

## ADAPTIVE REUSE FOR NEW SOCIAL AND MUNICIPAL FUNCTIONS AS AN ACCEPTABLE APPROACH FOR CONSERVATION OF INDUSTRIAL HERITAGE ARCHITECTURE IN THE CZECH REPUBLIC

*Oleg Fetisov<sup>1</sup>*

1. *Czech Technical University in Prague, Faculty of Civil Engineering, Department of Architecture, Thákurova 7, 166 29, Prague 6, Czech Republic; oleg.fetisov@fsv.cvut.cz*

### ABSTRACT

The present paper deals with a problem of conservation and adaptive reuse of industrial heritage architecture. The relevance and topicality of the problem of adaptive reuse of industrial heritage architecture for new social and municipal functions as the conservation concept are defined. New insights on the typology of industrial architecture are reviewed (e. g. global changes in all European industry, new concepts and technologies in manufacturing, new features of industrial architecture and their construction and typology, first results of industrialization and changes in the typology of industrial architecture in post-industrial period). General goals and tasks of conservation in context of adaptive reuse of industrial heritage architecture are defined (e. g. historical, architectural and artistic, technical). Adaptive reuse as an acceptable approach for conservation and new use is proposed and reviewed. Moreover, the logical model of adaptive reuse of industrial heritage architecture as an acceptable approach for new use has been developed. Consequently, three general methods for the conservation of industrial heritage architecture by the adaptive reuse approach are developed: historical, architectural and artistic, technical. Relevant functional methods' concepts (social concepts) are defined and classified. General beneficial effect of the adaptive reuse approach is given. On the basis of analysis results of experience in adaptive reuse of industrial architecture with new social functions general conclusions are developed.

### KEYWORDS

conservation; adaptive reuse; industrial heritage; social function; municipal function; new use; effective use.

### RELEVANCY OF THE ADAPTIVE REUSE CONCEPT

According to present conditions of post-industrial cities' industrial infrastructure in the Czech Republic the industrial heritage architecture (including non-operating and ineffective industrial buildings as well as brownfields) demands today a new experimental level of conservation and use that means the level of conservation of industrial heritage architecture by the adaptive reuse approach.

Relevancy of the present research project is defined by actual problems of all industrial cities in the Czech Republic: e. g. importance of the new effective use of non-operating industrial buildings as well as industrial buildings with ineffective manufacturing, conservation of historical value of industrial objects, development of favorable city infrastructure etc. [1]. Moreover, it is reasonable to

note local aggravating environmental situation because of industrial object that has negative influence on health improvement, psychic and emotional state of people, demographic

indices, including negative influence on social level of population, as well as economic and other indicators [1, 2]. It is important "to adapt" industrial heritage architecture for new effective functions with the conservation of historical and architectural value of all industrial heritage objects [2—5].

It is reasonable to emphasize, that the problem of adaptive reuse of industrial heritage as well as brownfields is so relevant nowadays [5, 6]. There are many organizations and institutions which are connected with this problem: scientific and research centers in the leading educational and scientific institutions, committees, specialized organizations with competent professionals, social groups etc. For example, International Committee for the Conservation of the Industrial Heritage (TICCIH), International Council on Monuments and Sites (ICOMOS), Industrial heritage of Wallonia and Brussels association, Research Centre for Industrial Heritage CTU in Prague, International Visegrad Fund, Directorate for Cultural Heritage in Oslo, Association for Industrial Archaeology in Telford etc. [5—7].

Today research in the field of relevant problems of industrial heritage architecture in the Czech Republic is carried out by Prof. Ing. arch. T. Senberger, PhDr. B. Fragner, Prof. Ing. arch. P. Ulrich, CSc., Doc. Ing. arch. P. Vorlik, Ph.D., Mgr. L. Beran and others (Czech Technical University in Prague), Prof. Ing. arch. H. Zemankova, CSc. (Brno University of Technology), Ing. arch. E. Dvorakova (National Heritage Institute in Prague) and others. Nowadays it is important to do research on this topic, to analyze the present problem and develop the conservation methods in terms of adaptive reuse of industrial heritage architecture that can solve all relevant problems: e. g. conservation of industrial heritage (industrial architecture objects, brownfields, historical industrial equipment and technologies), new effective use, integration of social, municipal, cultural and other components, improvement of microclimate in the area of industrial object etc.

## NEW INSIGHTS INTO THE TYPOLOGY OF INDUSTRIAL ARCHITECTURE

The first processes of industrialization began in England in the late 18th century with introduction of the first manufacturing plants. Soon industrialization has followed France and Germany and then in the late 19th century whole Europe. Industrialization has made direct impetus for production on a large scale. Moreover, this has changed the world market [6—10].

It is reasonable to note that industrialization was important for the global development of architecture. Industrialization (i. e. industrial revolution) meant a qualitative leap for the industry, technology, transport, telecommunications, atomic engineering, development of radio and television, automation etc. [11—13]. In addition to the major social changes, industrialization like a process of change from manufactory and craftsmanship to factory production and development of industry have influenced the creation of new typological type of buildings — industrial architecture (production halls and multi-storey buildings) [14—16].

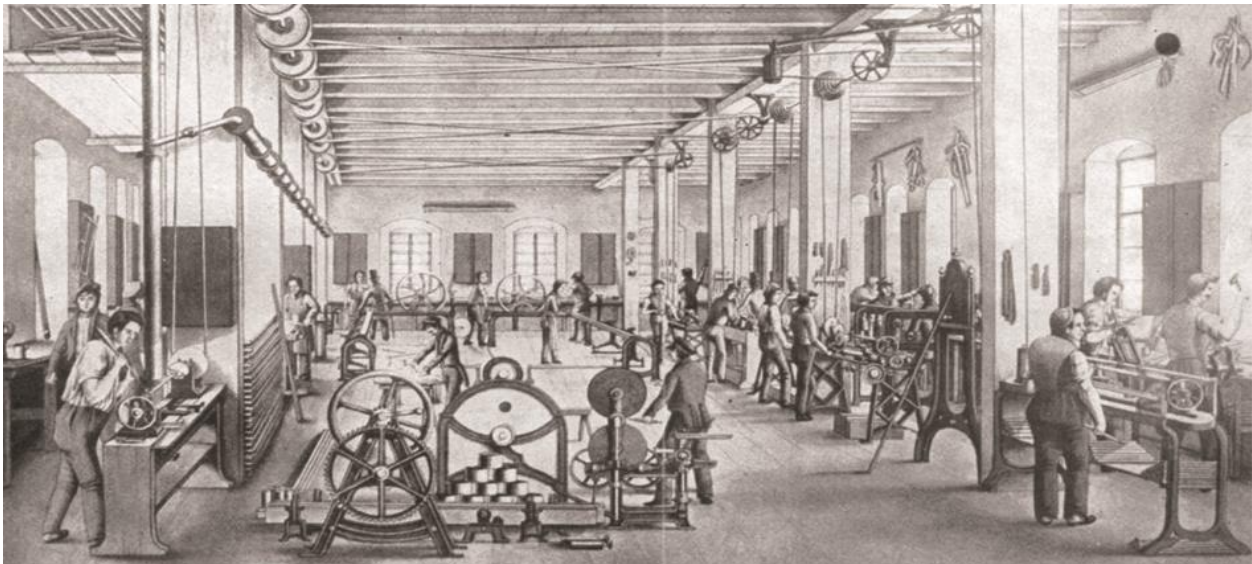
The industrial era introduced global changes that have occurred all European industry, which meant new goals and new means to achieve them. Moreover, industrialization has already taken place in various areas of industry: textile (weaving, wool, cotton etc.), sugar and flour-milling industry, brewing, distilling, starch industry, glass industry and the production of porcelain, paper, woodworking, iron and steel industry, construction, chemical and coal industry etc. Each industrial area for manufacturing was requiring new concepts and technologies [16].

The consequences of industrialization were also reflected in the typology of industrial architecture and their new features, such as [15, 16]:

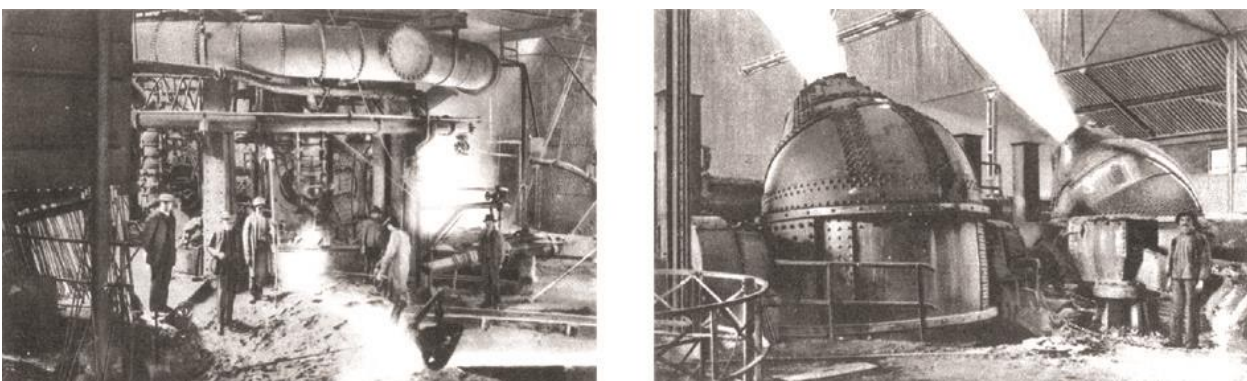
- versatility and variability of buildings;

- unification and standardization of building components as well as whole buildings;
- indoor environmental quality;
- requirements for fire safety.

As the general requirement for the construction of industrial buildings was a distribution of mechanical energy through the building for machines — industrial architecture began to be used not only for workpeople, but also for a new era devices (*Fig. 1, 2*). Elimination of dependence on classical supporting construction (e. g. open layout of the floor plans, continuous windows on the facades is typical for the industrial architecture of the industrial era. [15, 16]. The new demands on the architectural design solutions meet mainly by supporting pillars in a more or less regular grid, supporting ceilings or roofs, simply called "skeletons" [16, p. 214].



*Fig. 1. Distribution of mechanical energy: manufacturing workshop of Bracegirdle machinery factory in Jablonec, 1840 [12]*



*Fig. 2. Vítkovice Ironworks in 1913, Ostrava [17, p. 183] First buildings of a new era "had a massive stone or brick covering and wooden skeleton in the interior" (Fig. 3) [16, p. 214].*

*New solutions without wood in supporting construction came with the new innovative*

*materials and technologies— wood was replaced by iron construction (Fig. 4, 5) [15, 16, 18]. This design was suitable throughout the century. But soon typology of all industrial buildings was waiting for new changes. First of all, changes of the material of construction. The last decade of the 19th century was the period of reinforced concrete: a large number of multi-storey industrial buildings with monolithic reinforced concrete system of supporting constructions were built (Fig. 6) [18, 19].*

Soon industrialization had the first results: e. g. decrease of production costs, development of new products and internal changes in society, including thinking and lifestyle of mankind. The maximum progress in the production during the period of industrialization was in the late 20th century (adoption of the aforementioned innovations, development of new materials and modernization of manufacturing processes) [11, 12].



*Fig. 3. Wooden skeleton in Public Transport Museum located in the tram depot Prague-Střešovice (author's photo)*





*Fig. 4. Cast-iron columns in brewery building in Kralupy nad Vltavou (author's photo)*



*Fig. 5. Mechanical wool weaving mill Johanna Liebig & comp. in Liberec, late fifties of the 19th century [12]*



*Fig. 6. Interior of weaving mill Vonwiller in Žamberk, Ústí nad Orlicí [16, p. 217]*

It is reasonable to emphasize, that the result at the beginning of the post-industrial period are changes in the typology of industrial architecture. In addition, the old industrial infrastructure gradually loses its functionality, e. g. [2, 5, 10, 15, 16 and 18]:

- industrial buildings as well as industrial areas become unsuitable for future use: effective use of industrial buildings for future manufacturing is not possible;
- implementation of new environmentally friendly technologies for future production is not possible;
- ineffective technologies of production;
- the possibility of a partial operation of the industrial building.

Modern industrial architecture today requires different architectural concepts and manufacturing technologies. Modern typology of industrial architecture has new standards that are not compatible with the architecture of industrial heritage, i. e. with the industrial architecture from the 18th — early 20th century.

As a result of further development, more technological and automated electronic devices were introduced into manufacturing; moreover, made from new materials. Buildings are becoming more compact. It was significant to note that the industrialization had a significant impact on technical and scientific progress, automation, new technologies, new trends in production and distribution etc.

## **GOALS AND TASKS OF CONSERVATION IN CONTEXT OF ADAPTIVE REUSE OF INDUSTRIAL HERITAGE ARCHITECTURE**

Present research work deals with the problem of preservation and creating a new social functions for the architecture of industrial heritage that will be relevant to all sustainable and social problems. Under the present conditions of urban infrastructure in large industrial and urbanized cities in all European countries, it is reasonable to note, that the problem of industrial heritage preservation demands new experimental methods, which assume conservation and adaptive reuse of industrial

heritage architecture for a new social functions taking into account all state preservation strategies [6].

It should be noted, that a new much more reliable strategy for conservation of the objects of industrial heritage - implementation of a comprehensive system for preservation of movable and immovable heritage, including historic industrial buildings - was realized with the 20<sup>th</sup> century [19].

Based on carried out analytical research work, the following goals and tasks of heritage conservation in context of adaptive reuse of industrial heritage architecture have been defined:

- historical (preservation of historical value of industrial buildings);
- architectural and artistic (preservation of architectural and artistic value of the concept of industrial building, preservation of internal organization and distribution of the original spaces including interiors);
- technical (preservation manufacturing equipment and technologies, movable monuments: e. g. machinery, transport and other equipment).

## **ADAPTIVE REUSE AS AN ACCEPTABLE APPROACH FOR CONSERVATION AND NEW USE**

It is reasonable to emphasize, that the development of human society all over the world today has a direct impact on the environment and socio-cultural level of the population. Moreover, at the beginning of the post-industrial period, population began to pay close attention to various current problems of development technologies and approaches to safe and protect natural resources and the environment.

As a major precondition in context of present research work, it is important to take into consideration particular changes in all manufacturing trends (modern methods, technologies, concepts etc.), when companies in all developed countries changed from industrial to post-industrial phase. As a result, industrial buildings from the 18<sup>th</sup> — early 20<sup>th</sup> century are not suitable for production and it is not possible to modernize their infrastructure [2, 4 and 6].

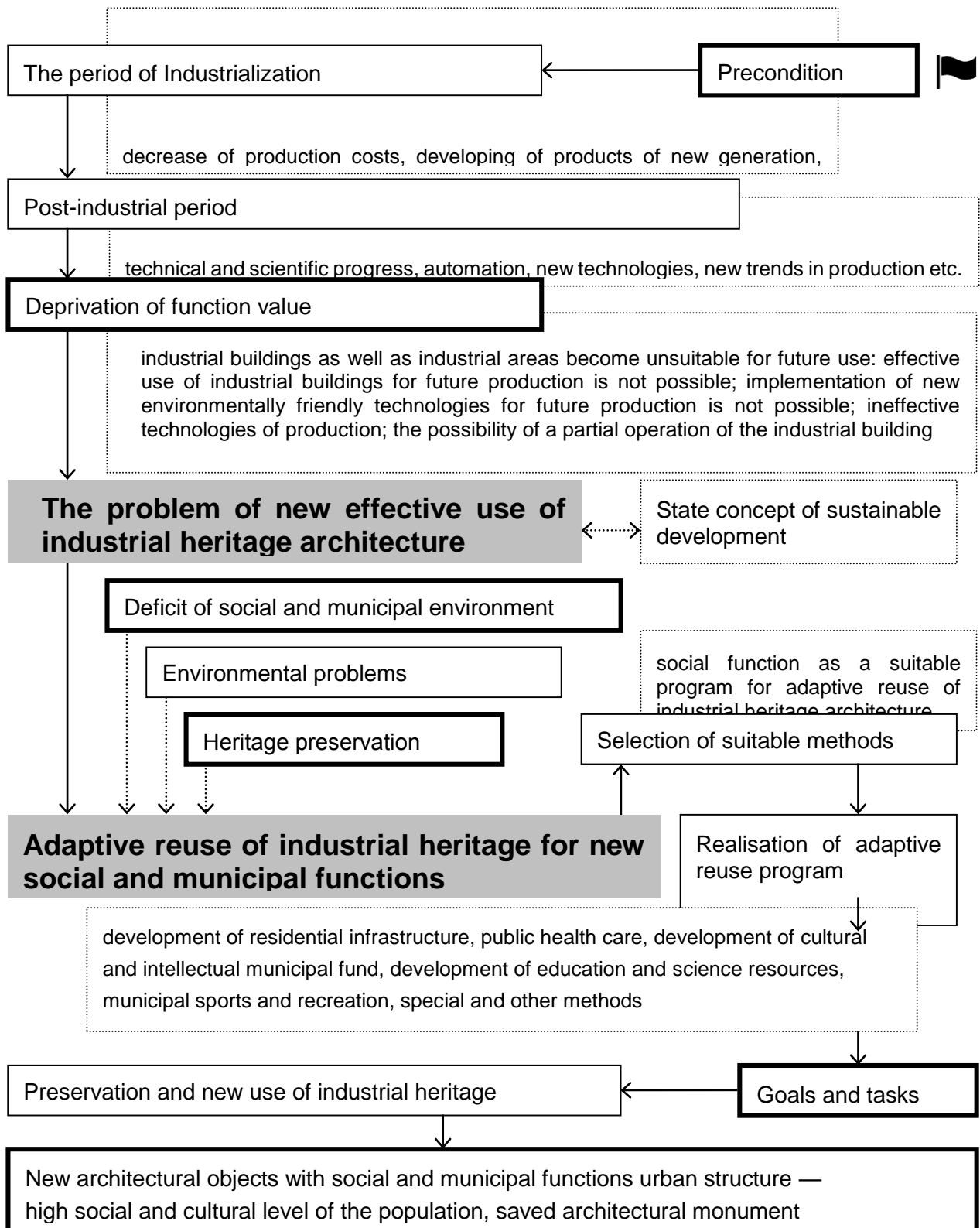
A lot of interesting industrial heritage objects now are brownfields or are owned by commercial companies with an inactive or inefficient production with different types of pollution: pollution of the environment, atmosphere and groundwater, mutation of ecosystem, flora and fauna, including negative impact on the urban environment and landscape [2, 4]. Moreover, architecture of industrial heritage has a negative impact on a person's health, mental and emotional state, including the general demographic indicators and criminogenic situation in the city.

problem of protection and new effective use of the architecture of industrial heritage is relevant today and the importance of all these architectural objects as the "architectural monuments" in context of history of each country and city is very high.

Conservation and adaptive reuse of the architecture of industrial heritage have great importance and relevance for more than last fifty years. Tendency to protect industrial heritage has been dating since the sixties of the 20<sup>th</sup> century in Great Britain. Later, this problem has become more important in Western Europe (Germany, France, Belgium etc.). In Eastern Europe (the Czech Republic, Poland, Hungary, etc.) — after the fall of communism in 1989 [6, 16].

It is reasonable to note, that the deficit of "suitable social environment" is typical for large industrial and urbanized cities nowadays. It is necessary to create a new social, cultural and municipal objects based on industrial buildings and brownfields that will be used taking into account all environmental and social problems. This is the main reason why the adaptive reuse of industrial

heritage architecture for a new social function was chosen as the most acceptable approach. Logical model of adaptive reuse of industrial heritage architecture as an acceptable approach for new use is shown in Fig. 7.





*Fig. 7. Logical model of adaptive reuse of industrial heritage architecture as an acceptable approach for new use*

## **METHODS FOR THE CONSERVATION OF INDUSTRIAL HERITAGE ARCHITECTURE BY THE ADAPTIVE REUSE APPROACH**

Based on carried out analytical research work the following general methods for industrial heritage preservation have been defined:

- historical method;
- architectural and artistic method;
- technical method.

These methods can be respected all as well as a single or their different combination that depends on each specific building. The basis for future adaptive reuse of industrial heritage taking into account goals and tasks of heritage preservation is a new "sustainable program" — a new function.

There are six most important and relevant functions for adaptive reuse: residential, public health, cultural, education and science, sports and recreation, special and other. According to defined functions, it is reasonable to classify following functional methods' concepts (social concepts):

- development of residential infrastructure (e. g. hostels, student hostels, social accommodation, house for aged, hotels, pensions etc.);
- public health care (hospitals, health centers and service, social institutions etc.);
- development of cultural and intellectual municipal fund (museums, libraries, concert halls, exhibition centers, galleries, workshops, theaters etc.);
- development of education and science resources (e. g. kindergartens, schools, colleges, universities, schools of art, study and reading rooms, dance halls, laboratories, research centers etc.);
- municipal sports and recreation (sports clubs, swimming pools, fitness centers, parks, botanical gardens etc.);
- special and other methods.

It is reasonable to emphasize, that the characteristics of each method are conditioned but another additional factors. Optimal new function is especially function with social or municipal importance for population.

Another important factor influencing new function is a character of financing. Most industrial heritage objects protected by adaptive reuse approach are initiated by commercial interests. In some cases, financed by European Union, government, grand etc.

Some methods for industrial heritage preservation in the frame of adaptive reuse for new social and municipal have been respected nowadays in the Czech Republic: there are lots of adaptive reuse projects successfully realized during the last ten years. For example, National Cultural Monument " Dolní oblast Vítkovice" in Ostrava (former mine, coking plant, blast furnaces and the other technological facilities of metallurgical basic industry and energetics metallurgical plant), adaptive reuse of the former brewery into the Administrative Center of Hradec Králové Region with

the Regional Council of the Hradec Králové region, Department of Arts of the Hradec Králové University etc. (fig. 8 and 9).

## BENEFICIAL EFFECT OF THE ADAPTIVE REUSE APPROACH

It is important to emphasize the beneficial effect on different levels in context of adaptive reuse of industrial architecture for new social and municipal functions as the conservation concept for new effective use in the Czech Republic as well as other developed countries: first of all, the development of social and municipal area and renovation of the environment [1, 2, 5].



*Fig. 8. National Cultural Monument "Dolní oblast Vítkovice" in Ostrava (author's photo)*



*Fig. 9. Administrative Center of Hradec Králové Region (author's photo)*

The beneficial effect of adaptive reuse approach is focused on a person, conservation of industrial heritage object by the development of stability in social and cultural systems. Adaptive reuse approach is directed to solve following important problems:

1. General social and municipal problems:
  - deficiency in residential infrastructure;
  - deficiency in public health care institutions;
  - deficiency in cultural institutions and intellectual municipal fund;
  - deficiency in new education institutions and science resources;
  - deficiency in sports and recreation infrastructure;
  - deficiency in other (special) social and municipal areas.
2. Companion problems:
  - negative influence on the environment;
  - negative influence on health, psychic and emotional state of people;
  - negative influence on demographic indices;
  - negative influence on visual environment;
  - negative influence on criminogenic situation.

Moreover, adaptive reuse approach with conservation of industrial heritage architecture has beneficial effect on renovation and protection of the environment.

## CONCLUSIONS

1. The relevance and topicality of the problem of adaptive reuse of industrial architecture for new social and municipal functions as the conservation concept has been defined.

2. New insights into the typology of industrial architecture have been reviewed: global changes in all European industry, new concepts and technologies in manufacturing, new features of industrial architecture and their construction and typology, first results of industrialization and changes in the typology of industrial architecture in post-industrial period.
3. General goals and tasks of conservation in context of adaptive reuse of industrial heritage architecture have been defined: historical, architectural and artistic, technical.
4. Adaptive reuse as an acceptable approach for conservation and new use has been proposed and reviewed. Logical model of adaptive reuse of industrial heritage architecture as an acceptable approach for new use has been developed.
5. Methods for the conservation of industrial heritage architecture by the adaptive reuse approach have been developed: historical, architectural and artistic, technical. Moreover, relevant functional methods' concepts (social concepts) have been defined and classified.
6. General beneficial effect of the adaptive reuse approach has been defined.

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## REFERENCES

- [1] MOROZOVA, E.B. Arhitektura promyshlennyh ob'ektov: proshloe, nastojashhee i budushhee. Minsk: UP Tehnprint, 2003. 316 s. ISBN: 985-464-349-2.
- [2] MASLOV, N. V. Gradostroitel'naja jekologija. Moskva: Vysokaja shkola, 2003. 284 s. ISBN: 5-06-004643-5.
- [3] JARGINA, Z. N., Jestetika goroda. Moskva: Strojizdat, 1991. 366 s. ISBN: 557-1-486-58753-3.
- [4] SEMENOVA, I. V. Promyshlennaja jekologija. Moskva: Akademija, 2009. 528 s. ISBN: 978-5-7695-4903-8
- [5] FETISOV, O., ALTUKHOVA, A. Problém konverzí průmyslových areálů v urbanistické struktuře na různých úrovních (na příkladu dolu Gorkého ve městě Doněck). In: Člověk, stavba a územní plánování 7. Praha: České vysoké učení technické v Praze, 2013, s. 312—320. ISBN: 978-80-01-05225-9.
- [6] ZEMÁNKOVÁ, H. Tvořit ve vytvořeném: nové funkční využívání uvolněných objektů. Brno: Vysoké učení technické v Brně, 2003. — 157 s. ISBN: 80-214-2365-X.
- [7] FRAGNER, B. Industriální stopy : architektura konverzí průmyslového dědictví v České republice 2000-2005 : Karlínská studia, Praha, září—říjen 2005 = Vestiges of industry : architectural conversion of industrial heritage in the Czech Republic / [texty naps.. — V Praze : Výzkumné centrum průmyslového dědictví ČVUT, [2005]. — 167 s. : il. (část. barev.). ISBN: 802395440-7.
- [8] DVOŘÁKOVÁ, E., Fragner, B., Šenberger, T. and Frič, P. Industriál - Paměť - Východiska. 1. vyd. Praha: Titanic, 2007. 243 s. : il. (převážně barev.). ISBN: 978-80-86652-33-7.
- [9] DVOŘÁKOVÁ, E. Nové využití technického a průmyslového dědictví. In: Zprávy památkové péče 2013/73, číslo: 3, Praha: Národní památkový ústav, 2013. s. 171-178. ISSN: 1210-5538.
- [10] BERAN, L. [Lukáš]. Průmyslové dědictví : [sborník příspěvků z mezinárodního bienále Industriální stopy] = Industrial heritage : [conference proceedings from the international biennial "Vestiges of Industry" / autoři příspěvků Lukáš Beran ... et al.]. Praha: Výzkumné centrum průmyslového dědictví



Českého vysokého učení technického v Praze ve spolupráci s Kolegiem pro technické památky ČSSI & ČKAIT, 2008, 335 s. : il. ISBN: 978-80-01-04067-6.

- [11] PURŠ, Jaroslav. Průmyslová Revoluce: Vývoj Pojmu a Koncepce. Vyd. 1. Praha: Academia, 1973. 733 s., [24] l. obr. příl. : il.
- [12] PURŠ, Jaroslav. Průmyslová Revoluce V českých Zemích. Vyd. 1. Praha: Státní nakladatelství technické literatury, 1960. 164 s., [32] s. obr. příl. : il., fotografie.
- [13] URLICH, P., ŠEVČÍK, O. and ŠKRANC, P. Dějiny 19. a 20. Století: Architektura - Umění - Filosofie - Věda a Technika. 1. vyd. Praha: České vysoké učení technické, 1997. 127 s. ISBN: 80-01-01705-2.
- [14] KIM, N. N. Promyšlenaja Architektura. 1. izd. Moskva: Strojizdat, 1979. 175 s.
- [15] HLAVÁČEK, Emil. Architektura Pohybu a Proměn: Minulost a Přítomnost Průmyslové Architektury. 1. vyd. Praha: Odeon, 1985. 167 s. : il.
- [16] ŠENBERGER, T. Skelety industriálních budov. In: Zprávy památkové péče 2013/73, číslo: 3, Praha: Národní památkový ústav, 2013. s. 214—217. ISSN: 1210-5538.
- [17] MATĚJ, Miloš. Chceme, nebo nechceme technické a průmyslové památky. In: Zprávy památkové péče 2013/73, číslo: 3, Praha: Národní památkový ústav, 2013. s. 179—186. ISSN: 1210-5538.
- [18] MOROZOVA, E.B. Arhitektura promyshlennyh ob'ektov: proshloe, nastojashhee i budushhee. Minsk: UP Tehnoprnt, 2003. 316 s. ISBN: 985-464-349-2.
- [19] DVOŘÁKOVÁ, Eva. Technické a průmyslové dědictví v průběhu padesáti let. Jak se měnil pohled na tuto oblast památkové péče v druhé polovině 20. století. In: Zprávy památkové péče 2008/68, číslo: 5, Praha: Národní památkový ústav, 2013. s. 420—422. ISSN: 1210-5538.