



## Exploring spatial patterns of urban brownfields regeneration: The case of Brno, Czech Republic



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### ABSTRACT

Previous studies have demonstrated that the location of brownfields is an important factor affecting potential investor decisions and brownfields regeneration. In this study, the spatial patterns of urban redevelopment are explored, using an analysis of variance model for a detailed database of existing and regenerated brownfields in the city of Brno, Czech Republic. Any general pattern of regeneration – such as ‘the closer to the city centre, the better’, which would be valid for all brownfields – has not been found. Rather, regeneration seems to be a function of local development potential, local occupier-demand for specific utilities, and planning regulations. Higher rates of regeneration have been detected in densely built-up areas (inner city zones and housing estates), while lower rates are registered for areas with low population density and with a greater supply of green spaces (garden colonies, open spaces, industrial zones and villa residential districts). The factors of centrality and transport links are positively associated with retail and business development projects, but negatively associated with the projects of housing development and construction of civic amenities, for which population density and the socioeconomic structure of the local population are significant positive factors. Important implications for further research and urban planning are formulated in the conclusions.

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### Introduction

The issues of regeneration and redevelopment of underused, abandoned, derelict and often contaminated lands and premises, or so-called brownfields, remain one of the greatest challenges for urban planners and developers today. As global economic stagnation continues, investments fall, many industries disappear or are moved to countries with lower labour costs – new brownfields emerge, and their sustainable redevelopment is still constrained by many barriers and associated with several dilemmas (Alexandrescu, Martinát, Klusáček, & Bartke, 2014; Frantál & Martinát, 2013; Ganser & Williams, 2007; Payne, 2013; Vojtkovská, Vojvodíková, & Macečková, 2013; and others).

The majority of studies that have explored drivers and barriers to brownfields regeneration, to date, have been based on stakeholder surveys (Alberini, Longo, Tonin, Trombetta, & Turvani, 2005; Letang & Taylor, 2012), interviews with experts (Adair, Berry, McGreal, Deddis, & Hirst, 2000; De Sousa, 2003), or

assessments of a limited number of local case studies (Coffin & Shepherd, 1998; Dixon, 2007; Nijkamp, Rodenburg, & Wagtenonk, 2002). A rigorous spatial–statistical analysis of comprehensive data has not been applied in brownfields research to date (for exceptions, see Frantál et al., 2013; Novosák, Hájek, Nekolová, & Bednář, 2013, or Sun & Jones, 2013). Effectively, this has been caused by methodological problems, primarily the availability and comparability of appropriate objective data. Mapping and inventorying of brownfields have not been centrally organized in most countries. Detailed inventories with specific locational information or GIS layers are not available, they are inconsistent, or otherwise methodologically problematic (Frantál et al., 2013: 7), and registers owned by private companies and consortia of owners are often protected or provided only with limited descriptive information, without any possibility of publication.

In this paper, we have benefitted from sources utilizing detailed data about successfully regenerated and existing (i.e., not-regenerated) brownfields, collected by the Brno City Municipality in the Czech Republic. The brownfield databases were originally used as supporting data for spatial–analytical documents contributing to the concept of the Brno’s ‘Master Zoning Plan’ (the statutory land

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use plan which guides city's development in the medium term), and – in the form of a best-practice brochure – to “contribute to raising public awareness of brownfields and by presenting successful projects to encourage property owners and investors to follow the presented success stories” (Brno City Municipality, 2013). To date, however, a deeper spatial analysis has not been provided, except for a basic statistical classification of sites according to their previous and current use and their total area.

This case study has an exploratory character: to identify which geographical factors have a significant influence on the objective outcome that some brownfields have become of interest for investors, politicians, experts or other actors, to be selected as profitable or urgent to invest money, time and energy, and therefore to be regenerated, while other sites have been ignored and thus stayed neglected and derelict, or the process of their regeneration has not been successfully completed. These are the key issues for local authorities, urban planners, regional development agencies and other decision makers, who need to effectively distribute limited available resources, time, and energy to those locations and sites where publicly co-financed regeneration is required. In effect, this process identifies those locations where market forces are considered to be weak and some form of intervention to stimulate market activity is required (Adair et al., 2000). This study focuses particularly on location factors; however, we do not question the importance of site-specific factors (such as the level of contamination or property relations) for brownfields regeneration.

### Exploring brownfields in a spatial context: literature overview

The problems of the evolution and regeneration of brownfields are generally of a multifactor and multilevel character. In large cities – specifically those resulting from transitional economies, such as the cities of post-1989 Eastern Europe – the wider spatial problems are connected with the dynamics of de-industrialization and economic restructuring, residential and commercial suburbanization and re-urbanization, which resulted in significant migration flows, the expansion of the city into the surrounding countryside, changing built-up and social structures within the inner parts of cities and within the housing estates (Haase, Steinführer, Kabisch, Grossman, & Hall, 2011; Hutton, 2010). Industrial activities, which can be regarded the strongest driving force behind the formation of the original urban structures, naturally gathered around historical city cores, gradually resulting in the appearance of abandoned or underused sites depending on the fluctuations of the industrial business cycle (Bjelland, 2004; Kunc, Martinát, Tonev, & Frantál, 2014; Liu, van Oort, Geertman, & Lin, 2014). Brownfields have constituted barriers to local development, they have become contributors to urban sprawl, burdens degrading the value of surrounding properties, potential hazards to human health and the environment, grounds for neighbourhood crime and other illegal activities (Kunc, Navrátil, et al., 2014; Litt, Tran, & Burke, 2002).

It has been suggested by previous studies (Bacot & O'Dell, 2006; De Sousa, 2003; Dixon, Otsuka, & Abe, 2011, and others) that the crucial ‘success factors’ for redeveloping brownfields are clear property relations, decontamination and regeneration costs and acceptable return rates for investors, government incentives, focused urban development policy and political leadership, strong place branding, and local stakeholders’ involvement and collaboration. It has been also demonstrated, however, that – in addition to political, economic and procedural factors – geographical factors play an important role. In other words, the location of brownfields matters! (Frantál et al., 2013).

Brownfields do not exist by themselves, independently or in a vacuum, but they are products of the interrelationships between

places and social and ecological processes (Bjelland, 2002). Brownfields are placed and rooted in a certain geographical space and time, which is hierarchically and functionally structured, and a product as well of the vagaries of time: the spatio-temporal attributes of brownfields are a principal concern in any interpretation of their nature and status. The geographical environment and driving forces acting within it have resulted in the formation of brownfields, and at the same time the actual existence of brownfields affects the environment in a dialectical manner (Harvey, 1996). Therefore, brownfields have to be perceived in their spatial context and we should take into account when assessing and prioritizing those (Chrysochoou et al., 2012), not just site-specific attributes but also contextual factors acting at higher hierarchical levels. This ‘area wide approach’ to brownfield regeneration, which reflects a wider community or geographic area of brownfields, can be regarded as an alternative to the previously more common ‘site based approach’ (Heberle & Wernstedt, 2006).

With respect to brownfields regeneration, the location factors can be regarded as local development potential or area competitiveness, which result from a complex expression of environmental conditions, economic potential and social capital (see e.g., Coombes, Raybould, & Wong, 1992). Longo and Campbell (2007) analysed revitalized brownfields in England and found that sites located in more prosperous regions (London, the South West, and the South East) are more likely to be regenerated compared to sites located in other regions. Their analysis, however, did not reveal a significant influence of population density on brownfields regeneration, nor a significant difference in the redevelopment of sites in rural versus urban areas. Lange and McNeil (2004) reported that brownfield sites in the United States, which have been located near airports, close to the central city, or close to rail access, get developed faster. Frantál et al. (2013) empirically verified that regenerated brownfields are more likely located in municipalities with a higher development potential, which is determined by spatial peripherality (measured as the distance of the municipality from the regional centre and the distance from main road networks), the rate of local business activities (measured as the number of entrepreneurial subjects per capita), and the quality of local infrastructure.

The above-mentioned national or regional studies implicitly demonstrated that site-specific factors (such as the size of brownfields, type of previous use, and land contamination), may not be determining barriers for regeneration for those brownfields which are located in prosperous and attractive areas (with high redevelopment potential) or in areas with a demand for particular projects (e.g., lack of retail or office spaces), and provided that their ownership relations are not complicated. In this paper, we attempt to contribute to current knowledge about the relevance and significance of location factors for brownfields regeneration by providing an analysis at the level of the city, which has not been realized to date.

### Geographical context of the study

Some countries, for example the US, Great Britain, France and West Germany, have long-term experiences with the problems of brownfields, which had emerged during the 1970s as a result of massively declining mining, heavy industries and textiles. In comparison, in the post-socialist countries (such as the Czech Republic), brownfields appeared in large quantities only after the collapse of socialism and the return to a market economy, with the restructuring of traditional industries, and following globalization trends during the last decade of the 20th century (Stejskal, 2005). The evolution of brownfields in post-socialist countries, their spatial distribution and functional structure are characterized by some specific factors, such as the large occurrence of agricul-

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