with the many realisations up the end of the 19th century, despite the tradition-oriented academic architectural profession, incentives for a thorough change in planning began to emerge

Also slab floors and mushroom-head columns by R. Maillart were first used in industrial warehauses in Altdorf in 1910

Taktiež doskové stropy a stĺpy s hríbovými hlavicami od R. Maillarta boli prvýkrát použité v priemyselných skladoch v Altdorfev 1910

Source Zdroj: http://commons.wikimedia.org/wiki/File:Eidg._Getreidelager_Altdorf_18_11.jpg

based on new technological evidence introduced by many innovators – engineers. On the Continent, the Werkbund had a key role; it was founded in Germany at the instigation of Hermann Muthesius, to introduce the advantages of British economy into the German industry, thus promoting the competitiveness of the German national economy. Through its congresses, the Werkbund presented the principles of industrialisation and its significance to the avant-garde generation of architects, the pioneers of the modernist and functionalist thought of the 20th century – Walter Gropius, Mies van der Rohe and Le Corbusier, to mention only the key members who attended the Werkbund Congress in 1907.

Having all been educated abroad, the Slovenian architects of the time were familiar with the current architectural trends. Even in the interwar period, some highly visible examples of functionalist architecture were built. In terms of industrial architecture, however, the most important accomplishments were the works of international civil engineers and domestic builders. The University of Ljubljana, with its Department of Architecture, was founded in 1918; however, the department was dominated by Jože Plečnik who was no supporter of functionalism. Nevertheless, some of his best students started to design functionalist architecture. In fact, functionalist architecture made its way into Slovenian architecture even before the war, with architects who were educated both locally and abroad, particularly in Vienna and at several Italian universities.

To summarise, we see that as the Industrial Revolution spread, it brought about not only technical innovations, but also considerable changes in architecture and urbanisation. By World War II, practically all of the principles of modern construction had been introduced in Continental Europe; reinforced concrete, as the new, low-cost material, allowed for impressive scale and great flexibility of design, and became the primary material used in all building types.

Intensive urbanisation, as the outcome of the new type of manufacturing, was kept under control using new spatial and planning principles, and the chief focus of design became the search for quality and the creation of housing solutions for the modern man. The new generation of architects who replaced the old historical principles with the visions of modernism and functionalism made a significant contribution in this regard; in fact, they based their work mostly on the new principles introduced by industrialisation. For this reason alone, it is important to study these processes in an integrated manner and to develop effective protection projects for the sites and structures that were, in their localities, the important transmitters of these processes.

Source Zdroj: KAGG, W.: Industriebau. Stuttgart 1994, p. 45

In industry tested famous Hennebique System, by F. Hennebique – first building was Charles Six spinning-mill, at Tourcoing in 1895

Známy Hennebiqueov systém, od F. Hennebiquea bol prvý krát použitý v pradiarni Charles Six, v Tourcoing v roku 1895

Photo Foto: Sonja Ifko

The case of implementing the cast-iron construction in textile mill in Tržič, built in 1885, but the oldest examples on the territory of Slovenia dated in 1860s

Príklad použitia konštrukcie zo železobetónu v textilnej továrni v Tržiči, postavenej v roku 1885, hoci najstaršie príklady siahajú do šesťdesiatych rokov 19. storočia

2. ESTABLISHMENT OF INDUSTRIAL ARCHITECTURAL HERITAGE AS A CATEGORY IN CULTURAL PROTECTION

Treatment of industrial heritage as a cultural category can be traced only to the 1980s at the earliest /5/. At the time, the general public, official conservation policy, the organisations that financially supported the conservation projects, and even the industry of the period itself still failed to appreciate industrial heritage as part of cultural tradition, not even in regions with a rich industrial tradition. Unfortunately, despite the worldwide recognition of industrial heritage in many countries, even today the appropriate treatment of this has not been put in place yet.

Regarding industrial architectural heritage, the heritage values were mostly addressed within the restructuring processes, where only outstanding facilities, i.e. in terms of design, aesthetics, or construction, were preserved. More often than not, though, the overall testimonial value of the complexes was neglected. This neglect was particularly evident in the early stages of post-industrial restructuring, when similar processes were underway in all environments, during which the question of heritage protection practically had no role. Generally, changes occurred after the destruction of worthwhile built heritage in the first restructuring stages, which were mostly focused on the optimisation of the economic remediation of the sites. And, understandably, the withdrawal of the primary production functions led to unemployment and social difficulties, which were addressed as a priority.

To optimise the effectiveness of these processes in the future, it is important that protective measures are established as realistically as possible, and are implemented in the stage when they can be most efficient in the sense of new development topics. In fact, after the end of their primary productive function, practically all industrial regions end up in the situation of receiving new

The Hennebique System also came to the territory of Slovenia with a relatively large time lag. The first case of this was the Pollak's leather factory in Ljubljana from 1922

Hennebiqueov systém sa objavil na území Slovinska tiež so značným oneskorením. Prvýkrát bol použitý v Pollakovej továrni na kožu v Ľubľane z roku 1922

Photo Foto: Miran Kambič

functions to enable their existence. Clearly, not all structures can be turned into museums, but their documentary value can be preserved if their renovation is done properly. And in turn, preservation is successful only if it is based on professional research work.

Industrial regions are complex; hence efficient and systematic approaches to preservation are required, relying on a comprehensive analysis. Industrial complexes are a reflection of various processes, not only of work, but also of life, research, production, and all the dimensions are connected by spatial and material structures, on yet another level rendering the work even more complex. I dealt with this topic in the research within my PhD dissertation from 2003 /6/, in which I presented a methodology developed for Slovenia, but in a generalised re-evaluating manner, upgraded with a proposal of the method for transferring the research and analytical phase directly to the design phase. Moreover, I proposed the inclusion of the interested public –civil society as an efficient part in the development of projects, in other words the inclusion of the people who are directly linked to the restructuring processes. These people are the ones who are left unemployed and thus have direct economic interests, as well as also possessing the know-how and the awareness of the heritage of the factories they worked in.

3. INTEGRATED ANALYSIS OF INDUSTRIAL ARCHITECTURAL HERITAGE AS THE BASELINE FOR IDENTIFYING PROTECTION AND INTERPRETATION ACTIVITIES

3.1 Starting points

The basic element of the analysis – the industrial complex

The baseline of the research and evaluation methodology is that the industrial complex is the basic format of industrial heritage, i.e. the basic whole within which the overall production process is carried out. It is the aggregate of architectural and technical characteristics, and as such provides the starting point for a comprehensive analysis. The exclusion of individual structures from the whole is unreasonable, but still extremely frequent. Indeed, the protection of entire complexes is in most cases impossible; however, they should be analysed as a whole, while the protective measures should be designed in such a way that their documentary value is reduced the least.

Photo Foto: Miran Kambič

The inside shell ceiling above the engine hall in the Fala HPP from 1918 provided an innovative, state-of-the-art solution; it is a thin – 5 cm thick, reinforced concrete shell, partially suspended from the roof trusses with thin steel wire ropes

Vnútro škrupinového stropu nad strojovňou vo Fala HPP z roku 1918 poskytla inovatívne, toho času špičkové riešenie; ide o tenkú – 5 cm hrubú, železobetónovú škrupinu, čiastočne zavesenú zo strešných väzníkov s tenkými oceľovými drôtenými lanami

Complexity and the interdisciplinary approach

Industrial heritage, including architectural heritage as one of its components, is complex both in its material legacy and in its historical documentary value. This is why a comprehensive and interdisciplinary research approach is necessary, and hence the cooperation of many experts that can develop effective conservation programmes through their mutual teamwork. The analytical research work can be divided into four basic groups depending on the characteristics of the heritage:
– historical documentary characteristics,

– technological and technical characteristics,
– architectural characteristics,
– spatial and urban characteristics.

Studying the continuity of development, and the design of a 'dynamic methodology'

Considering the multidisciplinary approach to research, we must emphasise the necessity of researching the continuity of development. This aspect was already mentioned by the industrial archaeologist M. Palmer /7/, and two other important industrial heritage researchers, i.e. Stratton /8/ and Cherry /9/, in terms of the necessity of contextualising the researched structures in time and location of their origin. Hence, the development can be presented comprehensively and comparatively.

In line with the direction of the research, we should also draw attention to another assumption in the design of the research and the methodology of protection, which is relevant for the design of the evaluation method. 'Dynamic methodology' /10/, is a methodological stance appropriate for, and adaptable to, the same segment of heritage across all its periods of development, e.g. industrial architecture of the 18th and 19th centuries, including the structures built up to this day.

3.2 The process of researching and analysing industrial heritage sites

Industrial architectural heritage, with the industrial complex regarded as the basic analytical unit, is analysed and evaluated as an architectural and spatial/urban category on three levels /11/:

1. The entire industrial complex as the basic organisationally and spatially completed unit.
Interdisciplinary research should be included to define the historical documentary characteristics (workplace, work safety, leisure activities for workers etc.).
2. The individual buildings inside the complex, revealing their architectural characteristics.

New Lanark, 1800, bought by Robert Owen to bring to life his humanitarian principles of work and life organisation in the early industrial society, revealing clear postulates of functionalist urbanism, albeit not intentionally

New Lanark, 1800, kúpený Robertom Owenom, s cieľom priviesť k životu svoje humanitárne princípy práce a organizácie života ranopriemyselnej spoločnosti, odhaľujúc jasné postuláty funkcionalistického urbanizmu, i keď neúmyselne

Source Zdroj: PEVSNER, Nikolaus: A History of Building Types. London 1976, p. 278

Heliogravure of the complex of the Vevče paper mill from 1857, demonstrating how the site selection and placement of industries was based on functional baselines

Heliogravúra komplexu továrne na papier Vevče z roku 1857 ukazuje, ako sa výber a umiestnenie priemyslu zakladali na funkčných východiskách

Source Zdroj: ŠORN, Jože: Razvoj papirnice Vevče. Ljubljana 1956, p. 57

Interdisciplinary research should include the study of the technological and technical characteristics (history of mechanical equipment and technologies, history of buildings and building materials).
3. The industrial complex related to the broader environment at the spatial/landscape level. Other interdisciplinary research should be included in this level (urban history, transport development, and urban sociology) to define the historical documentary characteristics and the actual impacts of the complex on the environment.

In the further presentation of the analytical process, the paper focuses on architectural, spatial, and urban characteristics. In the next chapter (4), dealing with the actual design of protective processes, the inclusion of the findings from other fields within the protection and interpretation processes will be discussed.

3.2.1 Analysis of the industrial complex as the basic production unit

As mentioned in Chapter 3.1, the industrial complex is the basic unit of investigation, and is analysed as the basic production unit in relation to site selection, functional and morphological characteristics, and compositional development characteristics.

Site selection

Site selection is analysed based on the following parameters:

Functional conditions

The site selection is specified due to the proximity of raw material, mining sites, energy resources, users, labour force, and similar factors.

Specification also depends on the proximity of important transport routes (roads, rail, ports etc.).

Economic, political and social conditions

Here, site selection occurs in relation to important economic events, economic milestones, and crises. Within this set of conditions, we analyse the impact of political decisions on the site selection, finding whether it is subject, e.g. to decisions to help underdeveloped areas, creation of industries to reduce social unrest, restructuring of the economy, and the like.

Relationship to existing spatial structures

Site selection is defined in relation to spatial relationships, adjustments to the location and nearby structures.

Environmental parameters

Site selection is defined in relation to environmental impact, where sites are regarded as positive where the selection took into consideration the physical consequences of landscape impacts, as well as emissions that would have adverse effects on residential areas.

Functional and morphological analysis

On this level of the analysis, we study the impacts of functional development on the organisation and design of industrial complexes. The morphology of the complexes is directly linked to the changes occurring within functional concepts. In general, the functional and morphological development is divided into the following five sets, which coincide with the key development stages of industrialisation in the territory of Slovenia.

Proto-industrial design (from the mid-16th to the early 18th century)

In this period, industrial manufacturing was started and completed in people's residences. Coal (iron works) or hydropower (mills, sawmills) were mostly used as energy sources. The sites were linked to the proximity of the sources of raw materials and water. Work was still organised in the form of workshops.

Design of semi-industrial and early industrial plants (from the mid-18th to the mid-19th century)

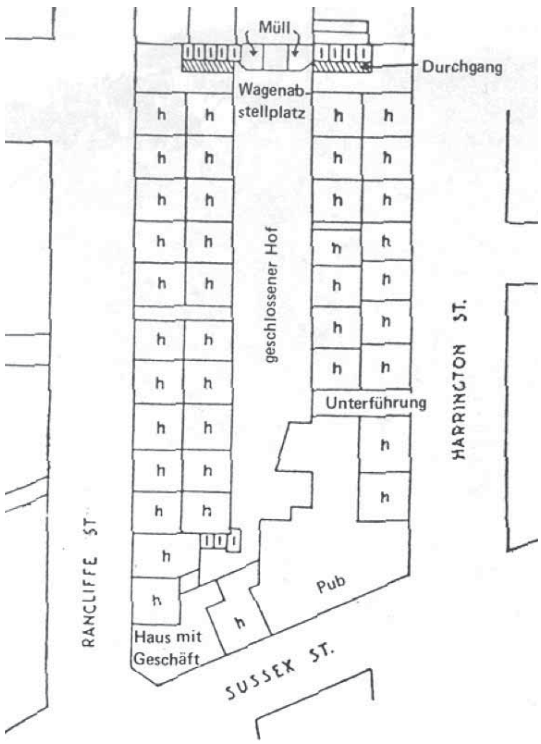
In the next stage, when the scale of production increased and was concentrated in plants, the production moved out of individual residences. The new structures are exclusively dedicated to production; they are dependent on water resources as the main source of energy, though their locations primarily depend on the proximity of raw materials. Many ancillary installations are created next to the production facilities, as well as housing for workers and owners.

Design of multi-functional industrial complexes (from the late 19th century to WW1)

In the course of industrial development, the owners' private residences moved away from the factory premises. Permanent control was given to the manager. The scale of production was related to the increase of workers' housing near the factory complex. Within the complex, the owners' provided facilities e.g. a store, a pub, and a savings bank. Physical structres also becoming increasingly complex due to the larger scale of production. The factories have energy stations; coal is used to heat water, while steam is used to drive machinery.

Design of mono-functional production sites (from 1918 to WW2)

Factory complexes of the period are adapted with great precision to the production activity. The production becomes complex, so that workers too move out of the factory premises. The head office is moved to an urban economic centre, while at the production complex only the necessary production control administration remains. The factories receive their energy from power plants. Thermal stations remain on-site, as the production requires



Source Zdroj: BENEVOLO, Leonardo: Die Geschichte der Stadt. Frankfurt/New York 1991

Workers' community in Notthingham, as drawn by the Commission for Identification of Living Conditions after the 1845 field inspection, terraced houses (h), toilets (l), waste (Müll), courtyard (geschlossener Hof), pub (Pub), and store (Haus mit Geschaeft)

Robotnícka komunita v Notthinghame, ako ju načrtla Komisia pre identifikáciu životných podmienok po terénnej inšpekcii v roku 1845, terasové domy (h), záchody (l), odpad (Müll), dvor (geschlossener Hof), krčma (Pub) a obchod (Haus mit Geschäft)

a lot of steam or industrial water. In this period, the complexes are no longer directly dependent on energy resources, with a few exceptions.

Period of socialist industrial combines (from 1945 to 1991)

The period after World War II is characterised by intensive industrialisation, when along with the newly emerging large-scale industrial combines, there appeared the construction of entire residential areas, even vocational schools and clinics. The care for workers' quality of life grows considerably; along with clinics, there are other social facilities, such as canteens, washrooms, and recreation installations. However, the sites are now the subject of political decisions.

Compositional and semantic characteristics

The guiding principle of the organisation of industrial complexes is to accommodate the needs of organising production within the complex, while, on the other hand, the key elements of the design are compositional and design principles prevailing in a specific period.

The analysis of the development of urban design compositions explores the relationships between the urban and compositional principles relevant in the period, i.e. when the investigated complexes were built, and the functional starting points which, on the other hand, had a significant impact on the compositional design of the complexes. Having this in mind, the spatial and compositional development characteristics of the investigated complexes are specified within one of the following stages:

Free designs subordinated to function

Designs that emerged in the early period of industrialisation had a free composition. They recall functionalist structures, but are not the outcome of consciously following the functionalist principles, but instead a set of random distributions, guided by the pragmatic needs of providing a practical layout and design of production areas.

Axisymmetric design

The next stage is a more organised industrial construction, directly linked to the arrival in the railway in the territory of present Slovenia. The constructions involved universal historicist axisymmetric compositions of the era, particularly used for major complexes by wealthy investors and state-owned companies

Photo Foto: Sonja Ifko

The workers' colony in Maribor was built by the Suedbahn Railway Company in the 1860s, in the vicinity of the company workshops. It has undergone an exemplary renovation with the assistance of the experts from the Institute for the Protection of Cultural Heritage

Robotnícku kolóniu v Maribore postavila železničná spoločnosť Suedbahn alebo Südbahn alebo Soudbahn v šesťdesiatych rokoch 19. storočia v susedstve dielní uvedenej spoločnosti a prešla príkladnou obnovou za účasti odborníkov Inštitútu pre ochranu kultúrneho dedičstva

Functionalist design

In the period around World War I, there was a considerable expansion of open composition designs, which paved the way to functionalism. Functionalism was prominent between the wars, with the emergence of free designs accommodating the rational organisation of complexes. During World War II, the compositions were generally based on the orthogonal grid, with one, or more, compositional axis emphasised.

Evolution of semantic characteristics

Semantic characteristics are among the basic distinctive features in the visual definition of an industrial complex. Semantic analysis is the presentation of those elements that critically shape the appearance of architectural entities in specific periods. In the case of industrial complexes, the main semantic elements – the factory chimney and the saw-tooth roof – developed functionally, yet also emerged as the symbols of industry. The characteristics of this transformation can be followed in the next development stages.

K. F. Schinkel: Sketch of Manchester in 1826
K. F. Schinkel: Škica Menčestru v roku 1826

Source Zdroj: PEVSNER, Nikolaus: A History of Building Types. London 1976, p. 277

Semantic indistinctness

The early period of industrialisation created production sites that are semantically indistinguishable from other architecture. In rural and urban areas, previously existing forms are used where new uses are organised, while particular functional components show the differentiation of functions.

Introduction of semantic elements

Due to the new functional elements (energy facilities, production halls), the design of industrial complexes became increasingly specialised. Along with boiler rooms, the image of the tall chimney became a landmark of industrial areas.

Semantic distinctness

Industrial complexes become identifiable by shed roofs, large volumes and simple design, features that establishes themselves as the symbolic characterisation of the building type.

3.2.2 Analysis of individual buildings within the industrial heritage complex

For a comprehensive review, it is necessary to expose the main objective of industrial facilities – protection of the machinery in order to optimise production. In the next development stages, the primary objective of 'protection for machinery' evolved by accommodating the new needs and criteria of design. At all times, the design was subordinated to functional and rational solutions that were more or less complemented with the addition of aesthetic and decorative elements. Further along, the leading principle of functionality became prevalent and started to influence the aesthetics of architecture.

In brief, the basic developmental characteristics of individual industrial buildings can be characterised by the following three analytical segments:

Functional analysis

Function is the basic characteristic that most directly defines industrial-architectural design; hence, functional typology is the basic typology of both industrial buildings and industrial complexes.

Regarding older heritage, we see that residential areas are directly linked to production areas, and must also be treated as part of the segment.

This typology classifies industrial buildings in accordance with their function in the production process. The basic division distinguishes between production, energy, transport, storage, and commercial facilities. Each branch has its specific production scheme that should be known, and the role of individual buildings should be evaluated when they are analysed according to their function. Therefore, it is necessary to prepare analytical parameters for each type of production. The elaboration of such analyses must be interdisciplinary; however, a full description is beyond the scope of this paper.

Morphological-typological analysis

The building morphology of industrial facilities depends directly on the function or type of production, and the know-how and approaches to solving the issues of building and design aesthetics. The most basic morphological division is between:
– single-storey,
– multi-storey and
– engineering structures (chemical and processing industries).

Visual and aesthetic analysis

The development of visual and aesthetic characteristics of industrial facilities follows the path of rationalisation and the decline in architectural ornament. Industrial facilities first imitated the decorations of prevalent historicist trends in 19th-century design, yet up to the mid-20th century, a form of functionalist expression emerged. The

development of designing and implementing the new aesthetics follows three basic stages.

The first stage includes traditional axial structural designs and the employment of decorative elements. During this period, industrial buildings display the subordination of a specific aesthetic to the criteria characteristic for the rest of architecture.

The second stage is the transitional period, in which the awareness of the new path for design and aesthetics, originating in the philosophy of industrial production, began to gain ground. The result is a stylistic combination, including non-symmetric compositions and the transfer of structural characteristics of the buildings to the façade; open ground plans are used. At first, decoration is adapted to the new stylistic guidelines, later it turns into simple geometry, and then gradually withdraws.

The third stage involves functionalist, non-symmetric designs that started to develop in the 20th century, when the principles of functional, volumetric compositions were assumed as a guiding principle by the rest of architecture.

3.2.3 Analysis of industrial architectural heritage as a spatial and landscape value

According to M. Palmer and P. Neaverson, the industrial landscape is one in which industry is the main factor of design /12/. In their work *Industrial Archaeology* /13/ they determine three basic system units of the industrial landscape: production units, transportation networks, and settlement patterns. In their logical exposition of the units, the authors provide concrete interpretations relating to the conditions of the early industrialisation of the 18th and 19th centuries. The three presented systems are, in fact, universal, so they need to be appropriately interpreted to define the continuity of industrial landscape development. These elements are also characteristic for the emergence of the Slovenian industrial landscape, which developed under specific circumstances that gave rise to specific solutions and relationships among the aforementioned systems.

Changes on the level of the landscape are manifested in the design of new spatial relationships and transformation of spatial identity. The effects vary: in some places, industrial construction only affected the structures in the impact area, while in other places the concentration of industrial construction led to the development of a genuine industrial landscape. In this regard, the impact on spatial development can be seen across two levels: the basic one, i.e. in terms of immediate local effects on the urbanisation process, and the complex one. The latter relates to the impact of industrial construction that led to the emergence of a more complex industrial landscape system.

First-stage analytical parameters: Impacts on the built environment

Impacts on the built environment analyse the relationship to urbanisation of both micro-areas and the design of major urban developments. Since each case is specific, it is necessary to describe these impacts at the inventory stage and later make a comparative evaluation.

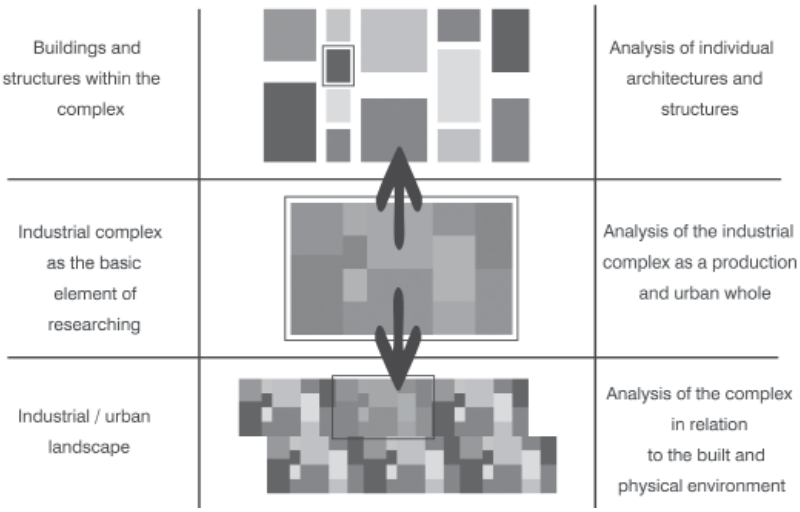
Impacts on the physical environment

Historically, the effect of industry on the environment was mostly aggressive. Indeed, the adverse consequences and impacts on human health led to the first protective measures in the field of design of technological processes, and later with regard to site selection and placement of industries. At this point of the analysis, we also need to define the parameters that determine the relationship to the physical environment. Here, the

The industrial landscape on the outskirts of Maribor in the 1930s, with textile factories built by German investors who came from the Czech territory

Priemyselná krajina na kraji Mariboru v tridsiatych rokoch 20. storočia s textilnými továrňami vybudovanými nemeckými investormi, ktorí prišli z územia Čiech

Source Zdroj: Regional Archives Maribor



Source Zdroj: IFKO, Sonja: Varstvo industrijske arhitekturne dediščine v Sloveniji. Doctoral dissertation, Ljubljana 2003, p. 250

Scheme of the levels of analysing industrial heritage sites

Schéma úrovní analyzovania území priemyselného dedičstva

interdisciplinary collaboration of qualified experts is necessary.

Impacts on local identity

Industrialisation as a global phenomenon influenced the development of the landscape and hence the formation of spatial identity. We need to draw attention to the various levels of impacts. Firstly, the impacts as a result of expansion of industrial production, specifically the building of factories and the development of a new social segment – the working class; the new way of life and the development of space under the new conditions, different from the ones prior to urbanisation. Secondly, there are the impacts of industrialisation caused by implementation of industrial products in construction, first in urban areas and later in rural areas as well.

In studying the impacts of industrial sites upon spatial identity, we first need to analyse the negative and positive consequences and present them comprehensively.

Second-stage analytical parameters

In the event that the first-stage industrial complex is identified as part of a more complex system, i.e. the industrial landscape, we must then analyse the developmental characteristics in relation to the landscape that it helped to create; otherwise, the analyses ends at this stage.

The analysis at this stage identifies the forces shaping the development of the industrial landscape and the role of individual complexes or smaller industrial sites as parts of the landscape system. The analytical parameters are combined in three groups:

Definition of the type of industrial landscape that the complex belongs to

At this stage, we need to analyse the structural characteristics of the landscape that the complex in question belongs to. According to the recognised development characteristics in Slovenia, we can distinguish between the following structural types of the industrial landscape, which are specified in the chapter “Development characteristics of the industrial landscape”, after Palmer and Neaverson /14/:

– mining industrial landscape,
– monocultural industrial landscape,
– linear industrial landscape,
– industrial landscape as part of an older urban system.

Impact of the industrial complex on the structural characteristics of the landscape that it helps to create

At this stage we need to determine how the complex influenced the existing structure and, on the other hand, to show how the landscape-structure itself affected its design.

We also need to define the characteristics and interactions between all the elements shaping the industrial landscape that the complex belongs to. Along with production sites, these factors include transport systems and residential areas with associated activities.

3.3 Analysis as the basis for determination of protective measures

After the completion of the analytical part, it is necessary to prepare protection baselines and the provisions for implementation of protective measures on their basis, and to do so for each segment to be preserved. The work must proceed in deliberate stages to assure that all protection requirements are considered, and to be able to control the implementation of protective

provisions in the next project stage, i.e. during the coordination with the design conditions of the renovations.

First stage:

The protective measures for preservation of the industrial complex as a whole are defined, hence all the key elements assuring a comprehensive testimony of the complex inside and outside must be provided, i.e. in relationship to the environment to which it belongs.

At this stage, the results of analyses of all the experts taking part in the interdisciplinary research group must be included (characteristics of historical testimony), and the approaches to protecting the overall testimony of the complex must be defined. In this regard, the methods of presentation and interpretation need to be defined, as this is the most efficient way to link the requirements to the design phase.

Second stage:

For each structure within an industrial complex, we need to determine the conservation level of the given structures, and for all the existing structures, we need to define the level and method of protection for the whole and its parts.

At this stage, we need to determine, along with the definition of protective measures for architecture, the protective measures regarding the technical and technological heritage.

Third stage:

At this stage, we determine the parameters enabling the preservation of the complex as part of the urban entity. We need to expose the elements that affect the structure of the landscape, the role

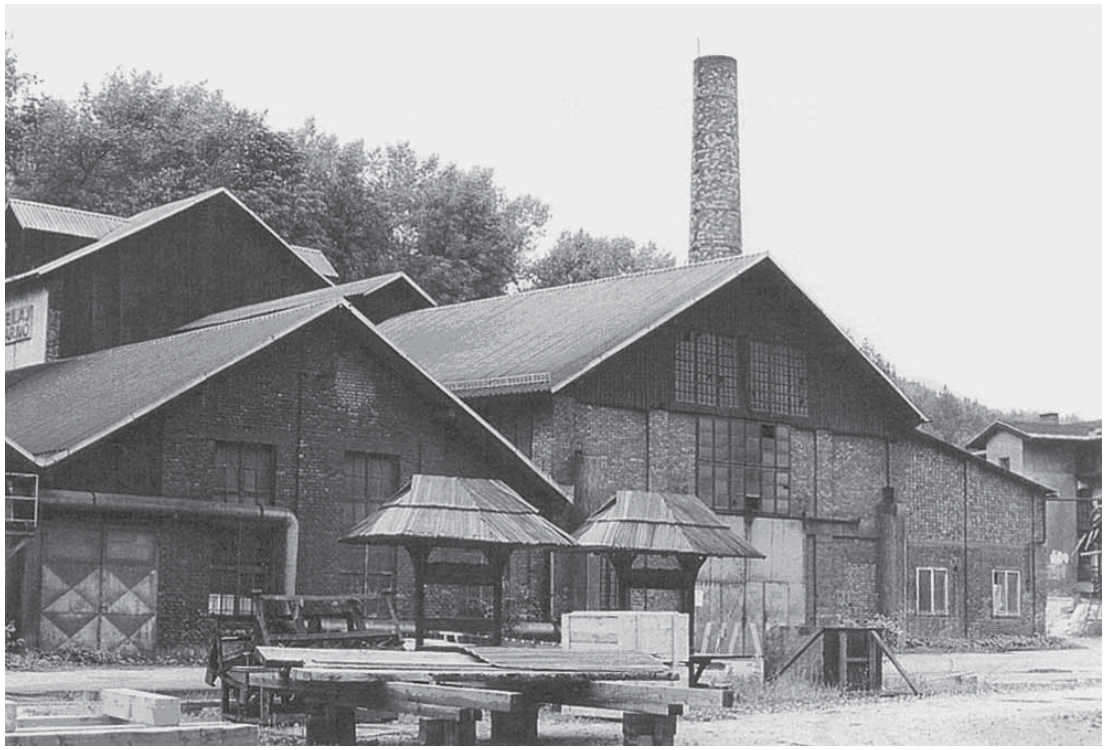


Photo Foto: Sonja Ifko

The project of re-using the oldest part of the ironworks in Ravne na Koroškem for museum use is one where the methodology presented here was implemented, i.e. in a scope necessary for overall analysis

Projekt konverzie najstaršej časti železiarní v Ravne na Koroškem na múzeum je projektom, kde bola použitá metodológia prezentovaná v príspevku, ktorá mala potrebný rozsah k celkovej analýze

The new museum use of the abandoned swaging forge, which is partially preserved in its most original condition, while its other part has been renovated (i.e. adaptive re-use) for exhibitions and as the regional museum's venue area

Nové múzeum vzniklo konverziou opustenej zápustkovej kováčne, kde niektoré časti sú kompletne archeologicky zachované, zatiaľ čo ďalšie boli obnovené a konvertované na účely výstav a priestory miestneho múzea

Photo Foto: Sonja Ifko

of the complex in experiencing the landscape, and the parameters that will enable the conservation of the basic heritage spatial qualities, which means the preservation of its spatial testimony and identity under the changed circumstances. We also need to define the measures necessary for environmental rehabilitation, if required.

4. TRANSFER OF ANALYSIS OUTCOMES TO THE DESIGN OF PROTECTIVE AND PRESENTATION MEASURES

The process of transferring the analytical part into practical implementation is the most demanding and crucial element for the quality of the renovation and preservation of built heritage. The high complexity of the heritage of industrial sites requires precise determination of the process and the phasing of the work. Most importantly, after the determination of what is to be protected, the investors and future users should be included in the determination of protective measures from the design stage onwards, and periodically review the feasibility of the plan. This is particularly important since the majority of industrial heritage does not have the highest level of legal protection, and investors often decide to make considerable changes (destruction of heritage), regardless of the reality of higher investment costs, usually to create a higher economic impact. For this reason, it is particularly important that the investors are made aware of the significance of industrial heritage, and are familiar

with the approaches that not only allow for conservation of authentic structures but also assure higher financial efficiency. Indeed, heritage qualities are increasingly emerging as an important economic potential in the case of industrial sites.

4.1 Significance of the inclusion of civil society in the processes of industrial heritage protection

An increasingly important aspect of the regeneration of abandoned industrial sites is the protection of know-how and traditions – intangible heritage, where people have the key role as carriers of knowledge. Their integration into the preservation processes is of great importance. As a result, the protective aspect is paired with a corresponding and significant social role; indeed the closing of companies is associated with loss of work and the search for new opportunities, which regeneration protective projects can create for the affected people, at least in the short-term.

Importantly, former employees, or those who are willing to be involved, can be involved already in the data collection stage, and they importantly participate in the design and implementation of presentation and interpretation processes, where they can assume important roles of heritage presentation /15/.

The inclusion of former employees has proven to be encouraging in the raising of awareness regarding the significance of heritage in the local area, where after the abandoning of production the sites were faced with a crisis of identity and a loss of developmental vision, along with economic and social problems. Through an effective approach, involving the inclusion of the former employees, these adverse circumstances can be overcome relatively easily.

4.2 The preservation process as a part of restructuring abandoned industrial heritage sites

Design guidelines for heritage protection should be drawn up based on protection baselines and the outcomes of the analytical work by all the experts in the interdisciplinary group. It should be noted that we must start off from an overall evaluation of the material structures as the platform of heritage protection.

The heritage protection design guidelines present any requirements to be taken into consideration in the renovation design. For effective work, it is essential that the conservation plan is made with guidelines for the investor and the potential users.

At this stage, i.e. prior to the development of the renovation project, it is crucial that the requirements are clear and coordinated with the investor, so that the developments will, in fact, be included in the project. At this stage, enough time should be dedicated to coordination of all the parties involved in the project, and the indicative amount of the developments should be estimated.

Importantly, the coordinated baselines for project activities, at the draft design stage, should be presented to the local public. Highlighting the contents related to the local tradition and identity should be encouraged, as this will assist the investor in anchoring the project in the local territory, and benefiting from greater financial efficiency. The successful integration of the heritage community with the investors is reflected in successful protection and financial results.

To sum up, the basic stages of the proposed methodological approach to achieve efficient protection outcomes should be structured as follows:

1. The analytical stage, consisting of three basic stages

a. Analysis of the industrial complex as the basic production unit, including a parallel analysis of its historical testimony characteristics.
b. Analysis of all significant facilities (buildings and structures) of the complex, including their technical and technological characteristics.
c. Analysis of the relationship between the complex and the built and physical environment of which it is part.

2. Preparing protection baselines

a. At the level of the industrial complex, we define the parameters showing the criteria regarding site selection, functionality of designs, complex organisation and its urban design. We need to expose the historical documentary characteristics that we wish to include in the conservation plan within the protection and interpretation part of the project.
b. For all important facilities (buildings and struc-

tures), the following should be evaluated: the form–function relationship, the level of technological innovation and the compositional characteristics of the architectural designs. The evaluation should include the results regarding technical and technological characteristics.
c. At the level of the spatial characteristics of the complex, we should evaluate the relationships that we want to preserve, i.e. those that developed between the complex and the built and physical environment of which it is part.

3. Coordination of protection and design requirements

Parallel presentation of protection baselines to investors and vice versa: the proposal of the new programme by the investor to the heritage conservation authorities. At this level, the requirements of heritage conservation services, investors and users should be coordinated.

4. Providing the local public with information regarding the draft design

The local community should be informed about the renovation development plans and the significance of the heritage, and included, as far as possible, within all further project development, as this is critical for successful protection and development implementations.

5. Coordination of all relevant stakeholders

The inclusion of the growing number of stakeholders will imply additional work and coordination; moreover, the competences should be clearly defined.

6. Work on the project

During the renovation project, it is important to manage and control the workflow; at the same time, the conservation experts should prepare interpretation programmes in which it is important to include the civil society concerned.

7. Keeping the public informed of project developments

This element should run in parallel with all project phases. It is crucial for the project, as it allows its connection with the environment, i.e. for site to become again a vital part of the environment after the renovation

5 CONCLUSIONS

The answers to the question of how to protect industrial heritage as an architectural and spatial value as efficiently as possible, which is the key topic of my research and design practice, are today more or less similar than over a decade ago.

To carry out a comprehensive analysis and evaluation of industrial heritage and its development impacts, it is necessary to go beyond the traditional criteria derived from the aesthetic and art-historical evaluation system. The objectification of criteria is clear in the sense of inclusion of such parameters as functionality, morphology as the result of function and construction know-how, composition as an expression of dynamic development. The qualities of spatial development define the functional baselines, i.e. the rational relationship to the built and the general physical environment.

Industrial complexes with all their facilities and structures are the basic element of protection and determination of the developments of protection and interpretation both inwards, i.e. by defining protection developments for individual facilities and their parts, and outwards, i.e. in relation to the space to which they belong. This actuality needs to be considered, regardless of the situation that we encounter in practice.

Based on working experience from specific projects, there is an evident difficulty in implementing the academically developed methodology due to various reasons, usually of a financial nature, where neither heritage protection professionals nor investors can afford the comprehensive investigations and comprehensive renovation projects. More often than not, the work is developed in stages and fragmented. Nevertheless, it is important that we follow the basic structure; only integrated activities, supported by quality research, can bring the desired outcomes. Additionally, it is necessary to ensure that appropriate information is given to the public, as heritage popularisation is instrumental for the enhancement of it.

NOTES POZNÁMKY

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15 Such cases have proven successful in practice, as former employees acted as excellent guides on the sites, helped to collect information, and similar instances.