

### Abstract

Compared to Western European or North American countries with developed market economies, the formation and acceptance of brownfields in post-socialist countries was delayed by approximately 30 years. For the Central European and partly Eastern European countries, the fall of the Iron Curtain and the transition after 1989 from a planned and state-controlled economy towards a market economy was unique for its time consistency. Yet, it was also specific for the distinct statuses of main sectors of national economy of individual countries, which got hugely manifested during the formation of spatial and functional connections concerning the problems of brownfields of all types (post-industrial, post-agricultural, post-military etc.). In the Czech Republic, there is a long history of industry; from the middle of the 19<sup>th</sup> century (the boom of the Industrial Revolution), it was regarded the most industrially developed country of Central and Eastern Europe. The massive deindustrialization of the 1990s caused increased concentrations of brownfield localities, with the local people and public administration becoming more familiar with them, and it also led to initial efforts for their systematic regeneration. The cities of Brno and Ostrava (Czech Republic), as well as other big cities in the Central European area, are typical examples for their finished intensive process of deindustrialization. Yet, regarding their economic preferences, and thus the existence of brownfields, they are highly distinct – in Brno there are more textile and engineering companies together with military and agricultural facilities; in Ostrava abandoned coal mining and metallurgical industry sites prevail. From the perspective of human-geographical methods and approaches, this contribution deals both with the functional-spatial consequences of brownfield existence in urban space, as well as with the results of research focused on the perception of the given issues by the residents of Brno and Ostrava. The research itself tries to demonstrate how the groups of selected respondents perceive and evaluate the brownfield problems from the perspective of their everyday experience.

**Keywords:** brownfields, perception, residents, city of Brno, city of Ostrava, Czech Republic.

## DESTINY OF URBAN BROWNFIELDS: SPATIAL PATTERNS AND PERCEIVED CONSEQUENCES OF POST-SOCIALISTIC DEINDUSTRIALIZATION

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## 1. Introduction

The issues surrounding the remediation, revitalization, and redevelopment of underused, vacant, derelict, abandoned, and mostly contaminated pieces of land (so-called 'brownfields') have become some of the biggest challenges for urban planners in the last decades. Brownfields are the result of changing patterns of industry and development in many regions; they are perceived as scars on the face of cities, as liabilities degrading the value of surrounding land, and as barriers to local development, which municipalities are often unable to revitalize from their own resources (Cabernet, 2005).

The developed countries have a relatively long experience with the problems of brownfields, beginning already in the 1970s as a result of a massive decline in the mining, heavy and textile industries, and subsequently in the engineering sector as well (Kirkwood, 2001; Davis and Sherman, 2010; Hutton, 2010). In post-socialist countries (e.g., the Czech Republic, East Germany, Poland, Hungary, Romania etc.) brownfields appeared in large numbers just after the collapse of socialism and the centrally planned economy. Their further spread was influenced by the return of the market economy and subsequent trends in globalization during the last decade of the 20<sup>th</sup> century (Klusáček, 2005; Wirth and Lintz, 2006; Šilhánková, 2006; Barta *et al.*, 2006; Domański, 2009; Filip and Cocean, 2012; Krzysztofik, Kantor-Pietraga and Spórna, 2013). Moreover, the evolution of brownfields in post-socialist countries, their spatial distribution, and their functional structure are characterized by some specifics – a large number of post-agricultural brownfields resulting from the decline of socialist agricultural cooperatives, and military brownfields left as relics of the Iron Curtain after the restructuring of military sectors (Hercik, Šerý and Toušek, 2011). Yet, within the municipal area it is the industrial brownfields that are and will be of a crucial importance (Hula and Bromley-Trujillo, 2010; Filip and Cocean, 2012).

Concerning redevelopment patterns, the majority of investors engaged in brownfield regeneration in post-socialist countries have been large companies with foreign capital for whom economic profit and a fast return on investment are the key factors behind their investments. Thus, commercial projects (e.g., supermarkets or shopping malls, office spaces and business headquarters or lucrative housing developments), realized mostly in capital or otherwise larger cities, are the most obvious regeneration projects (Koudela, Kuta and Kuda, 2004; Drkošová, 2005; Barta *et al.*, 2006; Wirth and Lintz, 2006; Domański, 2009). On the contrary, in developed countries (e.g., the USA, Canada, Sweden, the Netherlands, Germany) projects (especially in cases of the regeneration of larger post-industrial complexes) based on investments from both the private and public sectors, or so-called public-private partnerships, are more common (Collier, Collier and Halperin, 2008; De Sousa, Wu and Westphal, 2009; Hollander, Kirkwood and Gold, 2010).

This article focuses on the issues of brownfields in the urban spaces of post-socialist Central Europe by contrasting two big cities of the Czech Republic with their distinct historical and industrial development. After an introductory section, we will pres-

ent the two compared cities, Brno and Ostrava, describing their economic and social development, and the circumstances under which brownfields originated there. Further on, we will analyze the spatial distribution of brownfield localities, considering especially their traditional industrial function and its influence both on the formation of the municipal structure of both cities and on the concentration and localization of the brownfields themselves. The final section presents selected results from research among the residents of both model cities. The research objective involves examining differences in attitudes and perceptions among residents of Brno and Ostrava towards the brownfield localities that are part of their everyday life.

## 2. Theoretical background

The problems of brownfield evolution and regeneration are generally of a multi-factor character. In larger cities in the Czech Republic (and also other transitional countries), the wider spatial problems are connected with the dynamics of both residential and commercial suburbanization, which has resulted in huge migration flows that these cities never experienced before. Cities are spreading out onto the open landscape, traditional parts of cities are losing their population and the inner parts of cities and housing estates are changing in their social structure – such tendencies suggest that Czech urban spaces are becoming more and more polarized. If we consider de-industrialization and the transition of the economy of the Czech Republic as the most influential societal processes, then the large number of abandoned industrial, military, and other types of brownfields started to appear in urban spaces as their consequences. Such tendencies are becoming increasingly apparent in large Czech cities, although with different intensities on different hierarchical levels. As plenty of researchers have already studied these issues as connected with Prague as the national capital (e.g., Sýkorová, 2007; Ilík and Ouředníček, 2007; Sýkora, 2008), this paper will focus instead on brownfields and their perception in the so-called secondary cities of the Czech Republic, Brno and Ostrava, both of which will then be compared. The rationale for the selection of these two cities will be discussed below.

From the linguistic point of view, there is no established Czech equivalent to the term ‘brownfield’ (Kuda and Smolová, 2007; Kadeřábková and Piecha, 2009). Nevertheless, a term describing such phenomena can be spotted in the Czech scientific literature in the early 1980s. This was caused by the fact that the Czech Republic, a country with a strong industrial tradition going back to the mid-19<sup>th</sup> century, was already facing the ups and downs of the industrial cycle, and many factories were abandoned with new industrial uses usually being found for them. The natural business cycle was destroyed in the socialist era (1948-1989), when nationalization of industry, loss of traditional markets, and a centrally planned economy, focused almost solely on the Soviet bloc, introduced and accumulated problems with modernization, maintaining competitiveness, and protecting the environment (Kopačka, 2004). It has to be stated that the meaning of the term brownfield is rather broad.

The most accepted definition was provided in Alker *et al.* (2000), who stressed that ‘brownfield’ has become an internationally recognized term that usually refers to ‘any

land or premises which has previously been used or developed and is not currently fully in use, although it may be partially occupied or utilized, they may be vacant, derelict or contaminated and therefore not necessarily available for immediate use without intervention'. The project Cabernet (2005), funded by the European Commission, also proposed its own definition: 'brownfields are the results of changing patterns of economic structures in many regions – they are largely regarded as liabilities degrading the value of the surrounding land, because it is often difficult to sell them, and municipalities are unable to revitalize them by own resources'. To illustrate the variety of definitions given to brownfields in Central European countries, the definition used in the Czech Republic can be mentioned (Ministry of Industry and Business of the Czech Republic, 2008). It describes brownfields as properties (lands, objects, areas) that are underused, neglected, and can be contaminated. They are relics of industrial, agricultural, residential, military or other activities. They cannot be appropriately and effectively utilized without a regeneration process. On the other hand, the definition of brownfields in, e.g., Romania is solely related to sites where pollution was found (Oliver *et al.*, 2005); similarly in Poland these are defined as degraded areas due to diffuse soil contamination. In Slovakia or Hungary the definition of brownfields is not especially embedded in any strategic documents, or more precisely does not occur in the official report of CABERNET group (Oliver *et al.*, 2005). Nevertheless, Barta *et al.* (2006) attempts to set a certain definition in his huge research focusing on the rehabilitation of brownfields in Budapest.

The further development of urban brownfields in Central and Eastern European cities has a certain spatial-temporal context. The first source of the contemporary existence of brownfields is the Industrial Revolution that started to spread from England to the European continent in the second half of the 18<sup>th</sup> century. The most important driving force of industrialization was the power industry, i.e., the mining of raw materials (black coal and lignite being the major sources during this era), which heavily influenced the location of energy-hungry branches of industry (Birch, MacKinnon and Cumbers, 2010; Hutton, 2010). These branches of industry were situated in locations rich in raw energy materials because of high transport costs and underdeveloped transport infrastructure. Traditional industrial areas with large energy consumption grew gradually into the main cores of territorial structures of industrial production, but also into the centers of the whole economic development of individual countries (Stutz and Warf, 2007). Further activities connected with human presence started developing in urban spaces (transport, military, residential development, peri-urban agriculture etc.), and they initiated the development of the urban brownfield mosaic as we know it today.

Industrial activities can be indicated as the strongest driving force behind the formation of urban structures. These kinds of activities naturally gathered around historical city cores, gradually resulting in the appearance of abandoned and unused localities depending on the ups and downs of the industrial business cycle. Such areas were very often associated with environmental hazards caused by the previous uses

of the sites. Such potential contaminations are generally very sensitively perceived by the local populations and governmental administrations today (Litt, Tran and Burke, 2002; De Sousa, 2006; Kunc, Klusáček and Martinát, 2011a).

In urban spaces, the reuse of brownfields, e.g., for housing, can make certain localities more attractive as well as raise real estate prices, and thus give rise to the process of gentrification that is replacing original low-income residents with moneyed classes (Schopp, 2003). Inconveniences that cannot be ignored in heavily urbanized space, however, include increased costs for decontamination of the housing area and its surroundings, alongside fulfilling stricter standards which were not taken into account by the developers and which, frequently, they are not willing to accept. Moreover the residential model of brownfield regeneration is in most cases not as profitable as its commercial alternative and thus less attractive for developers. Therefore, the process of regeneration gets interrupted or even stops (Greenberg, 2002).

Similar attitudes were observed in both Ostrava and Brno, regardless of the fact that Brno is a city with typical inner urban structures that reflect the individual historical phases of its urban development and the development of urban brownfields (Toušek and Mulíček, 2003; Drkošová, 2005; Kunc and Tonev, 2008). Ostrava, on the other hand, is a typical representative of the mining boom (black coal) and its historical experience has been widely connected with mining in the last two centuries, with the consequences thereof (Vojvodíková, 2005; Klusáček, 2005; Vojvodíková, Potužník and Bürgermeisterová, 2011; Novosák *et al.*, 2013). The urban development of both cities is discussed further below.

### **3. Data and methodology**

#### **3.1. Study areas**

Why were the cities of Brno and Ostrava chosen to be compared? First of all, both cities are of comparable population size (Brno – 386,000, Ostrava – 296,000) and of comparable surface area (Brno – 230 km<sup>2</sup>, Ostrava – 214 km<sup>2</sup>). They were both important industrial cities, though with highly various specializations. While Brno developed and grew from the late 18<sup>th</sup> century based on the classical Western European model of industrialization, and thus focused on the textile and food industries, later on the printing, chemical, and particularly mechanical engineering industries (Mareš, 1988; Toušek and Mulíček, 2003), rising up to the end of the 20<sup>th</sup> century into a multi-branched industrial center, Ostrava in the days of the mid-19<sup>th</sup> century textile boom still existed as a small town focused on agriculture and crafts located at the periphery of the Habsburg monarchy with a population of approximately 7,000 (Moravská Ostrava). Huge development in mining and heavy industry in the next decades caused a dynamic population growth with migrants gathered around the historical cores of small towns and villages and even more intensively around industrial complexes (Vítkovice, Přívoz, Svinov) and mines (Slezská Ostrava, Kunčičky). The expansion of Ostrava was caused by different factors than the growth of Brno. In Ostrava, industrial development was caused by the discovery of black coal and its

later intensive mining, which was followed up by metallurgy and of course the development of railways, which then enabled the distribution of coal and metallurgical products (Rumpel and Slach, 2012; Tvrdoň, Tuleja and Verner, 2012). Such differences in their industrial history are significant in the urban structures of both cities down to today, and the local populations of Ostrava and Brno are still aware of their legacies. These differences can be illustrated by the different opinions of residents about industry located in their neighborhoods. Such assumptions were identified as benefits and were taken into account in the early stages of comparative research, the results of which are presented below.

The basic comparison of both studied cities is shown in Table 1. The main differences are indicated in items related to the issue of brownfields, such as the total area of brownfields, which is three times bigger in Ostrava than in Brno, and the average size of brownfields, which is even bigger (almost six times). Ostrava is the city with the largest share of brownfield areas in the total city land area in the Czech Republic within the category of cities with more than 100,000 residents (8.4%). When comparing this with, e.g., the research of Filip and Cocean (2012) in Romania, which has the largest share of brownfields in its total land area in Europe (Oliver *et al.*, 2005), then we can compare Ostrava merely with Braila, having 200,000 residents (6.5%). This difference between the two Czech cities in this study is caused by the different types of brownfields that can be found in each city. While in Ostrava large and spacious brownfields left by heavy industry prevail, in Brno a larger number of smaller sized sites can be found. The basic economic indicator of GDP per capita in each city shows certain differences as well. Ostrava is struggling with lower economic power (Plzeň, with a population of 167,000 inhabitants and only the fourth largest city in the Czech Republic, shows a higher relative level of GDP per capita than Ostrava) and a higher unemployment rate with associated social problems.

Table 1: Basic comparison of Brno and Ostrava

	Brno	Ostrava
Population (census 2011)	386,000	296,000
Population change (1991/2001)	-3.1%	-3.2%
Population change (2001/2011)	+2.6%	-6.5%
Population change (1991/2011)	-0.6%	-9.5%
Area (km <sup>2</sup> )	230.2	214.2
Average size of brownfield (ha)	4.4	25.8
Share of areas covered by brownfields (%)	2.5	8.4
Total area of brownfields (ha)	564.1	1,807.2
GDP per capita (2009, EU27 = 100)	134	95
Unemployment (2012, %)	8.5	11.9

Source: Czech Statistical Office, City of Brno, City of Ostrava, 2012

Such distinct economic and social differences are reflected in the population changes over the last two decades in each city (see Table 1). While in the 1990s very similar tendencies in population changes were noticed as a consequence of the transition period after the fall of the totalitarian regime, the first decade of the 21<sup>st</sup> century showed

totally different numbers. Ostrava's population decline continued (a decrease of more than 20,000 people in absolute numbers), yet Brno started to become more attractive, causing a population increase (2.6%). It is necessary to mention that according to official data, despite its economic success, Brno has still not reached its population recorded in the year 1991. However, only registered residents are taken into account here, which decreases the relevance of the data from censuses, since in reality many more people reside in Brno. According to the most recent estimates, the population actually oscillates around 500,000 inhabitants. Such a tendency is deeply influenced by the large number of university students in Brno (around 87,000 in 2013, while the number in Ostrava is just halved), and the common aversion of young people toward being officially registered after they start to live or study in some other city (Steinführer *et al.*, 2010).

Table 2 shows further comparisons of socio-demographic indicators. The falling population density in Ostrava and generally declining share of people employed in industry indicate the deindustrialization process in both cities (more than 43% of people of Ostrava were employed in industry in the early 1990s). Increases in the proportion of the university-educated population can also be seen. On the other hand, the population of Ostrava is relatively younger regarding the age index, a fact which was caused by a huge immigration of younger people coming to work in industries in the 1970s and 1980s. However, this demographic advantage of Ostrava loses its importance if we take into account the dynamics of age index change in Ostrava during the last decade; its tendency has been caused by a relatively important emigration of people of productive age to other cities and regions of the Czech Republic.

**Table 2:** Selected socio-demographic indicators related to changes in the socio-economic structures of Brno and Ostrava

	Brno			Ostrava		
	1991	2001	2011	1991	2001	2011
Population	388,000	376,000	386,000	327,000	317,000	296,000
Population density (pop/km <sup>2</sup> )	1,687	1,634	1,676	1,528	1,479	1,383
Share of economically active population in industry (%)	31.8	18.9	15.8	43.7	26.8	23.9
Share of university educated population (%)	15.1	17.9	22.7	8.6	10.5	14.3
Age index	72.3	108.7	135.8	54.4	77.4	118.0

Source: Czech Statistical Office, 2012

### 3.2. Spatial distribution of brownfields

The spatial distribution of brownfields in both studied cities was based on a database of existing localities obtained and then updated and adjusted by the authors of this article. In the case of Brno, this is the data of the Brno City Hall regarding brownfield localities, which is updated every two years. In the case of Ostrava, we used the work of Vojvodíková, Potužník and Bürgermeisterová (2011), which we supplemented with further internet sources (see below for the figures). Up-to-date adjustments and data corrections were based on field work and familiarity with the

discussed model localities. Morphogenetic zones were defined and adjusted to suit our purposes using the original concept of Muříček (2007), who in the case of Brno applied the age and density of buildings, integration periods, and the prevailing social and economic function of urban districts.

As we can see from the enclosed figures, at first sight there are no considerable dissimilarities in the elementary spatial distribution of brownfields in Brno and Ostrava (except the effect of the size of each locality), localities being concentrated in close proximity to the historical centers. Yet, when we inspect the figures more closely, we can spot the larger diversification of brownfields in Brno in contrast to Ostrava, where there are only mining- and metallurgy-oriented brownfields. Such extensive abandoned areas connected with the mining and metallurgical industry, located within dozens of meters of the city center, have no parallel in Central Europe at all.

Monocentric Brno with its traditional historical city core saw its industrial boom and subsequent appearance of present brownfields in the context of railroad expansion from the south (from Vienna) and along the river Svitava as a linear element (southwest-northeast direction, mainly the textile zone). In polycentric Ostrava with a rather undistinguished historical city core, coal-mining started first, and then other industries followed, with the residential and commercial functions creating the

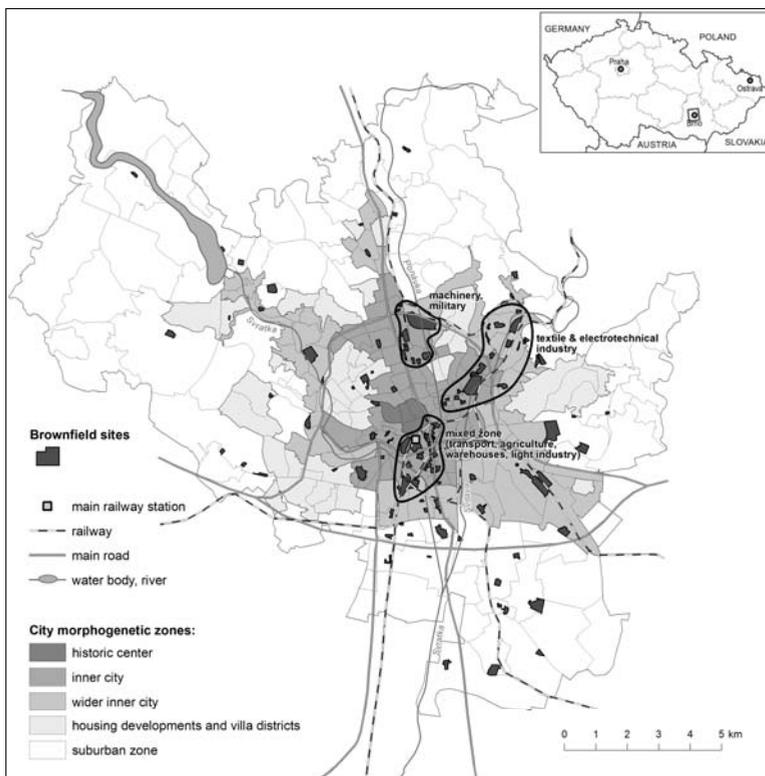


Figure 1: Spatial distribution of brownfields in Brno (2012)

Source: Authors' own processing

settlement. The railroad played an important part here again when it connected together all important industrial areas, i.e., the present brownfield sites (see the research results below). The industrial localities of brownfields make up half of the size of all brownfields together in Brno (Kunc and Tonev, 2008; Frantál *et al.*, 2013), in Ostrava it is almost 80% (Vojvodíková, Potužník and Bürgermeisterová, 2011; Novosák *et al.*, 2013).

It is needless to say that the authors are aware of the fact that it is not only brownfields left over from industry that are located in cities of such size. Almost all other types of brownfields can be found here, too (military, agricultural, transport, residential etc.), and this has also been taken into account. Despite the facts which have been mentioned above, it was industry that deeply influenced the contemporary look and inner structures of both cities, which then resulted in a different functional and spatial stratification of city quarters and caused the rise of the modern cities (Mulíček and Toušek, 2004; Vojvodíková, 2005; Halás *et al.*, 2012). Industrial brownfields in Brno and Ostrava are on the one hand the most numerous and the most problematic, and on the other hand they are challenging and widely known by the public.

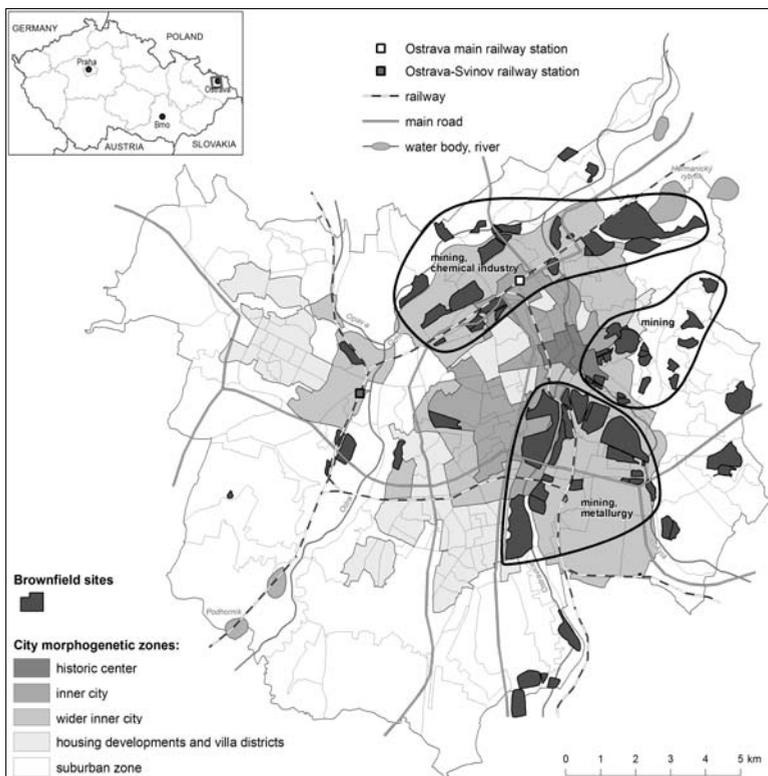


Figure 2: Spatial distribution of brownfields in Ostrava (2012)

Source: Authors' own processing

### 3.3. Survey

In the course of May 2010 (in Brno) and September 2010 (in Ostrava) field research was carried out. This research consisted of a standardized questionnaire survey among residents in the study areas, completed via on-site interviewing by trained interviewers (postgraduate students of geography from local universities). The sample included 382 respondents from Brno and 321 respondents from Ostrava. The respondents were selected for questionnaire interviewing by semi-quota sampling in proportion to their basic demographic characteristics (gender, age, place of residence). The aim was to include equal gender representation, a complete age spectrum, and respondents from different city quarters.

The research was focused on inhabitants with permanent residence in the city. Thus we can regard their opinions as those of local experts on their cities. The researched sample of gathered data can be considered representative when comparing the above-mentioned numbers of questioned respondents with the population number of both cities. The research localities were selected in widely frequented places within city cores and in several nodal points in inner parts of both cities (railway and bus stations, public transport connection points, shopping malls etc.), i.e., in areas with relatively high concentrations of brownfield localities. The questionnaire that was used for short interviews with respondents was developed as a set of unified questions, the same for both cities, though slightly adapted to local conditions in a few questions (certain spatial locations within each city etc.).

Elementary research questions involved these points:

- How the perception of the brownfield concept differs in both cities (both generally and concretely).
- How the awareness of the seriousness of brownfield existence in the context of further city development differs together with the urgency of its regeneration.
- Which financial sources should be used when regenerating brownfields and how the residents assess city policy in this respect?
- How concerns over the possible contamination of the brownfield localities and their surroundings differ.
- What is the prevailing reuse of the brownfield localities?
- How the perception of the existence of successfully regenerated brownfields differs, or else what problems arise most often with regeneration.
- Which city parts are perceived as being the most problematic regarding the brownfields.

Our hypothesis regarding the survey among residents of both cities was as follows: The extremely strong concentration of brownfields with mining and metallurgical history in the vicinity of the city center of Ostrava would imply stronger awareness among Ostrava residents of the existence of brownfields (the concept and concrete locality), bigger concerns about land contamination and the urgent need for a solution, and, however, a more critical attitude towards the policy of their City Hall. The

suggestions of how to utilize brownfields will in both cities (in Ostrava primarily) be directed outside any industrial activity.

#### 4. Findings: public perception of urban brownfields

##### 4.1. Awareness, urgency and rate of apprehension

The first question was focused on the definition or explanation of the term brownfields and its understanding. It must be stressed that the answers proved that general knowledge of this term is very limited. The respondents were not local experts, yet it involved their general knowledge. Only 37% of respondents in Brno and 17% in Ostrava (!) succeeded in explaining what the term brownfield means. In total num-

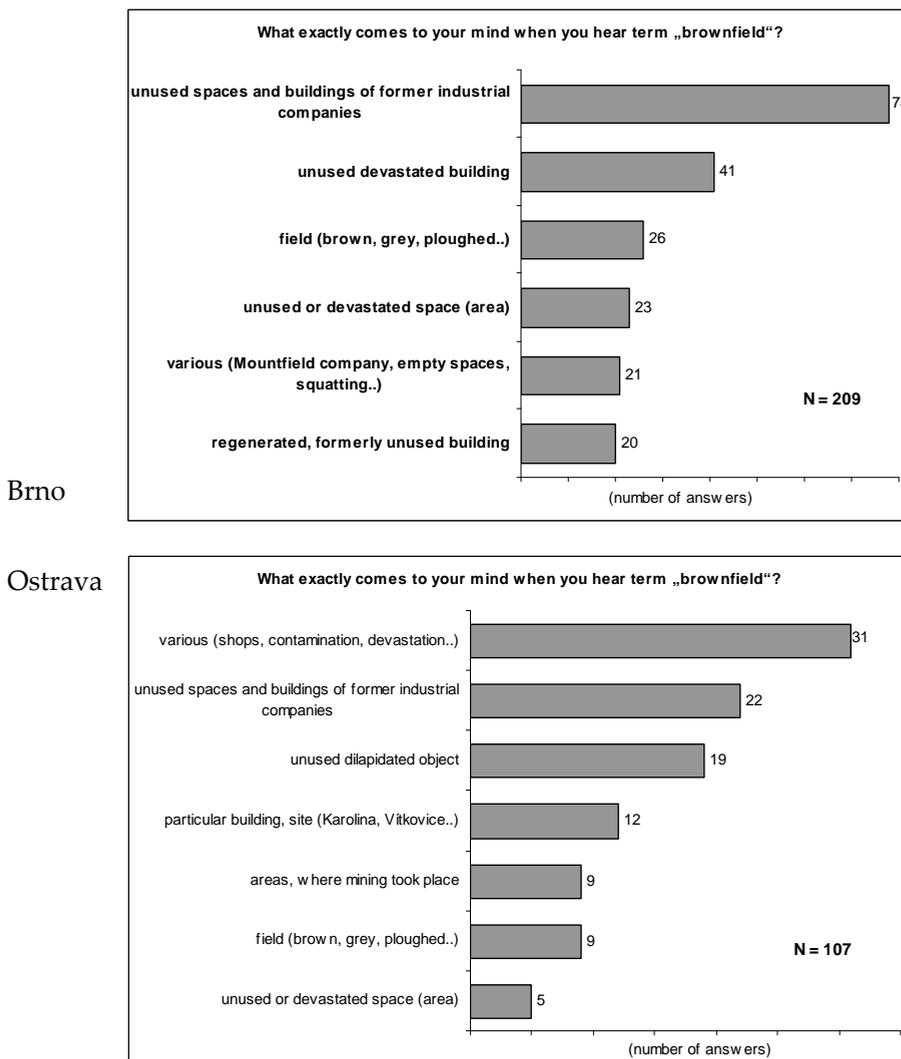


Figure 3: Awareness of the term brownfield

Source: Own survey

bers, 170 respondents (45%) in Brno and 210 (65%) in Ostrava (!) answered “I don’t know” or did not answer at all. Here the hypothesis supposing that Ostrava residents are rather familiar with the general as well as concrete perception of the brownfield concept failed to be confirmed. The reason was perhaps the lower level of education among Ostrava residents.

Significant differences in the opinions of Brno and Ostrava respondents appeared when discussing the perception of urgency (or lack thereof) in solving the brownfield problem. Brownfields are perceived as an important problem in Ostrava by almost 40% of the respondents (in Brno, only 16%); brownfields as a problem of the medium level of urgency were described by 80% of the respondents in Ostrava (62% in Brno). It is obvious that the residents of Ostrava naturally perceive the existence of unused, abandoned, and decayed buildings more sensitively than the residents of Brno. This is caused by the visible negative impacts of mining, black coal processing, heavy industry (part of it still in operation), and related air pollution. There is an obvious impact by brownfields on the daily lives of Ostrava residents, with consequences on their life quality – only 10% of respondents from Ostrava perceived the issue of brownfields as a marginal problem (in Brno, it was 17%).

The existence of unused, abandoned, and decayed buildings represents a decline of the city for more than a half of Ostrava respondents (52%). This is in contradiction to the answers recorded in Brno (40%), where the existence of brownfields as a symbol of urban decline is rejected by one half of respondents (in Ostrava, it was just 28%). Such differences once again confirm the strong negative perception by Ostrava residents in comparison to people in Brno. Here the hypothesis supposing a more sensitive perception by residents and greater feeling of urgency to regenerate brownfields for the further development of Ostrava was confirmed.

The perception of contamination of brownfields in Brno and Ostrava strongly varies. More than half of the respondents (53%) from Ostrava were disconcerted about potential pollution of soil, water, and the environment in their city, while in Brno worries about possible contamination were showed by merely one quarter of respondents, which left almost three fifths (58%) of respondents perceiving the contamination as being not such a big problem (in Ostrava, though, this feeling was held by just one quarter of respondents). Such a perception might be due to the overall view of

Table 3: Possible pollution

	Brno	Ostrava
Question: Are you concerned about possible pollution (in water, in soil) when utilizing the areas containing neglected and unused objects (for example, closed-down factories, out-of-use military barracks etc.)? (in %)		
Yes	9	11
Possibly yes	17	42
Don't know	16	23
Possibly no	40	14
No	18	10

Source: Own survey

Ostrava residents that their brownfields are a highly negative phenomenon, a view caused by their personal experience of living in a region still strongly influenced and polluted by mining and heavy industries and its impact on the environment, which is hardly comparable to the conditions in Brno. Again the hypothesis implying bigger concerns among Ostrava residents about land contamination was confirmed.

#### ***4.2. Brownfield regeneration policy***

A proactive city brownfield regeneration policy is one of the basic preconditions of more urgently solving the brownfield. Such policy, as practiced in Brno, is perceived to be good by merely one fifth of the interviewed respondents, in Ostrava one third. On the other hand, 13% of the respondents in Brno think it is very bad, in Ostrava almost one third (29%). It is obvious that brownfield policies as applied have caused more polarization of opinion in Ostrava than in Brno. As it has been already stated in this paper several times when interpreting people's responses, the brownfield issue raises much less controversy in Brno than in Ostrava, where the majority of residents live in close neighborhoods and where brownfields have become an integral part of their everyday lives. They either like the brownfields or hate them. Brownfields in Brno are not as 'visible' and also not as contaminated as in Ostrava, and so they are not as divisive among people.

This finding has to be taken into account when creating brownfield policies. Respondents in Brno seem to be rather indecisive, with almost one third of them (31%) not being able to assess the brownfield policy of the city. The other third is neutral, i.e., indecisive as well; this answer can be considered similar to 'I'm not able to assess' since only a small share of respondents really express their true opinion with the response 'I'm neutral' because a lot of them are ashamed of their unfamiliarity with the issue of brownfield policies (such answers were noted in only 38% of cases in Ostrava). To sum up, Ostrava residents express their opinions concerning city brownfields policy in a much more radical way, again confirming our hypothesis.

#### ***4.3. The most problematic localities and best practices***

Which parts of the two studied cities were defined by the respondents as the most problematic from the point of view of brownfields? In the case of Brno, the most problematic sites are those connected with the areas located east of the historical core and around the main railway station lying on the outskirts of the core. The above-mentioned localities show visible elements of their industrial past and present (textile industry, engineering industry, heating plant, gasworks etc.) and there is a very dense built-up area of city houses. When World War II was over, the vast majority of the native German population was expelled from Brno and replaced by Czech people and also Roma people who were not used to living in an urban milieu. Given the number of abandoned factories within the area and the worsening social exclusion of the Roma population living here, it has been quite a long time since this area started to be negatively perceived by the majority of the Brno population. At the same time, the

respondents indicated the historical core of the city with the railway station as a problematic area. This is the consequence of a neglected location in front of the railway station where many homeless people gather, and it also reflects the general perception of the historical core as 'an old area'. In this context areas of formerly large engineering factories located along the Svitava River should not be left out. Plenty of sites after textile, chemical, and engineering industries with confirmed heavy contamination used to be located here.

Ostrava's conditions seem to be much simpler in this context but the facts differ. Former mining areas are defined as brownfield sites in general, but there are more areas connected with mining too (Hrušov, Svinov), although mining in the Svinov area started much later. The Hrušov area is usually associated with a social type of brownfields, i.e., an area linked to the chemical industry close to Ostrava city center where many worker dormitories were located and with many residents who lost their jobs after the factories had been shut down and were never able to find new ones. The decay of this area started after 1989 and escalated after the year 1997, when the whole area was flooded and abandoned. Yet the area around Svinov railway station is perceived as a potential development zone (according to one quarter of answers), with spacious unused sites that are still awaiting regeneration. When this research was carried out, Karolina, as the most important development zone located on sites formerly occupied by steel factories in the vicinity of Ostrava city center, gained positive acceptance during its regeneration into a shopping mall, office complex, and residential project. When, however, the whole project was finished (in spring 2012), the positive acceptance of this place decreased dramatically due to the controversial architectonic value of the new buildings. Similar positive attitudes can be noticed in relation to the Vítkovice area, showing awareness by Ostrava residents of the valuable industrial architecture in the city and of its aspiration to be listed in the UNESCO Heritage Sites list.

The next question regarded opinions on the most successful regeneration project in both cities. Here the answers were spontaneous with no pre-defined options. In the case of Brno, the Vaňkovka Gallery (shopping mall, gallery) was the most frequent response. This example of regeneration is widely perceived as a unique phenomenon within the Czech Republic, with its sensitive combination of traditional industrial architecture and elements of modernity. Moreover, the proper combination of location and function in this regeneration project is accepted as an example of 'best practice' because of its popularity among Brno population and its suitable reuse of sites in close proximity to the historical core of Brno.

In Ostrava, there is a similar situation in the case of Karolina, though not with such a large intensity. The aim of the Karolina project was to regenerate an area of a former steel factory and coke plant, and to build a new city quarter located in close vicinity to the 'old' city center (Moravská Ostrava). Such an enlarged city center should offer to Ostrava residents a shopping mall, residential buildings, and at the same time office spaces, and intends to follow the Brno example of Vaňkovka. On the other hand, its controversial architectonic quality slightly limits its potential. Further quoted projects of successful regeneration of brownfields were met with much less response.



Figure 4: The most successful brownfields regeneration projects (Vaňkovka Brno, Karolina Ostrava)

Source: Own survey, pictures by Josef Kunc, Stanislav Martinát

#### 4.4. Future utilization

The last question analyzed from the presented survey focused on alternatives for further using brownfields (Figure 4). In both cities production activities as a new option of utilization were perceived rather negatively, again proving our hypothesis. As stated by Navrátil *et al.* (2012), tourism could be one alternative for reusing abandoned sites. However, leisure and sport activity utilization were not perceived too positively in the case of Ostrava, either (in contrast to Brno). Shopping malls as a more popular utilization were noted in both cities. The most supported utilization options, though, were those of housing and greenery. While Ostrava residents slightly prefer housing utilization, in Brno greenery is the favorite option.

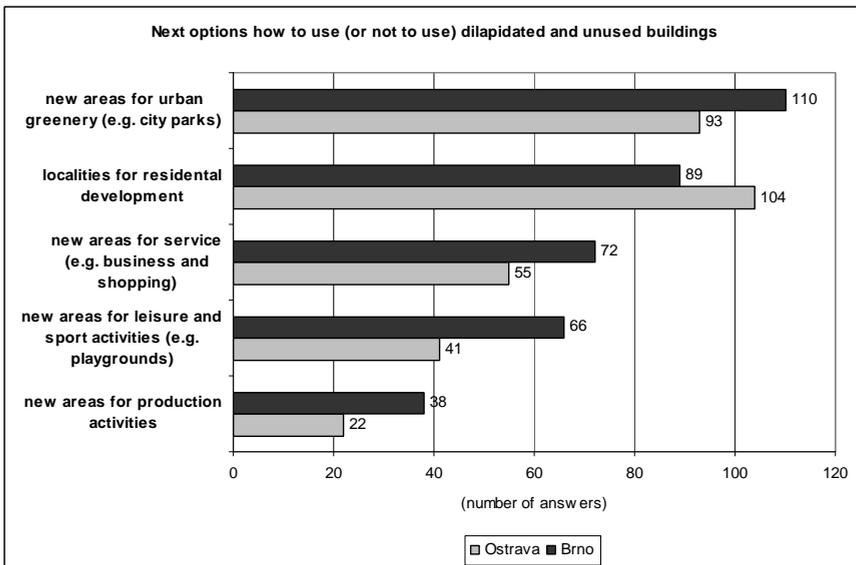


Figure 5: Further alternatives how to utilize brownfields

Source: Own survey

## 5. Conclusions

When trying to summarize the previous interpretations of the spatial and functional aspects of brownfield localization and survey results, we are able to generalize to a certain extent in spite of the fact that the areas of Ostrava and Brno are considerably different in their urban histories, development, location of brownfields etc. The fundamental and generalized difference between the two cities lies in the previous use of their industrial localities (textile, engineering, and electrical engineering in Brno vs. mining, metallurgy, and chemical industries in Ostrava), their actual level of contamination, and the size of brownfield areas within urban structures. According to the studies by Barta *et al.* (2006) or Filip and Cocean (2012) from Central and Eastern Europe, the largest areas of brownfields are located in cities with a formerly strong representation of metallurgical, chemical, and engineering industries. In the case of Czech Republic this generalization applies fully to Ostrava and its concentration of heavy industry.

Following the stipulated hypotheses, which were confirmed all except for one (for more detailed information, see above in the text), we can assume that everyday reality with its permanent visual contact and extremely frequent presentation of brownfields sites in media largely influence the perception of the brownfield problem among the people of Ostrava. They are rather skeptical about the development potential of brownfields; they are more likely to perceive such unused and dilapidated buildings as a serious problem. As the survey shows, the residents of Ostrava view the existence of brownfields as a sign of urban decay, people are afraid of contamination, and dispute the urban policy of the city. The research also proves (Kabisch, 2004; De Sousa 2006; Klusáček *et al.*, 2011) that an open and responsive urban policy is one of the most decisive aspects of brownfield regeneration, leading to higher levels of satisfaction among local residents.

On the other hand in Brno, where a lot of brownfields are located in direct proximity to the city core, people do not perceive this phenomenon as something exceptional since they do not associate the existence of brownfields with the decay of the city, and their fears over brownfield contamination are not as great as in Ostrava. Their attitudes towards the urban policy of the city are more moderate. Their everyday activities take place in visual contact with brownfields but their lives are not so heavily affected by industry and its consequences as in Ostrava (Vojvodíková, 2005).

The most frequented localities that spatially connect the population of Brno with brownfields are the Main Railway Station together with the nearby historical core of the city and the area that connects the historical core with the east, with high concentration of both former and operating industries and a settled Roma population (Klusáček *et al.*, 2009). Other examples of such areas are the large engineering factories and industrial zone along the Svitava River. In Ostrava, the majority of respondents connected this issue with areas of former mines, the area of Hrušov with its former chemical industry, and the area around Svinov Railway Station. Vítkovice, too, is a city quarter of Ostrava that is usually connected with the issue of brownfields (see Figures 1 and 2).

Both cities where our survey was carried out have their brownfield flagship, a representative and successful regeneration project situated on former brownfields and viewed by respondents as the most successful. As indicated by Kunc, Klusáček and Martinát (2011a), in the case of Brno it is a shopping mall called Vaňkovka with its cultural center Vaňkovka Gallery (Kunc *et al.*, 2011b), in Ostrava it is a project of the new city quarter located next to the old city center (New Karolina; the shopping center with the same name opened in 2012). However, in later phases of its development this project caused a lot of controversies over its architectural qualities.

If we attempt to answer the question concerning preferences about the reuse of brownfields, respondents in both cities tend to prefer reuse for greenery and residential purposes. A completely negative stance was shown towards reuses for industry, i.e., activities that from the historical point of view caused dynamic urban development and the boom of these areas, and later on caused the strongest problems.

The existence of brownfields in urban space has its historical justification. It is not possible to move them outside the city limits. Brownfields are usually located in proximity to historical cores, they are part of urban space, part of transport, production, and residential links between urban population and built-up areas and according to the studies of, e.g., Greenberg (2002) or Frantál *et al.* (2013), the position of localities within the intra-urban structure is truly crucial. Some buildings should be preserved for their historical and architectural importance and should become a part of the living urban organism and daily urban structures once again. The possibilities for their further utilization are not as complicated as it may seem which the presented answers of the respondents also confirm.

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