

A DYNAMIC APPROACH TO THE TYPOLOGY OF FUNCTIONAL DERELICT AREAS (SOSNOWIEC, POLAND)

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Abstract

The increasing number of wastelands in East-central European countries is primarily a consequence of functional transformations and movements in the structure of employment. Taking into account such a challenge in this article, the authors propose an approach in which the basic category is a typological proposal with reference to areas with derelict functions, which in turn refers to research within the scope of human geography. In their methodological proposal, the authors consider such variables as: (i) the diversification of management and use of space; (ii) time; (iii) economic functions; and (iv) the scope of geographic research. The effect of including these variables is an attempt to dynamically depict the evolution of land use, with particular attention paid to wasteland: original state – transitional state (derelict areas) – present state. The typological depiction of the emergence and transformation of areas with derelict functions is presented for the case of Sosnowiec.

Shrnutí

Dynamický pohled na typologii funkčně opuštěných oblastí (Sosnowec, Polsko)

Rostoucí počet opuštěných území v zemích střední Evropy je většinou důsledkem funkčních transformací a změn ve struktuře zaměstnanosti. Autoři v článku navrhuji specifický přístup, kde je základní kategorií pokus o vytvoření typologie funkčně opuštěných území, která je vztažena k výzkumu a předmětovému rámci humánní geografie. V návrhu své metodologie berou autoři v potaz následující proměnné: (i) diverzifikace managementu a využití prostoru, (ii) čas, (iii) ekonomické funkce a (iv) rámec geografického výzkumu. Smyslem zohlednění těchto proměnných je pokus o popis dynamiky vývoje land use se zvláštním zaměřením na funkčně nevyužívaná území: původní stav – přechodný stav (opuštěné plochy) – současný stav. Typologický popis vzniku a transformace funkčně opuštěných území je prezentován na příkladu města Sosnowec (Polsko).

Keywords: brownfields, typology of functional derelict areas, Sosnowiec, Katowice Conurbation, Poland

1. Introduction

The issue of brownfields is one of the most crucial elements discussed in geographical studies and research on urban space (Alker, Joy, Smith, 2000; Ferber, Grimski, Millar, Nathanail, 2006; Grimski and Ferber, 2001; Thornton, Franz, Edwards, Pahlen, Nathanail, 2007; Thornton, Nathanail, Franz, Pahlen, 2007; Tolle, Muszyńska-Jeleszyńska, Tadych, Jasińska, 2009). This assertion is a direct result of worldwide dynamic functional changes related to the transformation from production-based economies to economies based on services (Hudson, 2005; Müller, Finka, Lintz, 2005; Steiner, 2003).

In the context of the emergence of brownfield areas, this issue should be understood in two depictions. Firstly, the functional changes take place within

the interaction of the 2nd and 3rd sectors of economy. New service institutions are developing at the cost of disappearing or shrinking manufacturing operations. It should be highlighted, though, that this transformation is accompanied by changes within the services themselves. The more creative and modern activities, based on knowledge, are replacing those, which despite their service character, refer to a sub-group of “simple” services or primary in some other way.

The functional transformations taking place in highly-developed countries in Europe and in the world are, in their general dimensions defined by the evolution of the employment structure. Hence, one of the key issues is also the answer to the question as to what happens to areas and places where these changes are happening. Derelict areas in cities, including

brownfields, constitute a final stage of complicated socio-economic processes at the meeting point of global or national factors with local ones.

In the countries of Central and Eastern Europe, the post-industrial, post-mining and other wastelands are not only typical for the last 20–25 years (Müller, Finka, Lintz, 2005). However, compared to the post-socialist and western countries, this issue is differently ranked in the hierarchy of urban politics and management. As far as derelict areas are concerned, compared to western European countries, a gradual convergence of strategic and operational activities is noticeable in the most recent period. A crucial problem is definitely posed by a lesser scale of financing enterprises aimed at reclamation or, generally, new forms of development, particularly for those enterprises that are not of a commercial character.

A problem that unifies the countries of different economic pasts is the scale of the phenomena, reflected in the fact that in many cases, brownfield areas are equal to the areas of operating plants and areas with economic functions. Frequently, the derelict areas exceed the total area of the established investment property in a given town (housing, industry, services, and municipal services).

Among the cities extremely exposed to such a situation, there are post-mining and post-industrial centres, which, in their development, relied on a very explicit functional dependency: industry (mining) – urban space: employment in industry (mining) – level of socio-economic development of the city (Tkocz and Riley, 1999; Wirth, Černič-Mali, Fischer, 2012). A strong functional specialization is an indispensable element in the process of the dynamic development of a city. But the lack of balance in the city development, and a specialized economic base, always pose a threat in a moment of crisis or a system transformation.

One of the European regions where these phenomena have been taking place at a high intensity level is the Katowice conurbation in the Silesian Voivodeship in Poland. The scale of de-industrialization and restructuring of industry, even at the beginning of the 1990s, has become a key issue here requiring an urgent solution (Tkocz and Riley, 1999). The problem had several aspects: political, social, economic or spatial. The shrinking number of mines, steelworks and other industrial plants resulted in the accumulation of problematic areas, unprecedented in other Polish regions. In each case, they required urgent planning intervention, whose aim would be the re-definition of spatial, social and economic functions.

One of the first cities where the process of de-industrialization was intensified with extreme rapidity was Sosnowiec. The economic and functional slump that took place there already at the beginning of the 1990s led to quite a strong reaction. Paradoxically, the impact of negative phenomena present there 20 years ago led to the realization that coherent anti-crisis policies could be worked out (Krzysztofik, Runge, Kantor-Pietraga, 2012a; 2012c). One of its aims was undoubtedly the issue of the dynamically increasing number and area of brownfields and other derelict areas.

Therefore, from today's perspective, Sosnowiec constitutes the most relevant proving ground connected with the issue of brownfields. As far as the brownfields are concerned, the city has a peculiar milieu, constituting a model template for: problems, structures, paths, urban policies, and brownfield mechanisms on the scale of Poland. Thus, it is a resourceful research area for many disciplines, geography being one of the key ones.

The aim of this article is an attempt to define such a research model for functionally derelict areas, which would include elements of both the variability of functions in time and space, and the specifics of locational conditions. On the other hand, the authors would like to see its significance in the general division of geographic and economic sciences, which constitute their scope of research interests. This model also attempts to grasp various depictions of the brownfield phenomenon and their role in urban space. It was assumed that this aim may only be achieved in relation to a dynamic or multi-level presentation. However, its basic assumption was the reference to the issue mentioned at the beginning of the introduction, pointing out that brownfields and other types of derelict areas are truly only transitional effects of changes in the functional structures of particular cities.

2. Definitions: wastelands and functionally derelict areas

2.1 Terms of functional derelict areas

Having a positive reference to the proposed definitions of wasteland, brownfields and other areas where the previous prevailing functions have disappeared (Adamski and Oprych, 2012; Gasidło, 2010; Gasidło, Gorgoń, 1999; Jarczewski, 2009; Kirkwood, 2001; Morancho, 2003; Nathanail, Thornton, Millar, 2003; Popescu and Pătrăscu, 2012; Sellers, Mofat and Hutchings, 2006; Vojvodiková, Potužnik, and Büregermeisterová, 2011; www.umwelt.sachsen.de/umwelt), the authors propose to describe them with a common superior term of areas functionally derelict.

In this phrase, the focus is shifted to the issues of:

- the decline of former functions;
- the lack of new functions being shaped; and
- the functional genesis of their existence.

In connection with the above, the term of functionally derelict areas shall be understood as such areas, together with their existing development and infrastructure, which have lost their previous functions through the disruption of typical processes, structures and phenomena that were present there.

The term functionally derelict area refers to the existing term of derelict area in a way that highlights the genesis of the phenomenon in the name. Functionally derelict areas constitute a majority of derelict areas in general, especially within city borders. Direct causes of the emergence of derelict areas might also be different: natural, political, behavioural (Stangel, 2011; Sustainable brownfields – Cabernet, 2005; Tomerius, 2000; www.environ.ie/en). The denomination functional (derelict areas), at the highest level refers to their economic or socio-economic background.

It is important to emphasize that the strictly geographical-functional viewpoint of brownfields and derelict areas changes the defined general (multi-criteria) hierarchical order of them. In geographical-functional explanations, brownfield areas consist on wider terms of derelict areas. In the Cabernet definition (the EC funded expert network on brownfield regeneration), the situation is opposite – derelict areas are one among five key groups of space (Franz, Pahlen, Nathanail, Okuniek, Koj, 2006, p. 136).

However, from the financial and legal point of view, the two above-mentioned approaches and the three-element (A-B-C) model use the same division of the concerned sites:

- viable sites (private-driven projects),
- marginally non-viable sites (public-private partnership),
- non-viable sites (public-driven projects) (Sustainable Brownfield Regeneration. CABERNET Network Report, 2005, p. 43);

as well as the four-element (A-B-C-D model) of the D. Butzin team, where derelict sites are additional element:

- viable sites (private-driven projects);
- marginally non-viable sites (public-private partnership);

- non-viable sites (public-driven projects); and
- permanently derelict sites (Franz, Güles, Prey, 2006).

As mentioned, the key scope of interest in the term of functional derelict areas, is the interaction of the previous socio-economic function of a given space to its present state expressed by land use, inter alia. In the designation of “derelict sites”, on the other hand, the scope of interest lies in aesthetic, marketing or socio-psychological issues. As far as spatial issues are concerned, a crucial element is the aspect of derelict sites surroundings, as well as the derelict site–neighbourhood relationship (Sustainable brownfields – Cabernet, 2005; Tomerius, 2000; www.environ.ie/en).

Within the functionally derelict areas, areas and facilities of various natures may be distinguished: derelict greenfields, greyfields (grayfields), brownfields and blackfields (Tab. 1). In this case, their division comes as a result of three premises treated jointly: economic or socio-economic functions, land use, and interference in the human environment. Therefore, their definition range is not always going to be identical with some adopted typologies. In reference to them, it is proposed to broaden the term of greyfields and slightly narrow the term of blackfields. Detailed definitions of various types of the functionally derelict areas are presented in the following list.

Derelict greenfields – areas which require planning and functional intervention connected with the need to develop the former agricultural areas, including arable land, meadows, gardens, plantations and also facilities and infrastructure previously used for agricultural purposes¹. Derelict greenfields constitute, relatively, the least burdensome space, which requires a functional transformation and a new form of spatial development. We are assuming that derelict greenfields emerge during the decomposition of hitherto prevailing functions for the period of 3–5 years or longer. The so-called urban fallows or areas with noticeable plant succession are typical forms of derelict greenfields. In some cases, after a period of several to several dozen years, the form of greenfields may be acquired by areas, which previously served different functions (industrial, services, housing and others), depending on the degree of decline of the previous functions as well as the possibilities for plant succession.

Greyfields (grayfields) – areas and facilities which have lost their former service or housing functions. Most depictions of greyfields point their definition range

¹ Greenfields from a morphological point of view comprise both natural as well as agricultural areas (without agricultural infrastructure).

Former functional type of the concerned area			Type of functional derelict area			
			Greenfields	Greyfields	Brownfields	Blackfields
Economic functions	1st sector	Agriculture	X	X	-	x
	2nd sector	Mining	x	X	X	x
		Industry (& construction)	x	X	X	x
	3rd sector	Logistics and communication	x	X	x	x
		Commercial	x	X	-	-
		Recreation	x	X	-	-
		Other services	x	X	-	x
Non-economic functions	Residential	x	X	-	-	
	Military	x	X	x	x	
	Other	x	X	x	x	

Tab. 1: Geographical typology of functionally derelict areas: previous functions versus dominant type
 Note: X – a key type of functionally derelict area for the function in question; x – other types of functionally derelict areas. [-] – relation not existing. Source: Authors

only towards prior large-size facilities with commercial functions. Our research, however, from a functional point of view, indicates that similar conditions (crises in the given branch of services or commerce) have lead to abandoned office buildings, service facilities and compact housing areas. A functional key to understanding greyfields should be the fact that they were not previously connected functionally with agriculture or industry.

We are assuming that greyfields emerge during the decomposition of previous prevailing functions for a period of two or more years. Greyfield areas are not formally inhabited (former housing function) nor are there any business activities conducted there (service functions). Typical forms of greyfields are vacant buildings and abandoned buildings, including unfinished buildings.

Brownfields – areas and facilities which have lost their former industrial or mining functions and have not obtained new ones yet. On brownfield areas there is no formal production or exploitation activity. This period lasts for at least a year or longer. Brownfields, due to their previous functions, require urgent planning intervention and a quick process of redevelopment. Typical brownfield forms are abandoned lands, buildings and industrial (or mining) infrastructure, as well as fundamentally transformed arrangements of geographical environment components in a larger area.

Blackfields – areas (or facilities) which have lost their prior economic function, mostly industrial or mining, and whose existence constitutes a real threat to the natural environment and especially to human life and well-being. Blackfields require not only immediate intervention at the planning level, but also urgent actions in situ, which would eliminate or limit the

harmful influence on the environment. Blackfields are qualified as such, soon after they have ceased to serve their economic function, frequently remaining beyond institutional or social supervision. Blackfields include all types of landfills and dumping grounds of harmful materials, substances, etc., post-floatation basins, areas chemically or radiologically contaminated, and other areas with a significantly negative influence on human well-being and life.

The inclusion of the functional factor in the emergence of derelict areas is important insofar as that, in every case, it makes it easier to dynamically analyse transformations taking place in a given area. Such a depiction was recently applied in studies referring to Ostrava (Vojvodíková, Potužník and Büregermeisterová, 2011), Łódź (Piech, 2004; Kotlicka, 2008), and Craiova (Popescu and Pătrăscioiu, 2012).

The range of problems connected with understanding the term of brownfields, also in its genetic and functional context, is reflected in Fig. 1, for example. In reference to the scope of human geography and its academic sub-disciplines, the authors indicate a need to refer to them in an attempt to create a dynamic and functional model of derelict areas. Therefore, this model includes:

- the research subject for various academic sub-disciplines of anthropogeography (human and social geography, settlement geography, agriculture geography, geography of industry, geography of services, geography of transport, geography of tourism, commercial geography, spatial aspects of all branches of geography);
- the time factor, creating the picture of development stages for a given fragment of space; and
- the specific locational conditioning factors, conditioned by functions in an urban system.

Considering the above issues, derelict areas in this study include semantically more elements than those highlighted in the model developed by the CABERNET project. Of those that are in that model, we have integrated in our study the types: *Derelict*, *“Historical” Urban Green Space* and *Vacant*.

2.2 Toward the functional background of explanations

The final research proposal referring to the above assumptions is presented in Table 1. There, a division into economic and non-economic functions is pointed out. Within economic functions, three primary sectors are highlighted: agriculture (including forestry and fisheries), production (including the building industry) and services. Due to the role of particular activities in the structure of local urban economies, it was decided to additionally differentiate mining and industry within the 2nd sector. In comparison, within the sector of services, the categories are pointed out which have particular meaning in the local economy and therefore constitute a crucial element that differentiates the urban landscape. In many cases, meaningful perception differences of given services are noticeable. Recreation and tourism have an areal character and simultaneously a limited scale of development. Transport has a linear and point located character, with dominating infrastructure that does not consist of buildings. Commerce is the opposite; being one of the most basic services in the city and of point-location character, but in the case of the largest malls and shopping centres – it has areal character. All the above issues are particularly crucial in the situation when a given type of service has become a derelict function or a vanished function from a different perspective in a given area.

The other group pointed out consists of non-economic functions. This category includes social functions and functions socially useful. Housing functions are listed first, being primary for each city and not having,

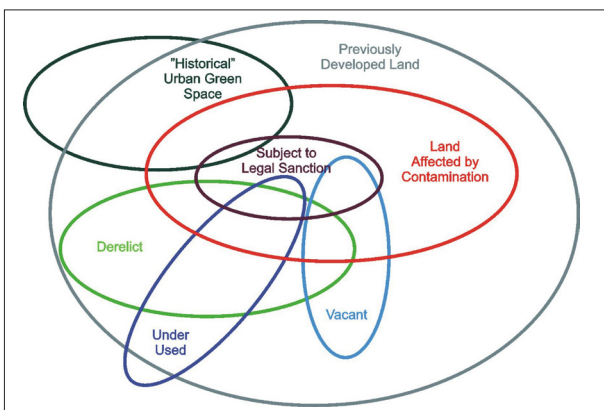


Fig. 1: Relationship between brownfield-related definitions
Source: Sustainable Brownfield Regeneration. CABERNET Network Report, 2005, p. 26

ultimately, an economic character (Fig. 2 – see cover p. 3). Other crucial functions are military functions and those related to the defence and safety of a country or a region. The last category is composed of the remaining socially useful functions, mostly connected with municipal services (functional landfills, sewage treatment plants, cemeteries and others).

The functional types of area development methods are, in the following part, juxtaposed with the four types of functionally derelict areas. The main aim of the juxtaposition of both elements is to indicate the potential and dominating possibilities of transformation of a given area or facility into a concrete type of the functionally derelict area.

Greenfield areas may emerge on areas previously used for any purposes. In most cases, it happens after a longer period of time (Fig. 3 – see cover p. 3). Such an area, as a rule, previously underwent a stage of partial reclamation. Buildings and infrastructure were demolished. To conclude, conditions for unconstrained plant succession were created. Areas previously used in agriculture constitute a typical functional structure, which is a base for greenfield development. Abandoned fields or meadows relatively quickly become areas of expansion for wild plants. Characteristic urban fallows come into existence dominated by grass, bushes, tall weeds and arborescent communities. The observed proportions of plant types are varied.

Analogous to greenfields, facilities (including their surroundings) of greyfield type also may be of various functional genotypes. In the case of agriculture, these are abandoned buildings used for agricultural production (pigsties, stables, garages, administration buildings). In the case of mining, these are service facilities located in the proximity to industrial areas that are not directly used for production or exploitation. Greyfields, though, constitute a type of functionally derelict areas mostly related to former services.

Another type of derelict areas is represented by brownfields. Brownfields emerge in post-mining and post-industrial areas, hence they are a typical form in urban structure. Due to the fact that brownfields cover vast areas, there appears to be a problem in their definition, resulting from the future specific character of these places. Within many brownfields, there are, for example, water basins, which are legally or illegally used for recreation. Another problem is posed by forests (frequently of vast area), which by way of succession, have covered former areas of mines or other industrial plants (Krzysztofik, Runge, Kantor-Pietraga, 2012b). Some production facilities,

formally operating within services connected with transportation, logistics and communication, and acting for the benefit of railway or road engineering, were also included in brownfield areas.

The last category includes blackfields, which, in majority, represent a consequence of industrial or mining activities. Contamination, which endangers human lives or well-being strongly influences components of the natural environment (atmosphere, surface and ground water, soil). It may also result from other business and non-business activities; e.g. from abandoned pesticide tanks or other chemicals in agriculture, insufficient safeguarding of abandoned municipal units dealing with utilization and sewage or waste storage, and also service buildings where laboratory work was conducted with the use of toxic and poisonous substances.

The creation stage for functionally derelict areas is only a part of the longer process of urban space management. Equally important is the method of their reuse. Therefore, in the research on abandoned or degraded areas, a crucial element is the issue of methods and paths leading to redefinition of these functions. In a dynamic method, this process is presented by Figures 4 and 5.

In the first case (illustrated by Fig. 4) a re-use of functionally derelict areas is assumed, with the inclusion of the range of functions discussed above. In an obvious manner, the inflow of certain functions and also internal determinants of development to a specific city may be and frequently are an assumption for redevelopment of functionally derelict areas. In each case, competition is present in the line of functionally derelict areas – areas continuing their development within the framework of defined functions. Another area for competition is the question of which of the functionally derelict area types is going to “win” the attention of municipal authorities, various developers, public opinion and other institutions. Experience from the area of the Silesian Voivodeship indicates that chances are relatively equal, but it should be stressed that a different group of stakeholders supports redevelopment of each type of space. Regardless of the inflow of new functions as external impulses, the transformation of brownfields may come as an effect of actions taken within an internal potential. In this case, key actors are mainly municipal authorities or municipal authorities with the participation of a public or private entity.

Figure 5 presents a situation where no visible transformations were recorded in the functionally derelict areas in the examined period of time, due to

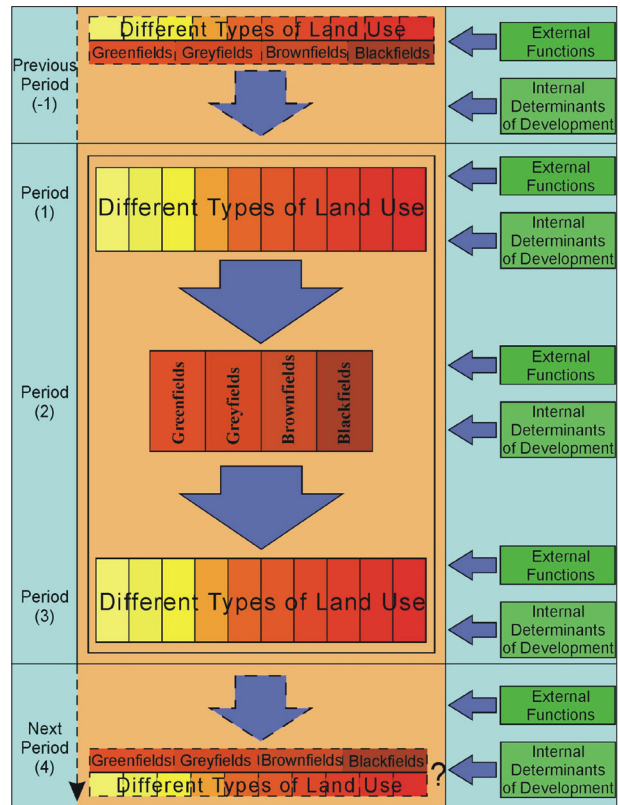


Fig. 4: Model of land use transformation with the stage of functional derelict areas. A positive path
Source: Authors

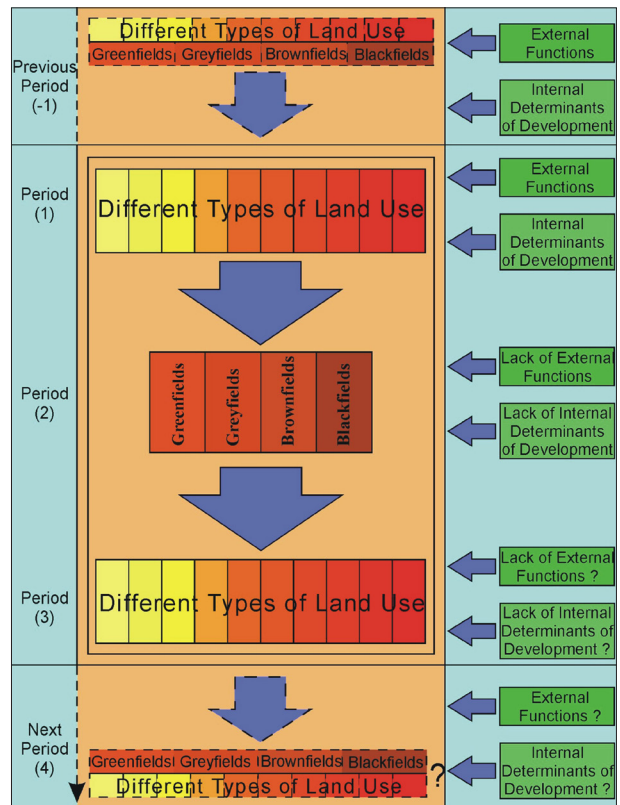


Fig. 5: Model of land use transformation with the stage of functionally derelict areas. A negative path
Source: Authors

the lack of inflow of functions within urban borders and the lack of initiatives from urban authorities or other actors.

The presented examples are of a model character. In the first case, we assume that transformations are going to reach any level of the new form of development. In the second case, that it is not going to happen at all. The reality shows that some changes occurred in almost all medium-size towns and cities in Poland researched by the authors (44 cases). In all of them the changes were not sufficient, but for the majority, not always desired or expected.

The model pointed out above is of a two-stage character, i.e. it defines the stage of emergence of a functionally derelict area [Period (1) to Period (2)] and its possible development or lack of it [Period (2) to (Period (3))]. Comprehensive explanation of these transformations will make it possible to have a broader analysis of the given area. That is, on the one hand, it allows one to refer to the stage of primary land use [Previous Period], before the function analysed presently as derelict was shaped there. It is particularly interesting if this function had not been shaped in a previous derelict area with, e.g. the 19th century genesis. Other former functional changes are also interesting.

On the other hand, the model reveals the necessity for academic research regarding further spatial and functional transformations in the future [Next Period]. This is particularly the case if the instability of a new way of development is observed or there are barriers which might have some influence on it in the nearest future, e.g. profitability of some industrial or service branches, free interpretation of the local spatial development plan, etc.

3. Derelict areas in Sosnowiec and the form of their development in the period 1990–2012

3.1 Downsizing of the economic base of Sosnowiec and its consequences

Sosnowiec is one of the largest cities in the Katowice conurbation and in the Upper-Silesian Industrial Region. It experienced an almost historic cycle of redefining its functions in the last two decades, which, for the first time since the establishment of the city in 1902, transformed from industrial to service and industrial. In the background of the transformation of the city's functional image, there were serious economic, social, spatial or infrastructural problems. Sosnowiec is a large central-European city, which is ranked as a leading city as most affected by the political and economic transformation at the turn of the 1980s

and 1990s. On the other hand, it constitutes a model example of multi-aspect shrinkage (Krzysztofik, Runge, Kantor-Pietraga, 2012a).

In the period 1990–2012, as many as three out of four coalmines were closed down in the city and in one coalmine the number of employees was cut by half. Significant restructuring also took place in the two local ironworks. The huge centre of textile and clothing almost totally collapsed, including three of the largest facilities which had employed several thousand people before 1990. A large number of metal and machinery facilities were reduced. The functional crisis affected services as well, even local agriculture. In the period of 1990–2012, the city lost over 40 thousand inhabitants and this depopulation process continues. The demographic decline trend is going to prevail into the future. By 2035, the population of the city will have decreased to 160.8 thousand (from 215.3 thousand in 2010 and 259.4 thousand in 1990).

Another crucial consequence of the economic and social crisis of the city is the dynamic increase of brownfields, and to a lesser extent greyfields and derelict greenfields (Fig. 6).

Nevertheless, it should be highlighted here that since the early 2000s, a process of economic reorganization of the city is taking place, which has significantly slowed down the crisis, if not stopped it. A considerable success in redefining the function of the city was a concept, which stressed the need for developing local wastelands. Urban policy was focused on regaining

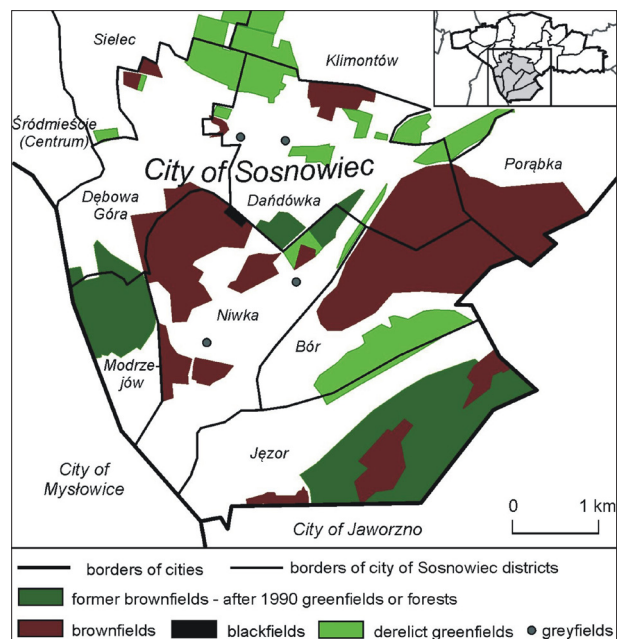


Fig. 6: Functionally derelict areas in the south districts of Sosnowiec, 1990–2012

Source: Authors

post-mining and post-industrial areas for economic purposes. Coming to terms with a not always “reasonable” pace of closing coalmines, decisions were taken to transform post-mining areas into new and diversified developments. Their character was described, depending on the specific location, as a new industry zone or a new industry and services zone. A significant role in the policy of eradicating brownfields in the city was played by the Katowice Special Economic Zone (KSEZ) and special programmes and tools endorsed by municipal authorities, such as The Economic Gateway of Silesia. Within the Katowice Special Economic Zone only, there emerged 13 new industrial facilities (Fig. 7). The sound investment policy with the simultaneous institutional and financial support, as well as individual actions of many entities, have enabled success to be reached within a dozen years, and this has not been experienced by any other city of similar size in Poland (Krzysztofik, Runge, Kantor-Pietraga, 2012a). Sosnowiec has become a leading town in the category of number and size of new investments per 10 thousand inhabitants,

and even a leader in the whole conurbation considering the corporate tax receipts from companies located in former brownfields. A positive aspect is also the number of employed persons. Companies of diverse branches located in the brownfields employ over four thousand persons.

The described phenomenon of the “economic” governance (municipal authorities, KSEZ, individual entrepreneurs, central government, EU) of the problem of brownfields is of permanent character. However, the effects of this policy are variables over time. The investment activities peaked in 2006–2010 and the number of developments has been decreasing currently. This is a result of the general world economic crisis as well as of the lack of municipal financial resources, which would be the city’s own contribution to build a new technical and transport infrastructure on the extensively developed brownfields so far (see Fig. 6 – large area marked in brown on the border of Bór, Dańdówka and Porąbka districts). An opportunity for the development of these areas is likely to be

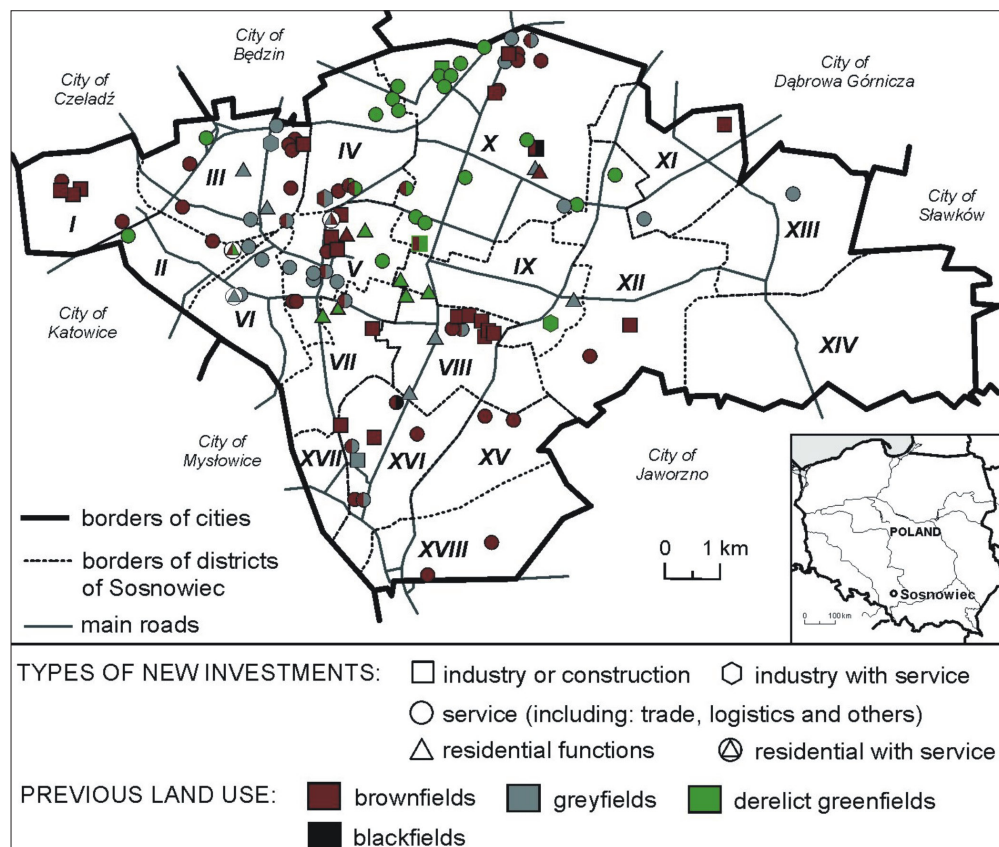


Fig. 7: New investments in the derelict areas in the city of Sosnowiec, 1990-2012; a geographic-functional approach. Explanations: 1 – borders of cities; 2 – borders of districts of Sosnowiec; 3 – main roads; TYPES OF NEW INVESTMENTS: 4 – industry or construction; 5 – industry with services; 6 – services (including: trade, logistics and others); 7 – residential functions; 8 – residential with services; PREVIOUS LAND USE: 9 – brownfields; 10 – greyfields; 11 – derelict greenfields; 12 – blackfields. City districts: I – Milowice; II – Stary Sosnowiec; III – Pogoń; IV – Środula; V – Sielec; VI – Śródmieście (Centrum); VII – Dębowa Góra; VIII – Dańdówka; IX – Klimontów; X – Zagórze; XI – Kazimierz Górniczy; XII – Porąbka; XIII – Ostrowy Górnicze; XIV – Maczki; XV – Bór; XVI – Niwka; XVII – Modrzejów; XVIII – Jęzor. Source: Authors

a new instrument of regional policy, the so-called OSI (Strategic Intervention Areas). The OSI will be financed from EU funds.

3.2 The "post-brownfield" landscape in Sosnowiec

The process of restructuring and closing industrial facilities in Sosnowiec resulted in a clear increase in the number and size of functionally derelict areas. From estimates, it is concluded that in the period from 1990 to 2010, their area increased by approximately 450 ha. This was additionally increased by wasteland areas that emerged in previous historical periods, even dating back to the second half of the 19th century. They were mostly areas connected with the former open-cast coal mining.

At the same time, in almost all city districts, single abandoned buildings appeared, or their fragments connected with services or trade. A majority of them were redeveloped relatively quickly. Some buildings though, especially the ones of large cubic volume, remained unoccupied. Some of them, such as the multi-storeyed Silesian University of Medicine in the Ostra Górka district, have not yet been completed. Former farmlands, where production has ceased, have constituted a peculiar category of derelict area. They were both privately-owned (Józefów, Porąbka, Kazimierz Górniczy), as well as state-owned (Sielec-Klimontów). In the Dańdówka district, abandoned gardens and orchards are noticeable.

Together with the emergence of successive wastelands, some of the formerly shaped ones were developed gradually. An increase in the dynamics of redeveloped areas took place in the 2nd half of the 1990s. Developers were mostly attracted to derelict greenfields or greyfields. New enterprises were mostly connected with large format commerce, services and housing development. A crucial element deciding on the location was the availability of convenient transport.

An investment breakthrough did not happen until after 2000, though. At that time, a transformation of economic structure in new investments took place. Industrial facilities began to dominate. Commerce and services became of secondary importance. Another crucial issue connected with that stage was the concentration of new investments in brownfields. This direction constituted a primary trend in the investment policy of the city as well as in the Katowice Special Economic Zone. Starting in 2000, the number of new industries grew rapidly. By 2009, 17 facilities were opened altogether, built from scratch (see Tabs. 2 and 3). Moreover, several smaller production companies (frequently established from the collapsed old ones) used the buildings and infrastructure of

closed-down facilities that operated in the socialist era. Since 2007, in the process of brownfields development, the dominating enterprises have been services. Some, such as the editorial office of a large regional newspaper and the most modern printing house in Central and Eastern Europe, Dziennik Zachodni (Polskapresse company) or the Exhibition Center Expo-Silesia, were particularly important investment points, also at the metropolitan scale.

The trend of dominating investments connected with services located in brownfields is confirmed by those realized in 2012, (Raben, the Silesian University of Medicine, the Sosnowiec Park of Science and Technology, the Climbing Centre – Poziom 450) as well as those under construction (see Tab. 4).

The awareness of the problem of development and location of functionally derelict areas in a given city and the scale of further investments in them allows for an empirical reference to the dynamic model previously proposed (Fig. 7). Table 5 presents a simplified version for the city of Sosnowiec. The simplification in this case lies in the fact that the "X" symbol indicates the existence of the functional transformation of the given arrangement and the "-" symbol indicates the lack of change. Instead of using symbols, one may enter for example a number of interactions of each type or the total area subjected to a functional transformation within the framework of particular functional types.

A complement to the model that makes the whole process legible comes in the form of a specification, indicating the dominating types of functionally derelict areas subject to disappearance in the space of a given city and the types of spatial development that are in their developmental stage (see Tab. 6). These specifications point out not only the method of making use of various types of functionally derelict areas, but they also may give evidence of the potential demand for them. From the academic point of view, they indicate the direction of general functional transformations in cities.

In the case of Sosnowiec, it is clearly noticeable that the regressive character in the structure of land use applies to former mining, agricultural and industrial areas. Their transformations went in the direction of several different functional types, but diverse from the previous ones. Only in some of the former post-industrial areas was this function recreated. Functionally derelict areas where the method of former use was different had an incidentally regressive character. An expansive character was typical for the following types: other services, commercial, and residential as well as logistics, transportation and industry. The scale of quality transformations

No.	Name of enterprise	Function of enterprise	Former land use type	City part
1	Auchan	Retail	Der.gr.	Śródula
2	AUMA Polska	Manufacture of metal products	Der.gr.	Zagórze
3	Banasik Wholesaling	Wholesale	Der.gr.	Zagórze
4	Bodzio Meble	Retail	Der.gr.	Zagórze
5	Brzozowy Stok (Osiedle) (The Birch Slope – H. Estate)	Housing estate	Der.gr.	Sielec
6	Castorama	Retail	Der.gr.	Zagórze
7	Decathlon	Retail	Der.gr.	Śródula
8	District motor vehicle inspection station	Car service	Der.gr.	Zagórze
9	E. Leclerc	Retail	Der.gr.	Zagórze
10	Ewmar-Ness	Wholesale	Der.gr.	Zagórze
11	Ford – Szumilas	Retail	Der.gr.	Zagórze
12	Leroy Merlin	Retail	Der.gr.	Śródula
13	Macro Cash&Carry	Wholesale	Der.gr.	Zagórze
14	Mercedes	Retail, wholesale & services	Der.gr.	Stary Sosnowiec
15	Mikołajczyka (Osiedle) (The Mikołajczyk – H. Estate)	Housing estate	Der.gr.	Dębowa Góra
16	Municipal Rescue and Fire Department (Division Porąbka)	Services	Der.gr.	Porąbka
17	Neuca	Wholesale	Der.gr.	Zagórze
18	Norauto	Retail & services	Der.gr.	Śródula
19	ProLogis Sosnowiec	Logistics	Der.gr.	Zagórze/Śródula
20	Puczpol	Manufacture, wholesale and service of metal products	Der.gr.	Klimontów
21	Słoneczne (Osiedle) (A Sunny – H. Estate)	Housing estate	Der.gr.	Dębowa Góra/Sielec
22	Trade and Service Centre	Retail, wholesale & services	Der.gr.	Sielec/Klimontów
23	Wzgórze (Osiedle) The Hill (H. Estate)	Housing estate	Der.gr.	Sielec/Dębowa Góra
24	Toyota – Konsek	Retail & services	Der.gr.	Zagórze
25	Volkswagen – Magro	Retail & services	Der.gr.	Pogoń
26	Zielona Dolina (Osiedle) (The Green Valley – H. Estate)	Housing estate	Der.gr.	Dańdówka

Tab. 2: New larger enterprises located in the derelict greenfields in Sosnowiec after 1990. Functions and localization
Source: Authors

No.	Name of enterprise	Type of functional derelict areas	Former land use type or institution	Function of enterprise	City part
1	Aldi (Pogoń)	Br	Meat industry	Retail	Pogoń
2	Aldi (Sielec)	Br & Gy	Post-mining railway sites	Retail	Sielec
3	Alicja	Gy	Abandoned community and entertainment center	Services	Ostrowy Górn.
4	Amtra	Br	Politex – cotton-industry plant	Wholesale	Pogoń

Tab. 3: Economic activities in Sosnowiec – the most important investments in brownfields and also in larger greyfields (as of 31.12.2012)

Notes: Br – brownfields; Bl – blackfields; Der. gr – derelict greenfields; Gy – greyfields; KPP (Kopalnia Piasku Podszadzowego) – Sand Pit; KWK (Kopalnia Węgla Kamiennego) – Hard Coal Mine; the authors considered both investments in new construction and new investments "in old walls" (refurbished buildings or objects)

Source: Authors

Tab. 3 – continuing

No.	Name of enterprise	Type of functional derelict areas	Former land use type or institution	Function of enterprise	City part
5	Autodrom Sosnowiec	Br	Former construction industry	Entertainment	Pogoń
6	Automax	Br and Der. gr	Former mine slag heap and derelict greenfields	Retail and services	Śródula
7	Bart	Gy	Abandoned house	Services and contr.	Pogoń
8	Biedronka (Sielec)	Br	Cotton-industry (before 1945)	Retail	Sielec
9	Biedronka (Zagórze)	Br	KWK "Porąbka-Klimontów"	Retail	Zagórze
10	Bitron	Br	Coal mining (before 1945)	White goods industry	Dańdówka
11	Black Red White	Gy	Secondary school – the mining specialization	Retail	Zagórze
12	Budecon	Br	"Silma" – socialist electronics industry	Construction	Zagórze
13	Budirem	Br and Bl	KWK "Porąbka-Klimontów"	Construction	Zagórze
14	Caterpillar	Br	Coal mining (before 1945)	Automotive	Dańdówka
15	CEBI Poland	Gy	Coal mining (before 1945)	Electronics industry	Niwka
16	Caritas	Gy	Former secondary school	Centre of care (NGO)	Sielec
17	Coopra	Br	Politex – cotton-industry plant	Wholesale and retail	Pogoń
18	District motor vehicle inspection station	Br	Former mine slag heap and derelict greenfields	Car service	Śródula
19	Duda-Silesia	Br	KWK "Saturn"	Meat-industry	Milowice
20	Elgum Automotive	Br	Politex – cotton-industry plant	Automotive	Pogoń
21	Energy – community center	Gy	Secondary school – the energy specialization	Community centre; NGO offices	Pogoń
22	Expo Silesia	Br and Gy	"Silma" – socialist electronics industry	Exhibition	Zagórze
23	Europa Shopping Center	Gy	Not finished and abandoned building	Retail and service	Centrum
24	EZT	Br	"Silma" – socialist electronics industry	Security and cleaning services	Zagórze
25	Fashion House Outlet Cent.	Br	Industrial railway sites	Shopping centre	Jęzor
26	Ferrolti	Br	KWK "Sosnowiec"	Manufacture of metal products	Sielec
27	Geiger Technik Polska	Br	Coal mining (before 1945)	Manufacture of metal products	Dańdówka
28	Geocarbon	Br	KWK "Niwka-Modrzejów"	Investigation and research services	Niwka
29	Gimplast	Br	KWK "Saturn"	Manufacture of plastic products	Milowice
30	Grzybex & Klich-Pol	Gy	PSS "Spolem" - unfinished wholesale buildings	Wholesale	Kazimierz Górnicy
31	Heraeus Electro-Nite Polska	Br	KWK "Sosnowiec"	Electronics industry	Sielec
32	High School of Medicine	Br & Gy	KWK "Niwka-Modrzejów"	High school	Niwka
33	Hoermann Polska	Br	KWK "Saturn"	Manufacture of metal products	Milowice
34	Housing estate at Kilińskiego St.	Br & Der. Gr	Post-railway sites	Housing estate & retail	St. Sosnowiec
35	Housing estate at Kosynierów St.	Br	KWK "Porąbka-Klimontów"	Housing estate	Zagórze

Tab. 3 – continuing

No.	Name of enterprise	Type of functional derelict areas	Former land use type or institution	Function of enterprise	City part
36	Humanitas – High School	Gy	Former office building	High school	St. Sosnowiec
37	Iglotex	Gy	Former wholesale	Wholesale	Zagórze
38	Janus	Br	“KBO” – former construction company	Manufacture of metal products	Dębowa Góra
39	Indoor Karting – Adrenalina	Br	Politex – cotton-industry plant	Entertainment	Pogoń
40	Instac	Br	KWK "Kazimierz-Juliusz"	Construction	Porąbka/Juliusz
41	Kana – Education Center	Gy	Former natural therapy centre	Services	Sielec
42	Magneti Marelli Exhaust System	Br	Coal mining (before 1945)	Automotive	Zagórze
43	Municipal Department of Real Estate Management	Gy	Former local clinic	Services	Sielec
44	Municipal Cemetery	Br and Bl	Post mining sites	Cemetery	Niwka
45	Municipal Landfill Department	Br	KPP “Maczki-Bór” (sand pit)	Modern landfill site	Porąbka/Juliusz
46	Municipal Office (building at 3 Maja St.)	Gy	Former Municipal Hospital No. 2	Municipal Office	Centrum
47	Nadwozia-Partner	Br	Coal mining (before 1945)	Automotive	Dańdówka
48	Netto	Br	Former metal industry	Shopping centre	St. Sosnowiec
49	Nowa Wanda (New Wanda)	Br and Der. gr	Stone-waste and derelict greenfields	Housing estate	Dębowa Góra
50	Office and service building at Nowopogońska St.	Br	Former office-building of "Buczek" steelworks	Service and offices	Pogoń
51	Office and service building at Andersa St.	Br and Gy	Office-building of former “Wanda” industrial plant	Service and offices	Dębowa Góra
52	Office and service building at Jedności St.	Br and Gy	Office-building of former industrial plant – elements for construction	Service & offices	Dańdówka
53	O.K. Sosnowiec	Br	KWK “Porąbka-Klimontów”	Manufacture of plastic products	Zagórze
54	Okraślak	Br and Gy	Local clinic at KWK “Sosnowiec”	Hotel (3-stars) and restaurant	Sielec
55	Plastic Components and Modules Poland	Br and Der. gr	Derelict greenfields and brownfields	Automotive	Zagórze
56	Plastic Components Fuel System Poland (former Ergom Poland)	Br	Coal mining (before 1945)	Automotive	Dańdówka
57	Plejada	Br	Former mine slag heap	Shopping centre	Środula
58	Police station	Br & Gy	“Intertex” – cotton industry plant (office building)	Public services	Pogoń
59	Polskapersse	Br	KWK “Saturn”	Printing, editorial off.	Milowice
60	PRC Group (former SEGU Polska)	Br	KWK “Sosnowiec”	Automotive	Sielec
61	Process Electronics	Br	Coal mining (before 1945)	Electronics industry	Dańdówka
62	Powiat Employment Agency	Gy	Former student hotel	Services	Sielec
63	Pronos	Br	Former construction company	Manufacture of metal products	Kazimierz Górnicy
64	Raben Group	Br	KPP “Maczki-Bór” (sand pit)	Logistics	Bór
65	Real	Br	Old sand pit area	Shopping centre	Milowice
66	Recreation-Sport Centre (Środula)	Br and Der. gr	Old quarry & stone-waste hill	Recreation	Środula

Tab. 3 – continuing

No.	Name of enterprise	Type of functional derelict areas	Former land use type or institution	Function of enterprise	City part
67	Residential block at 11 Listopada St.	Gy	Abandoned hotel for workers	Residential function	Dańdówka
68	Residential block at Czeladzka St.	Gy	Unfinished and abandoned building	Residential function	Pogoń
69	Residential blocks at W. Polskiego St.	Gy	Unfinished and abandoned buildings	Residential function	Dańdówka
70	Residential block at Mjr Hubala-Dobrzańskiego st.	Gy	Abandoned hotel for workers	Residential function	Klimontów
71	Residential block at Kosynierów St.	Gy	Abandoned hotel for workers	Residential function	Zagórze
72	Residential block at Mariacka St.	Gy	“Metalowiec” – former community centre and cinema	Residential function	Pogoń
73	Residential block at Sienkiewicza St.	Gy	Unfinished & abandoned building	Residential function and retail and services	Centrum
74	Saltzmitter Mannesmann	Br	KPP “Maczki-Bór” (sand pit)	Wholesale	Bór
75	Selw-2	Br and Gy	Steelwork “Buczek”	Service and manufacture	Środula
76	Silesian Logistics Centre	Br	Coal mining (before 1970)	Logistics	Jęzor
77	Silesian Revenue Office	Gy	Abandoned hotel for workers	High school	Dańdówka
78	Silesian University of Medicine	Br	Wasteland	Administration	Zagórze
79	Sistema Poland	Br	“Silma” – socialist electronics industry	Wholesale	Zagórze
80	Sosnowiec Park of Science and Technology	Br	KWK “Niwka-Modrzejów”	Research & Technology	Niwka
81	Stelonex	Br	“Silma” – socialist electronics industry	Logistics	Zagórze
82	System	Br	“SPBP” – former construction company	Furniture manufacture	Dańdówka
83	Tesco (Sielec)	Br	Cotton-industry (before 1945)	Retail	Sielec
84	The Climbing Centre – Poziom 450	Br	KWK “Sosnowiec”	Recreation	Sielec
85	The Jehovah’s Witnesses Convention Centre	Br and Gy	“Transgórze” – former logistics company	Religious functions	Niwka
86	TM Steel	Br	“SPBP” – former construction company	Wholesale	Dańdówka
87	University of Silesia – Faculty of Philology	Gy	Abandoned old hospital	High Education	Pogoń
88	Watt	Br	Coal mining (before 1945)	Engineering industry	Niwka
89	Wrzosowe Ogrody (Heather Gardens)	Br	KWK “Sosnowiec”	Housing estate	Sielec
90	Zap	Br and Der. gr	Former mine slag heap and derelict greenfields	Wholesale	Środula

Name of enterprise	Function of enterprise	Former land use type	Former land use or economic institution	City part	Will be open
Hotel Mercure	Hotel	Brownfields and Greyfields	Mining power station	Sielec	2013
Hotel ibis Style	Hotel	Brownfields	Mining power station	Sielec	2013
Kaufland	Retail	Brownfields	Metal industry	Stary Sosnowiec	2013

Tab. 4: Sosnowiec. Enterprises under construction (01.01.2013)

Source: Authors

		Functional type of derelict area										
		I Sector	II Sector				III Sector			Non-economic		
New type of functional land use	FUNCT.	AGRIC	MININ	INDUST	LOG&C	COMM	RECR	O. SER	RESID	MILIT	O. FUN	
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
		Δ	X	X	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
		X	X	Δ	X	Δ	Δ	Δ	Δ	Δ	Δ	Δ
		X	X	X	Δ	X	Δ	Δ	Δ	Δ	Δ	Δ
		-	X	X	Δ	Δ	Δ	X	Δ	Δ	Δ	Δ
		X	X	X	X	Δ	Δ	Δ	X	X	Δ	Δ
		X	X	Δ	Δ	Δ	Δ	Δ	X	X	Δ	Δ
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
		Δ	X	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ

Tab. 5: Dynamic model of the functional land use transformation

Explanations: AGRIC – agriculture; MININ – mining; INDUST – industry; LOG&C – logistics and communication; COMM – commerce (retail and wholesale); RECR – recreation and tourism; O.SER – other services; RESID – residential functions; MILIT – military; O.FUN – other functions

Source: Authors

Previous functions	Number	Emerged functions	Number
Mining	7	Other services	5
Agriculture	4	Commercial	3
Industry	3	Residential	3
Logistics and communication	1	Logistics and communication	2
Residential	1	Recreation	2
Other services	1	Industry	1
		Other functions	1

Tab. 6: The number of previous and newly emerged functions of functionally derelict areas in the city of Sosnowiec (1990–2012). Note: Without change within the same type

Source: Authors

expressed in numbers had its reference in the count of enterprises, too. Generally, the newest investments were observed in the post-mining and post-industrial brownfields and derelict greenfields.

Both the quality, as well as the quantity depictions showing the transformations in functionally derelict areas, may constitute a significant supplement (e.g. the employment structure) in defining general changes in the functions of the city.

4. Conclusions

Functionally derelict areas currently constitute a crucial problem in the spatial development of cities. On the one hand, they offer incentives for investment through their accessibility, price, location, and functional diversification. On the other hand, due to

their disadvantageous image, there may represent some barriers, too. Not every developer is able to undertake the challenge of locating an enterprise in the “wasteland”. The problem frequently arises from the fact that the investment site is an enclave, still surrounded by derelict areas, where the urban landscape is usually decomposed. Perceptually, it is the antithesis of development.

From this case study of Sosnowiec, however, where investment zones have developed in dispersed form and where the need to be a “pioneer” has always existed, this barrier can be broken. In this case, the diffusion model has become apparent – hierarchical and infectious. In the case of hierarchical diffusion – new investments were located in almost exclusively derelict areas, where the factor of low price, good transport accessibility and allotments of proper size were the most influential.

Following pioneer investments, new developments agglomerated around them in the process of a so-called infectious diffusion. From the perspective of over 20 years, it can be stated that this development model of functionally derelict areas, and particularly brownfields, is most welcome. It is recommended also from the viewpoint of economic, tax, social and spatial benefits.

The examined case of Sosnowiec also reveals that consistent and open urban policies focused on wasteland development may even create a model example of facing the problem for other post-mining and post-industrial cities. In Sosnowiec itself, a form of milieu has been shaped, which redefines the current development of the city.

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