

Article

Redevelopment of Brownfields for Cultural Use from ERDF Fund—The Case of Hungary between 2014 and 2020

Mariann Szabó ^{1,2,*}  and Fruzsina Bozsoki ²

¹ Institute of Advanced Studies Kőszeg, Chernel Street 14, 9730 Kőszeg, Hungary

² Department of Environmental Economics and Sustainable Development, Faculty of Economic and Social Sciences, Budapest University of Technology and Economics, Magyar Tudósok Körútja 2, 1117 Budapest, Hungary; fruzsina.bozsoki@edu.bme.hu

* Correspondence: szabo.mariann@gtk.bme.hu

Abstract: In the current research we aim to analyse the public redevelopment projects financed in Hungary from the Territorial and Settlement Development OP between 2014 and 2020, with special focus on cultural use. Brownfield redevelopment is a major topic in an urban development context from an urban sustainability, circularity, and creative urban/regional development point of view. Within the examined period, 39% of the brownfield redevelopment projects have cultural ties. A detailed introduction of the cases highlights the importance of landscape-oriented spatial strategies, temporary use, and mixed land use options in redevelopment for long-term viability. The original function of redevelopment projects encompasses a wide range. We could find industrial brownfields from the 19th century to agro-food facilities from the soviet era, which proves that the allocation of ERDF funds for brownfield redevelopments helped the rehabilitation of those sites which are important in showcasing Hungarian history.

Citation: Szabó, Mariann, and Fruzsina Bozsoki. 2022. Redevelopment of Brownfields for Cultural Use from ERDF Fund—The Case of Hungary between 2014 and 2020. *Journal of Risk and Financial Management* 15: 181. <https://doi.org/10.3390/jrfm15040181>

Academic Editor: Daniela Angelina Jelinčić

Received: 27 February 2022

Accepted: 8 April 2022

Published: 14 April 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: brownfield redevelopment; cultural use; public funds; Hungary; post-socialist transformation; circular urban development

1. Introduction

Regions are subject to changes due to various often interrelated effects, such as industry shocks or development, global crises, new technologies or changes in consumer expectation, resulting in volatilizing population patterns, income differences and welfare conditions. Thereby, as (Simmie and Martin 2010) notes, regional and local development is definitely not a smooth and incremental process but rather an interrupted, sequential one (as the global financial crises in 2009 or as a result of the COVID-19 pandemic prove). Structural changes (discussed by Rostow 1959) in the economy influence the economic equity, social welfare, and natural and built environment of urban centres as well as their environment (city regions, urban–rural structures), and impact land use too. Brownfield sites are often considered as the legacy of a century of industrialization (NRTEE 2003; Czirfusz 2014; Dannert and Pirisi 2017) or socialist era (Osman et al. 2015); in parallel, their rehabilitation or remediation is favourable from the perspective of sustainable regional and urban development (Pediaditi et al. 2010; Morio et al. 2013; Kolosz et al. 2018; Loures and Vaz 2018; Song et al. 2019). Depending on their size, they represent opportunities from small-scale to large-scale urban improvements, contributing to the reduction in pressure to expand into surrounding green fields, which could contribute to achieving the EU goal of no net land take by 2050 (Science for Environment Policy 2016). The redevelopment of brownfields (depending on various factors, such as the size of the territory, the remediation cost and the social perception) is often implemented through a step-by-step process where temporary use is a viable option for fostering how the territory could be reintegrated into the urban fabric (Bardos et al. 2016; Marian-Potra et al. 2020).

As the availability of the scientific works indicates, the brownfield redevelopment phenomenon is a global research theme discussed frequently from a regional/national perspective (e.g., Visegrad Countries—Petříková et al. 2013; developing countries—Ahmad et al. 2018; China—Han et al. 2018). On the European level, brownfield redevelopment has become a major topic in urban development; however, it is more than just a phenomenon with emerging importance, but rather an ongoing challenge for the governments, regional authorities, development agencies and institutions, communities, etc. Several scientific contributions deal with the scale and nature of European brownfields by applying a case-study approach (e.g., Budapest, Hungary—Romaniak et al. 2014; Karvina, Czech Republic—Martinat et al. 2016; brownfields in Kranj, Slovenia—Cotic 2019; Lene-Voigt Park in Leipzig, Germany—Kabisch 2019; former sandpit in Southern Poland—Krzysztofik et al. 2020). From a policy perspective, it was extremely important to determine the precise content of the phenomenon (Loures and Vaz 2018; Tonin and Bonifaci 2020; Vojvodíková et al. 2021). Differing from the definition accepted in the US, the EU accepts a broad-spectrum definition (Rey et al. 2022), which is based on the concept of previously developed land (originated from the UK terminology). The definition by CABERNET (Concerted Action on Brownfield and Economic Regeneration Network), a European multi-stakeholder network that focuses on the complex issues that are raised by brownfield regeneration, reflects that broad-spectrum nature: “Brownfields are sites that have been affected by the former uses of the site and surrounding land; are derelict and underused; may have real or perceived contamination problems; are mainly in developed urban areas; and require intervention to bring them back to beneficial use” (CABERNET 2006). For a deeper understanding of the phenomenon, various classifications have been elaborated to determine what brownfield sites are exactly. For instance, Dannert and Pirisi (2017), referring to Orosz (2012), classify brownfields based on the former use of the area as (1) **traditional brownfields** (former industrial, military and transportation areas), (2) **transitional brownfields** (former commercial, residential and other technical infrastructure areas) and (3) **the new type of brownfields** (former social and cultural functions). Similar to this, a current publication issued in Rey et al. (2022), titled *Neighbourhoods in Transition*, highlights the diversity and richness of situations: (1) **industrial brownfields** (composed of industrial sites from the nineteenth and the first half of the twentieth centuries and large sub- or peri-urban industrial sites), (2) **railway brownfields** (abandoned railway stations, obsolete railway areas, industrial railway sites), (3) **military brownfields**, (4) **waterfront brownfields**, (5) **infrastructural brownfields** (including transport-related infrastructures, agro-food facilities, tertiary sector facilities, commercial brownfields, energy brownfields) and, finally, (6) **diverse derelict sites**. The classification of the brownfield sites is the starting point. The next question—taking into consideration the positive effects of the redevelopment—is the new function to be introduced, the related financial budget for the reclamation and the cost bearer(s). The most common types of new functions vary from the recreational or cultural through infrastructural, business or residential to complex large-scale redevelopment projects. From a financial point of view, the various redevelopment projects could be reimbursed by private funds to public/national or European Union funds (for e.g., European Capital of Culture projects, The European Regional Development Fund (ERDF)) based on the profitability of the investments.

Recognized by the Treaty, culture is one of the most important foundations of the European Community, it is the basis for integration and represents a distinct criterion as to why the EU is more than just an economic cooperation. This was underlined by the European Spatial Development Perspective (ESDP) in 1999, which stated that cultural variety is a characteristic territorial feature of the European Union (EU). Accordingly, spatial development policies have to pay attention to not unifying the heritage but to enriching it in order to increase the quality of life of its citizens through the development of local public goods (CEC 1999). Barnett (2001) points out that culture serves as a medium for the ongoing integration process, resulting in a progressive ‘governmentalization’ of culture in terms of common programmes and budgeting. The European Network of Cultural Centres (ENCC) highlights the importance of culture in forming a sense of belonging to

the European community; upholding common European values; enhancing social capital; creating spillover effects on social cohesion, solidarity and diversity; ensuring educational activities for younger generations as well as life-long-learning; supporting democracy and active citizenship; raising the level of tolerance, openness and respect of others (ENCC n.d.). As one of the European Union's priorities, direct culture-related projects represent a significant share of the budget. A recent article about the EU Funding Programmes for Culture between 2021 and 2027 lists eight programmes which have direct relation to cultural programmes: Creative Europe (EUR 2.24 billion), the Asylum and Migration Fund (EUR 8.705 billion), Citizens, Equality, Rights and Values (EUR 1.64 billion), Digital Europe (EUR 7.588 billion), Erasmus+ (EUR 23.4 billion), the European Social Fund+ (EUR 87.319 billion), Horizon Europe (EUR 79.9 billion) and Interreg (EUR 7.95 billion) (EUcalls 2021). In addition, there are the non-direct cultural development project-related programmes, which as the official website of the European Union points out, incorporate culture-related dimensions, such as many EU policies, including education, research, social policy, regional development and external relations (EU n.d.).

There are several emblematic brownfield redevelopment projects for cultural use across the EU. Due to the redevelopment of the former gas plant in Vienna (capital of Austria), the city's newest quarter has been built. The monumental building retained a new complex function, hosting a shopping centre, an event hall, a number of offices, apartments, dormitory rooms, a kindergarten, a leisure centre and the city archives (Varga 2002). Another example is the historically outstanding area of the former industrial belt in the Ruhr region, which recently became home to many cultural institutions. There is, for example, the new University district, the Ruhr Museum and Zollverein Park (Heidenreich 2015).

Nowadays, brownfield redevelopment—due to the post-socialist transformation of cities and towns—is one of the major topics in Hungarian spatial development research and practice. Despite the fact that there are many sites in Hungary associated with the brownfield phenomena, current research, such as Dannert and Pirisi (2017), primarily focuses on the capital or larger urban centres (like the city of Pécs, which was the European Capital of Culture in 2010—the first award-winning city in Hungary after the country's accession in 2004). It is important to note that larger urban centres are the hot points of spatial development, so it is not by coincidence that former studies put so much emphasis on them. Furthermore, urban studies and spatial studies may apply in-depth analysis for a given research phenomenon or a systematic approach for analysing the wider perspective. In the current study, we have chosen the second alternative as we aim to evaluate the brownfield redevelopment projects for cultural usage financed by the ERDF fund in Hungary in the previous programming period (2014 to 2020). During this period, the ERDF funds were available dominantly for six NUTS-2 regions from the seven present in Hungary (the region where the capital resides (Central Hungary) had little access to these funds because of its development status). Therefore, this study enriches the brownfield research in Hungary by two main contributions: (1) currently, there is no such scientific paper from the field of development policy which focuses on the functional redevelopment of brownfields for an entire programming period; (2) considering the NUTS-2 regions outside the capital and the region formerly referred to as Central Hungary, it supplements research which does not concentrate on the capital.

The study is structured as follows. Firstly, we provide a literature review in terms of the redevelopment of brownfields for cultural use. At the end of this section, we synthesise the literature findings and highlight the most important aspects. Secondly, we interpret the collection of data and the development of the database using the online search engine for development projects in Hungary. Thirdly, we analyse all available brownfield redevelopment projects, totalling 64, from various points of view in order to understand the importance of cultural redevelopment projects. Finally, we provide a full overview of culture-related brownfield redevelopment projects where we will see the importance of

mixed land use options, including public greenspaces and culture, sport and children's parks.

2. Redevelopment of Brownfields for Cultural Use

The redevelopment of brownfields is widely discussed using CABERNET's ABC model or classification (with the later addition of category D) for the assessment of economic potential, thus, helping authorities to prioritise investment projects (Doleželová et al. 2014; Vojvodíková et al. 2021). The ABC model has two dimensions for the classification of sites: (1) land value (after reclamation) and (2) reclamation costs:

- For projects under type A, there is no need for public support or intervention, they are highly economically profitable for private investors since they are associated with low environmental risk and good position in the urban fabric, thus, with economic viability;
- For projects under type B, there is an opportunity for mixed financing since they are not profitable enough to be financed solely by the private sector; nevertheless, a Public–Private Partnership—PPP—would be a viable option since they are at the borderline of profitability due to their good position in the urban fabric on the one hand, and some associated environmental risk, higher investment cost, etc., on the other hand;
- For projects under type C, there is definitely a need for public funding since expected costs of revitalisation significantly exceed the economic benefits due to various factors such as the high level of contamination at the site, social challenges, deteriorated urban fabric, etc. (Ferber 2006; Vojvodíková et al. 2021).

Type D sites, as Vojvodíková et al. (2021) note, have a different character from the redevelopment perspective; they might be not attractive for either the private or the public sector.

As we can see, the ABC model incorporates the position of the brownfield sites into the investigation. Depending on their location in the urban fabric, the regeneration of brownfield sites is a strategic question of spatial development. Romaniak et al. (2014), examining a transitory belt in the Hungarian capital, Budapest, propose a specific urban design and landscape-oriented spatial strategy that could be applied to the fragmented site. Kabisch (2019) promotes brownfield regeneration as a possible direction for sustainable and healthy urban development, considering the case of a former railway in the city of Leipzig, Germany, where, with the involvement of a wide range of stakeholders, a successful co-creation process has been implemented. Czirfusz (2014) links brownfield regeneration to the creative city idea; the attraction of knowledge-intensive, high added-value industries definitely improves the viability of regeneration projects, while Taraba et al. (2021) emphasise the key role of urban design interventions, including industrial brownfield redevelopment in creativity-driven urban regeneration. Marian-Potra et al. (2020) also suggest the redevelopment of brownfields as creative/cultural places possibly as a temporary use of the sites.

Several scientific contributions deal with the strategic management of brownfield redevelopments. One major challenge is the question of ownership. Lorange Rall and Haase (2011) describe the case of the City of Leipzig and its 'interim-use' programme, which was dedicated to revitalise the city's declining neighbourhoods by taking over the development of private brownfields through waiving property taxes in return for a promise of regular maintenance, by which the city has vastly increased the share of public greenspace in these areas. In the case of brownfield redevelopment, either in the preparatory phase or after the redevelopment, it is worthwhile for the expectations and perception of residents to be assessed. Martinat et al. (2016) investigate how a range of brownfield re-use options are perceived by residents and visitors to the Landek area in the city of Ostrava (Czech Republic) by applying a questionnaire-based method; the results indicate that future brownfield uses such as culture, sport and children's parks are the most popular options. Morio et al. (2013) propose a multi-criteria genetic algorithm

which is meant to determine optimal land use configurations with respect to assessment criteria and given constraints on the composition of land use classes, including stakeholder preferences and financial viability aspects. They also conclude that mixed land use options are favourable for redevelopment from a societal point of view.

Zhu et al. (2015) propose an indicator-based evaluation (Information System for Brownfield Regeneration) for brownfield redevelopments, providing customised information according to stakeholders' characteristics and needs based on four dimensions (1. social and economic, 2. financial and accounting, 3. environmental and health, 4. prospective value). Turečková et al. (2021) apply an indicator method, which analysed a set of 572 existing sites recorded in the official brownfield database administered by CzechInvest, to define a set of indicators of brownfield regeneration potential by factor analysis, considering their significance in the regions of the Czech Republic on the NUTS-3 level. They concluded that the most frequent factor distinctive for brownfields is their size, while the least significant factor proved to be the indicator of former utilisation. They argue that the intervention of the public sector is well-grounded, not only by its participation in the brownfield regeneration process, but also by supporting and helping the private sector (Turečková et al. 2021). Despite the fact that the uniqueness of each brownfield may limit general approaches to its regeneration, the identification of similar and common features of brownfield sets makes it possible to boost the regeneration potential (Turečková et al. 2021).

Jamecny and Husar (2016), highlighting the complex nature of historic industrial brownfield regeneration, elaborate a new conceptual framework to improve the processes of brownfield regeneration and to develop efficient and sustainable management strategies under existing complexity, multiple actors and levels in decision making. Special attention is to be focused on the redevelopment of abandoned or underutilised cultural heritage buildings since they hold a unique niche in the urban landscape; in their case, the optional full restoration is the most favourable option since it embodies the local cultural and historic characteristics that define communities (Foster 2021). Military brownfields, due to their size and contamination, represent a special group among PDL. Peric and Miljus (2021) propose a deliberative planning approach if several institutions are the decision makers in the redevelopment of former military sites.

Rizzo et al. (2018) introduce an innovative tool called the Information System for Brownfield Regeneration (ISBR), which has been tested by stakeholders from the EU project TIMBRE case studies; the results indicate that for stakeholders, the remediation aspects, the benchmarking information (valuable to improve practices) and, finally, sustainability-related issues, are the most important aspects. This result is important from the EU perspective since there are Territorial Cooperation Programmes, such as the URBACT or Interreg, which aim to facilitate the dissemination of good practices (which could be perceived as benchmarking information). For instance, in an ongoing Interreg Europe Project, called 'Local Flavours', which aims to promote cultural heritage-based urban development in less visited regions, partners shared ideas for brownfield redevelopment, such as the regeneration of the "Caserma Piave" in Belluno, a former military barrack; the Factory in Grisu where former firefighters buildings were developed into a creative enterprises hub; the activity of associations, such as the "Friend's club of Bānītis", involving the community of local and railway enthusiasts to preserve narrow-gauge railway heritage (Interreg Europe Local Flavours n.d.).

A literature review synthesis is provided in Table 1 about the aspects for the redevelopment of brownfields. We divided the aspects into two categories: the first one highlights the interrelatedness of brownfield redevelopment with other urban and regional development policies. Brownfield regeneration has strong correlations with the sustainable, healthy and circular urban/regional development initiatives as well as with the creative city/region concept. The second one collects those criteria which contribute to the successful redevelopment projects, including special cases, such as monuments and historic buildings.

Table 1. Aspects for the redevelopment of brownfields.

Aspect	Solutions	Authors
Connection to development approaches	sustainable/circular regional development	Pediaditi et al. (2010); Morio et al. (2013); Kolosz et al. (2018); Loures and Vaz (2018); Song et al. (2019)
	sustainable and healthy urban development	Kabisch (2019)
	Landscape-oriented spatial strategy	Romaniak et al. (2014)
	temporary use	Bardos et al. (2016); Marian-Potra et al. (2020)
	creative city/region	Czirfusz (2014); Taraba et al. (2021); Marian-Potra et al. (2020)
Strategic management of brownfield redevelopments	type of redevelopments	Lorance Rall and Haase (2011): public greenspace Martinat et al. (2016): culture/sport and children’s park
	stakeholder involvement	Morio et al. (2013): mixed land use options Morio et al. (2013); Zhu et al. (2015); Peric and Miljus (2021) for military brownfields
	financial matters	CABERNET (2006); Vojvodíková et al. (2021)
	determinant nature of the size	Turečková et al. (2021)
	complex nature of historic industrial brownfield regeneration	Jamecny and Husar (2016); Foster (2021)
	importance of benchmarking information	Rizzo et al. (2018)

3. Materials and Methods

The main focus of our research is the cultural utilisation of brownfield sites. It is important to note that we comprehend the cultural use in broader terms, not just museums, libraries and archives or art galleries, but such developments that have the capacity to educate citizens on associated aspects of culture and history, such as community cultural centres. In the course of the research, we examined the Hungarian brownfield redevelopments supported during the EU from 2014–2020 programming period from the ERDF fund. Our main goal was to get an idea of what percentage of the brownfield developments in Hungary were cultural utilisation and how they were implemented. In Hungary, the application takes place on an electronic interface, and the announcement of the calls and the submission of the application also take place through an online system. The Hungarian government provides an online inventory of development projects, this is called “search engine for funded projects” (“Támogatott projektkereső” in Hungarian), which is available to the public on the following website: https://www.palyazat.gov.hu/tamogatott_projektkereso# (accessed on 30 November 2021) and contains the EU-funded projects.

Generally, the EU uses a top-down approach for the development programmes, which are called Operative Programmes. For the use of the ERDF funds, the “Regulation (EU) No. 1301/2013 of the European Parliament and of the Council of 17 December 2013, on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal and repealing Regulation (EC) No. 1080/2006” is the base document. According to *Article 5*, Investment priority (6) e) is for the promotion of brownfield redevelopments: “taking action to improve the urban environment, to revitalise cities, regenerate and decontaminate brownfield sites (including conversion areas), reduce air pollution and promote noise-reduction measures”.

In the programming period between 2014 and 2020, the Hungarian Development Program (short name: ‘Széchenyi 2020’) was composed of eight Operative Programmes, from which the Territorial and Settlement Development OP (financed through the ERDF) had, accordingly, a specific call for the rehabilitation of brownfield sites (TOP-2.1.1). Generally, the programme focused on two funding priorities: (1) creating local conditions to boost economic growth and increase employment and (2) enterprise friendly and population-preserving urban development. The second priority is divided into six further interventions:

1. The development of green urban areas and the development of small-scale environmental protection infrastructure;
2. Sustainable urban transport development;
3. Improving the energy efficiency of local government buildings;
4. The development and expansion of public services;
5. The development of deprived urban areas;
6. The strengthening of local communities and cooperation (EC n.d.).

As the call for proposals has been introduced by sub-calls in Hungarian countries, we have reviewed all of these. Unfortunately, the engine does not provide the opportunity to export the projects but just list them, thereby we have built a separate database for further evaluations in MS Excel. The columns of the database describe the various attributes of the development projects and the rows of the projects themselves. With the help of the search engine, we collected the following data: the call identification number of the Territorial and Settlement Development OP, the name of the settlement housing the project, the county the settlement belongs to, the start and end of the project, the description of the project, development fund, budget, aid intensity and the date of approval. Next, we have added further attributes to the database, such as the NUTS-2 region the settlement is located in and the number of inhabitants of the settlement, which was essential to define the size category of settlements, as well as the settlement category—these data were derived from the Hungarian Central Statistical Office. For deeper understanding of the projects, we evaluated the original function with brownfield classification by Rey et al. 2022, the type of the redevelopment, the exact original function and the new functions introduced. Table 2 indicates the projects’ attributes, the attributes added to the original ones from the search engine are in bold.

Table 2. Development projects’ attributes.

Project Identification	Territorial Attributes	Project Measures	Financial and Implementation
Name of the settlement	County (NUTS 3)	Brownfield classification (based on Rey et al. 2022)	Development fund
Call identification number to the Territorial and Settlement Development OP	Development region (NUTS 2)	Redevelopment type	Budget
Project start	Settlement category	Original function of the brownfield sites	Aid intensity
Project end	Number of inhabitants	New functions introduced	Date of approval
Description of redevelopment project	Size category		

The database consists of 64 brownfield redevelopment projects. With the help of the database, we analysed the projects on two separate levels.

The first level is the nature and characteristics of the redevelopment project. In this discourse we have examined the following questions:

1. How many cultural redevelopment projects have been financed by the specific call?
2. What are the new functions, in general, that have been achieved by the rehabilitation projects?
3. What were the original functions of these brownfield sites?
4. What is the relation between the original functions and new functions? Which brownfields are redeveloped for cultural use prospectively?
5. How much is the budget for cultural rehabilitation?
6. What is the distribution of brownfield redevelopment projects on the regional (NUTS 2) level?

The second level of the analysis is a deeper understanding of the projects from a regional and urban development perspective. Here, we have formulated the following hypotheses based on the literature review that have to be tested:

Hypothesis 1 (H1). *According to Turečková et al. (2021), the former utilisation of the brownfield site is less significant from a regeneration perspective; accordingly, we assume that for the ERDF projects a large range of former functions is covered.*

Hypothesis 2 (H2). *Morio et al. (2013), as well as Turečková et al. (2021), emphasise the benefits of mixed land use options for ensuring financial stability and social spillovers; consequently, we assume that examined cultural redevelopment projects take into account the income regeneration potential (component 'A') and social goals (component 'B').*

Hypothesis 3 (H3). *According to Foster (2021), the redevelopment of cultural heritage buildings consists favourably of a full restoration; accordingly, for monument sites, we assume that the redevelopment aims at demonstrating the appearance of the building in its original state.*

Hypothesis 4 (H4). *For military sites—as Peric and Miljus (2021) indicate—the level of contamination is one of the greatest costs to be covered, thereby, we assume that in the case of these projects, the financial aid is primarily for remediation.*

From the project descriptions, we got a picture of the previous function of the brownfield areas, which we could categorise further. Respectively, the description also included the developments taking place within the framework of the project, based on which we were able to group the areas according to new functions.

4. Results

At first, we provide an overview about the brownfield redevelopment projects which have been financed within the framework of the Territorial and Settlement Development OP between 2014 and 2020 (first level analysis). There are 64 projects under the specific call for brownfield redevelopments in the Territorial and Settlement Development OP, of which 39% are cultural.

We have evaluated the redevelopment projects one by one in order to classify the new functions which have been introduced through the rehabilitations. These categories refer to the classical typology of brownfield redevelopments: cultural sites (39%), business estates (27%), sport facilities (14%), complex rehabilitations of public spaces (12%) and, finally, commercial sites such as marketplaces (8%). The redevelopment projects represent high variety in terms of the new functions, which indicates that these sites provide the opportunity for tailor-made solutions according to the development needs of each settlement.

In the project register, detailed descriptions of the redevelopment projects are available. Due to this, the original function of the projects could be assessed. We have analysed the descriptions one by one, and we have categorised the original functions according to the typology developed by Rey et al. (2022). The distribution of the original brownfield sites is as follows: industrial (31.25%), infrastructural (29.69%), military brownfields (17.19%), diverse derelict sites (15.63%), waterfront (1.56%), industrial and diverse derelict (1.56%) and, finally, industrial and waterfronts (3.13%). There were few projects which belonged to more than one category, for instance, the rehabilitation of a former mill which is situated along the riverside covers two categories.

We have examined the relation between the original function and new functions. Figure 1 represents a cross-check evaluation of the original and new functions which indicates that cultural redevelopment projects originated from various brownfields including diverse derelict sites (4 projects), industrial brownfields (8 plus 2 projects), infrastructural brownfields (8 projects) and military brownfields (3 projects).

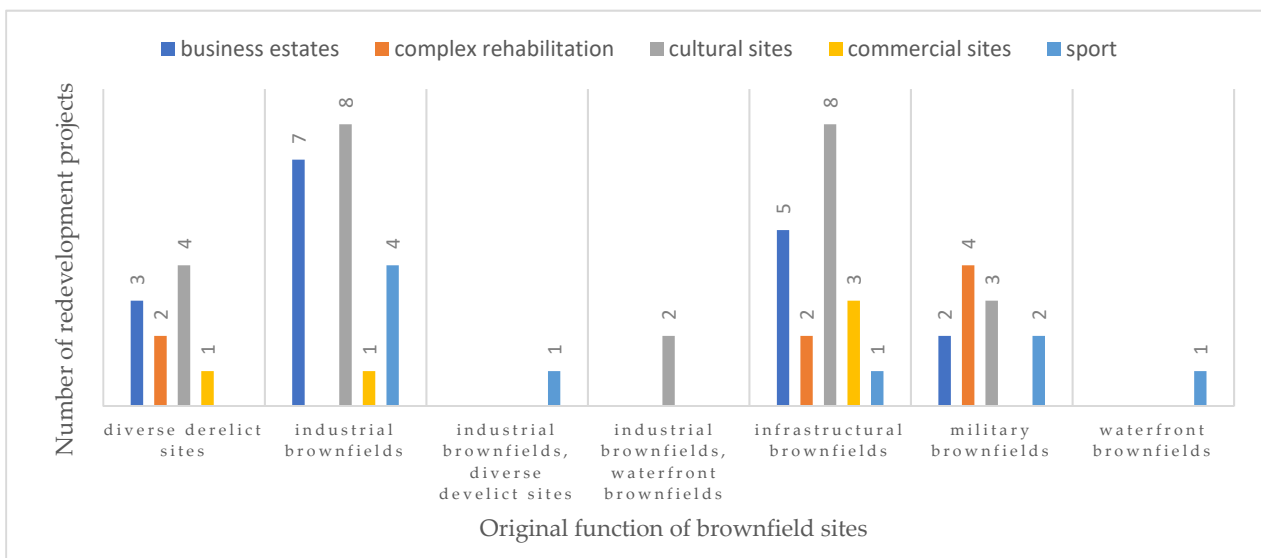


Figure 1. Total redevelopment projects with new functions per original functions (N = 64).

The budget allocated for cultural redevelopment projects is dominant too, it counts for 40% of the specific call for brownfield redevelopments.

The total budget for cultural rehabilitation was approximately EUR 94 million, and the budget allocated for cultural redevelopments was almost EUR 38 million. From a financial point of view, cultural redevelopment and complex rehabilitation projects count for the majority of funds.

As the ERDF fund was mainly available for convergence NUTS 2 regions in Hungary (6 regions from the total of 7), the analysis could prove that the brownfield redevelopments financed by public funds are really important in these regions. The territorial distribution of the projects validates the necessity of the specific call since all six development regions in Hungary have been involved (Figure 2).

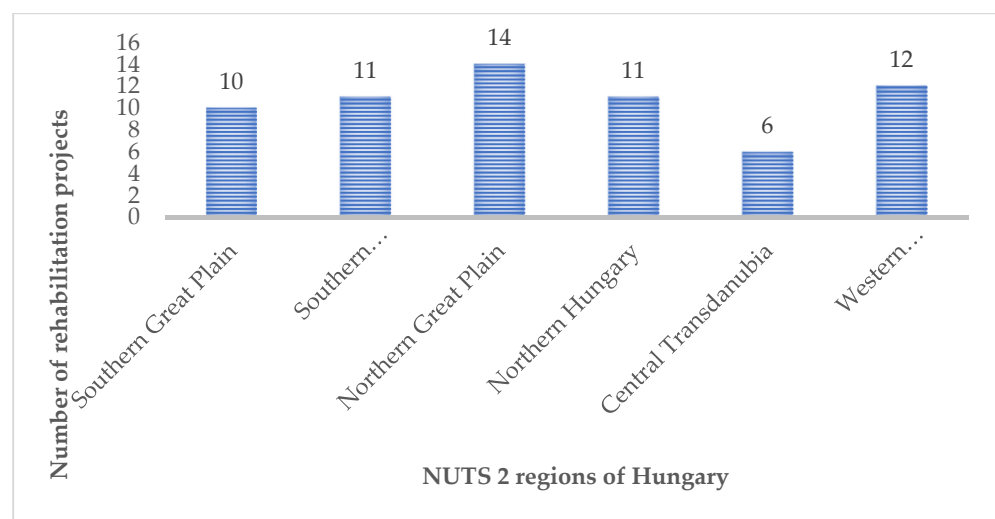


Figure 2. Total number of brownfield rehabilitation projects on NUTS 2 level (N = 64).

We have analysed the distribution of the new functions on a regional level (Figure 3). The split of redevelopment projects represents significant variance in all regions. The analysis proves that the cultural redevelopments are important in all regions resulting in direct benefits for the local communities and society.

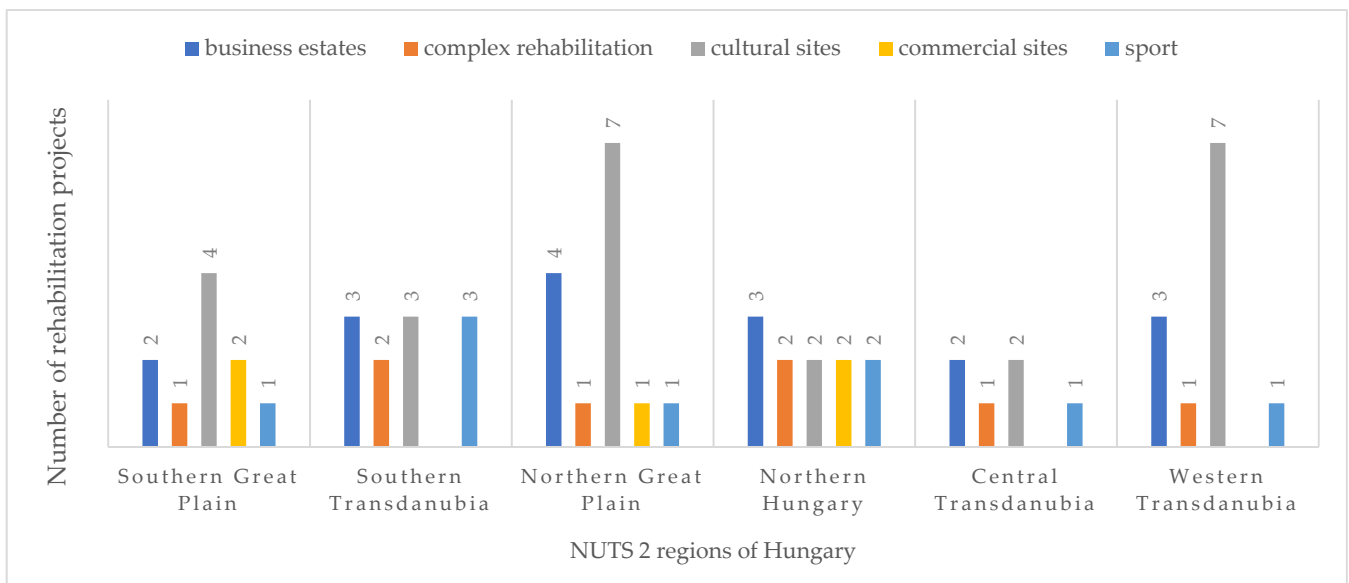


Figure 3. Rehabilitation types on NUTS 2 level (N = 64).

In the course of our research, we were able to get more detailed results on the cultural redevelopment projects (second level analysis). These projects, according to the CABERNET definition, belongs to TYPE C, where public intervention is needed (CABERNET 2006). As it came out from the statistical analysis, the classification developed by Rey et al. (2022) is sufficient to categorise the projects. In this discourse, based on their typology, we develop further sub-categories within the framework. At first, we interpret the cultural redevelopment projects, secondly, we test the hypotheses.

Table 3 includes the diverse derelict sites, in our examples of downtown and urban suburbs. During the evaluation of the projects, we found an interesting case in the example of Kaposvár, where the former Nostra building was based on the former castle ruins. Rehabilitation, thus, involves exploring and preserving the memory of the past.

Table 3. Redevelopment projects for diverse derelict sites.

Development Region (NUTS 2)	Name of the Settlement	Type of the Derelict Site	Original Function of the Brownfield Sites	New Functions Introduced	Budget
Southern Transdanubia	Tamási	sub-urban site	Old building in the deprived urban neighbourhood	Community place for cultural and other events, meeting place for NGOs, conference room and offices	EUR 801,440
	Kaposvár	peri-urban site	The building called “Nostra” was built in 1931 in the area of the former town castle. After the regime’s change the buildings fell into disrepair	Development of green areas with facilities for cultural, sport and recreational activities	EUR 1,994,326

Table 3. Cont.

Development Region (NUTS 2)	Name of the Settlement	Type of the Derelict Site	Original Function of the Brownfield Sites	New Functions Introduced	Budget
Northern Great Plain	Vámospércs	sub-urban site	Facilities on the outskirts of the settlement	Event hall for 200 people with the development of green areas	EUR 423,237
	Szolnok	complex rehabilitation in the town	Degraded old part in Szolnok town near “Final road” (‘Végső út’ in Hungarian)	Community place for cultural, entertainment and other events, parking zone, sports facilities, tennis playgrounds	EUR 3,188,488

Table 4 highlights the redevelopment projects for industrial brownfields. Buildings from the 19th century and from the first half of the 20th century are in this range, including industrial monuments as well (e.g., Keszthely, the beer manufacturing site of Vencel Reischl). We would like to highlight one example from this set. It is Körmend, where the former shoe factory buildings in the castle park will be demolished parallel to the soil change. The main reason for this is that the previous activity caused very serious soil pollution. The majority of the development projects include green space development, and we can see that there are a few projects which include mixed land use options.

Table 5 represents the redevelopment projects for industrial brownfields and waterfront brownfields. The two examples in the following are particularly interesting for their own complexity. The rehabilitation in Mohács, a historic industrial brownfield, has been restored to previous conditions, and during the rehabilitation of the building, a charming Danube bank site was created, which has become the home of many events, including cultural events, conferences, balls and weddings. In Jászberény, the former mill factory building was also restored to its original condition, where the conference centre was converted into a loaf to commemorate its former function. In our opinion, it would also be important to take advantage of the proximity to the waterfront; however, we did not find any improvements in the project descriptions.

Table 6 contains redevelopment projects for infrastructural brownfields. In this category, a dominant share of the buildings is due to the post-soviet transformation. In a few cases, such as Karcag or Mándok, the cultural function of local marketplaces has encouraged business incentives to be developed.

The military brownfields projects in Table 7 also include a number of creative and interesting rehabilitations. The Csongrád project will be built on the site of the former barracks in the new industrial park, and a new service house will be built in its former command building, which will contain several rooms and storage rooms, as well as a conference room for 100 people.

One of the special cases in our research also fell into this group. The area of the Kecs-kemét barracks will be rehabilitated for the first time, thus, involving the city residents from the previously closed part of the city and then only in the future will they add new functions to the buildings in the area after assessing the needs of the city residents. This is a creative development that can also be considered a temporary recovery process. In the public area of the barracks, a new layer of humus will be filled up after decontamination for pollution, so that the new public area can accommodate many cultural events.

Table 4. Redevelopment projects for industrial brownfields.

Development Region (NUTS 2)	Name of the Settlement	Type of Industrial Brownfield	Original Function of the Brownfield Sites	New Functions Introduced	Budget
Western Transdanubia	Jánosháza	industrial sites from first half of the twentieth century	Reconstruction of a former industrial site (textile industry) in the centre of the settlement. Rehabilitation of the green area of the fishing pond	A new building for community events, programmes with parking places. Green area rehabilitation, new facilities for recreational activities	EUR 620,760
	Körmend	industrial sites from first half of the twentieth century	Former shoe production factory	The former industrial site is demolished in order to provide place for the cultural and community events next to the valuable Batthyány castle monument (originally built in Baroque style in the 18th century)	EUR 844,111
	Moson-magyaróvár	industrial sites from first half of the twentieth century	Former metal manufacturing site, called "MOFEM"	Cultural centre, community place	EUR 1,866,428
	Keszthely	industrial sites from first half of the nineteenth century	The building is one of the oldest baroque monuments in the town built in 1770; from 1844 it was the beer manufacturing site of Vencel Reischl	Reconstruction of the former building for community place for cultural and other events, commercial and service sites with green area development	EUR 2,398,420
	Szombathely	industrial sites from first half of the twentieth century	Former electronic manufacturing site, acquired later by the municipality	New multifunctional area with sport, commercial and service sites, rehabilitation of green areas, community and cultural meeting place	EUR 2,116,253
Central Transdanubia	Gárdony (Agárd)	industrial sites from first half of the twentieth century	manufacturing site	Rehabilitation and enlargement of the former industrial buildings, development of public place for community purposes	EUR 1,139,761
	Komárom	industrial sites from first half of the twentieth century	Former industrial and logistic site in the town centre	Development of green areas with open air furniture. Community place development for families, youth, offices for NGOs and place for various catering services	EUR 1,608,352
Southern Great Plain	Déaványa	industrial sites from first half of the twentieth century	Former manufacturing site	New multifunctional place for the local government, cultural activities and business	EUR 1,798,511

Table 5. Redevelopment projects for industrial brownfields and waterfront brownfields.

Development Region (NUTS 2)	Name of the Settlement	Type of Industrial Brownfield	Original Function of the Brownfield Sites	New Functions Introduced	Budget
Southern Transdanubia	Mohács	industrial sites from the nineteenth century	Former silk, later textile industry site	Monument rehabilitation to the original state and use for community purposes for cultural and other events	EUR 2,560,487
Northern Great Plain	Jászberény	industrial sites from the nineteenth century	Former mill and its surroundings	Conference room, premises, sports and recreational activities, public place development	EUR 2,257,336

Table 6. Redevelopment projects for infrastructural brownfields.

Development Region (NUTS 2)	Name of the Settlement	Type of Infrastructural Brownfield	Original Function of the Brownfield Sites	New Functions Introduced	Budget
Western Transdanubia	Pannonhalma	agro-food facilities	Former Hungarian Agricultural Cooperative site in the Socialist Era	With the renovation of the building, development of community place for cultural and other events with hospitality facilities, parking zone	EUR 846,501
				Enlargement of the parking zone, cycling centrum development, community events	EUR 843,420
Northern Hungary	Gönc	commercial brownfields	Former Hungarian Consumption Cooperative site in the Socialist Era	With the demolition of the former site, new community place for cultural and other events, shop for local products and a Craft House	EUR 1,289,503
	Tokaj		Former trading site	Urban service place and green area development	EUR 1,485,195
Northern Great Plain	Besenyszög	agro-food facilities	Former Hungarian Agricultural Cooperative site in the Socialist Era	Renovation of the building: sport facility, offices and event hall for cultural programmes	EUR 748,304
	Hajdú-dorog	tertiary sector facilities	Former office building of a television service provider	Renovation of the building: offices, a multifunctional conference, event hall and business premises	EUR 411,499
	Karcag	agro-food facilities	Former mill (called Rónai) and its environment	Green place rehabilitation for community purposes for cultural and other events, shop for local products, infrastructure (roads, parking places)	EUR 1,410,835
	Mándok	commercial brownfields	Abandoned business site	Community place for cultural and other events with local market	EUR 372,460

Table 7. Redevelopment projects for military brownfields.

Development Region (NUTS 2)	Name of the Settlement	Type of the Military Brownfield	Original Function of the Brownfield Sites	New Functions Introduced	Budget
Southern Great Plain	Csongrád	Barracks	The commandant’s office building in the former military barrack as the last building in the site which has been the new industrial park	Event and conference hall (cultural and other occasions), recreation	EUR 810,948
	Baja		The commandant’s office building with the restaurant and kitchen	Rehabilitation of the building: sport and event place	EUR 1,410,832
	Kecskemét		Former Rudolf military barracks	Rehabilitation of the monument site including green space development and construction of roads for potential educational, cultural, social and touristic institutions	EUR 4,545,711

Next, let us test the hypotheses. Table 8 lists the hypotheses and their status: accept/decline.

Table 8. Confirmation of the hypotheses.

Hypothesis	Accept/Decline
H1. According to Turečková et al. (2021), the former utilisation of the brownfield site is less significant from a regeneration perspective; accordingly, we assume that for the ERDF projects a large range of former functions is covered.	Accepted
H2. Morio et al. (2013), as well as Turečková et al. (2021), emphasise the benefits of mixed land use options for ensuring financial stability and social spillovers; consequently, we assume that examined cultural redevelopment projects take into account the income regeneration potential (component ‘A’) and social goals (component ‘B’).	Accepted
H3. According to Foster (2021), the redevelopment of cultural heritage buildings consists favourably of a full restoration; accordingly, for monument sites, we assume that the redevelopment aims at demonstrating the appearance of the building in its original state.	Accepted
H4. For military sites—as Peric and Miljus (2021) indicate—the level of contamination is one of the greatest costs to be covered, thereby, we assume that in the case of these projects, the financial aid is primarily for remediation.	Partially accepted

The findings of Turečková et al. (2021) for the first hypothesis, has been validated since the 64 projects represent great variety. Focusing on the cultural redevelopments, there are former functions which resemble the “broad spectrum definition” of previously developed land. The range of projects covers cases from contaminated sites to underused buildings through to monuments.

The projects which have been financed by this specific call were initiated by municipalities, thereby we could expect that both financial and social sustainability concerns have been taken into account when project design took place. A few cases from the projects serve as a good example to accept the second hypothesis: development of the community places is the heart of most of the projects and several ones take into account the potential of income regeneration with establishing conference rooms, event halls, places for catering services, shops for local products or offices. In Hungary, the municipalities are able to

receive revenue from renting, consequently, this business activity is represented in the cases.

The third hypothesis can be accepted as well. There were three monument sites in which redevelopment aims are to demonstrate the appearance of the building in its original state: the beer manufacturing site of Vencel Reischl in Keszthely, the former silk and later textile industry site in Mohács and the former Rudolf military barracks in Kecskemét. The monumental building in Jászberény (former mill) is protected and renovated as well.

The fourth hypothesis could be partially accepted. In the case of the former Rudolf military barracks in Kecskemét, the remediation cost represents a significant cost to be covered, nevertheless, in the case of Csongárd, the development is the final step of a longer rehabilitation project (utilisation of the building in the industrial park), while in the case of Baja, the redevelopment project is the first step of a longer-rehabilitation process, which does not include environmental remediation.

5. Discussion

The analyses underline the importance of culture-related policy and developments within the EU. Although the ERDF is not a direct fund for culture-related projects, such as Creative Europe, the European Social Fund+ or Interreg, we can see that in the case of urban development projects where the local municipality would like to increase the number of meeting places for different social groups, cultural redevelopments are implemented. The focus on local communities can be accepted as a stakeholder-oriented strategy, which would result in better governance and collaboration. Better governance and collaboration have the potential to mobilise the various resources of the community, which are really important for resilient behaviour. The developments could provide benefits for various social groups including families, young generations and the elderly which improves the population retention capacity of the settlements. We can conclude that the availability of the territorial programmes compared to the sector-oriented ones could provide direct benefits for residents. From a programming point of view, it is quite important for regional and urban funds to be maintained, as well as sectoral ones, to enable direct changes in the living conditions of people. The projects—as we could see—have not only social benefits but environmental and economic ones too.

The redevelopment projects between 2014 and 2020 indicate the importance of the sustainable/circular urban development approach proposed by Pediaditi et al. (2010), Morio et al. (2013), Kolosz et al. (2018), Loures and Vaz (2018) and Song et al. (2019)—a dominant share of the projects had ambitions for improving the natural environment. The landscape-oriented spatial strategy proposed by Romaniak et al. (2014) is really important in the waterfront projects, which is similar to the case of Mohács. There are many cases (like Besenyőszeg, Dévaványa, Gárdony, Gönc, Hajdúdorog, Jászberény, Tamási and Tokaj) which use mixed land use options (Morio et al. 2013) in order to improve financial viability. It is important to note, that in less populated areas, a viable option for the cultural institutions is the mixed use since it could contribute to the maintenance of the establishment in the long term.

The redevelopment of the Former Rudolf military barracks is not a typical case in that it could be handled as a place for temporary use, as suggested by Bardos et al. (2016) and Marian-Potra et al. (2020): the EU fund is used for the restoration, and the concrete functions will be developed step-by-step, like a living lab.

The analysis has proven, from a redevelopment perspective, that it is not the former function but the reintegration potential of the brownfield sites into the urban fabric that is important. Settlements are living systems where the different sub-systems are interrelated with each other. Considering the funds available for the local municipalities, the strength of the local economy is a determinant, either from the viewpoint of collecting money from taxes for community purposes or attracting investors. The case of Keszthely—where the redevelopment of one of the oldest baroque monuments in the town, built in 1770, is implemented—would be a surprising case since the town is situated near Lake Balaton, one

of the most popular tourist destinations in Hungary; however, the income of the town is rather limited (despite what could be expected) due to the tourism-oriented local economy.

The question of the redevelopment of monuments and monumental buildings is always a challenge in less wealthy countries like Hungary. In concentrated urban areas, we often face the problem of the mismanagement of these sites—the economic power is stronger than the local interests, often resulting in the full/partly demolition of the buildings. In contrast, the EU/public projects could enable a better management of these sites, which could result in the full restoration of monuments since the primary focus is not on the return on investment. The redevelopment projects thereby increase the level of European public goods, not just in their physical form but from a historic perspective as well. Redevelopment projects have the potential to conserve periods from the past that are part of the national and European collective memory. A healthy, resilient society must learn from the past in order to develop better policies and make better decisions. For instance, monuments from the second half of the 19th century are memories of the Austrian-Hungarian Monarchy, a really important period in the modernisation of the country, while unused agribusiness and infrastructural sites from the second half of the 20th century are the legacy of the Soviet period.

One of the major challenges in brownfield redevelopment projects is the question of full or partial redevelopment. Favourably, the territory would be redeveloped as a whole, however, contamination matters, size, ownership questions and budget issues often do not make it possible. That is why it is important to continuously monitor the status of the brownfield sites which could help design better interventions. In these developments the ownership question was evident—the municipality as the owner was able to apply for the funds. Collaboration is really important to handle the ownership question, as there are a few cases when the owner realises that selling the building is essential for the urban development project and the owner increases the price accordingly.

The majority of the projects have a regional character, meaning that the redevelopment increases the catchment area of the settlement, for example, with a new conference room, a music hall has a larger market area. There are favourable trends which could contribute to the long-term stability of these markets, for example, there is growing popularity for weddings in the countryside, and people—as an effect of COVID-19—evaluate their neighbourhoods and seek the opportunity to spend time in green, recreational places, making smaller-distance excursions.

In this review, we have chosen a broader approach to comprehend the nature and complexity of brownfield areas outside the capital area. We have emphasised that this is a change in the approach since most works have a capital-focus and apply case study methodology. The wider range of the analysis, however, influences how the cases could be interpreted. In the future, it would be worth developing more comprehensive analysis on the relation of the projects with the current urban/settlement development strategies. Currently, the creative urban development in Hungary is a question of larger cities, however, on the level of settlement alliances it would be interesting to examine the cases of small- and medium-sized towns too. The data currently available is about the implementation of the redevelopments, but later, monitoring data and methods would be worth investigating the projects both in terms of result indicators, such as the number of visitors, organised events, revenue generated, renewed green spaces and satisfaction levels from stakeholder surveys.

A deeper understanding of the brownfield redevelopment processes in Hungary would be favourable for designing policy recommendations about stakeholder engagement and landscape-oriented spatial solutions for maximising the economic and social benefits of brownfield redevelopments from public sources.

6. Conclusions

In this research, we have analysed public redevelopment projects financed in Hungary from the Territorial and Settlement Development OP (financed by the ERDF) between 2014

and 2020, with special focus on cultural use. These projects belong to type “C” according to the CABERNET’s model because there is a need for public funding since expected costs of revitalisation significantly exceed the economic benefits due to various factors such as the high level of contamination at the site, social challenges and deteriorated urban fabric. The analysis has two major novelties: firstly, instead of an in-depth analysis of a brownfield redevelopment case study, it provides a systematic overview of a brownfield redevelopment programme for entire EU programming with a wide variety of former industrial, agricultural, infrastructural and military sites; secondly, it enriches the brownfield redevelopment research with cases from convergence regions in Hungary. The analysis carried out shows that it is not the original function but rather the reintegration potential that is the criteria for designing brownfield redevelopment projects. The projects do not only improve the condition of the environment or the buildings of previously developed land, they also result in recreational and community-oriented public places which have the potential to generate revenues for the local municipalities. The developments take into account the stakeholders’ interests, urban–rural linkages and history. Despite the fact that ERDF is not for directly culture-related projects, these interventions initiated by the municipalities aim to provide better living environments, enhancing the standard of living, thus, they often have a culturally-related redevelopment, enriching European public goods.

Author Contributions: Conceptualization, M.S.; methodology, M.S.; software, F.B.; validation, M.S.; formal analysis, F.B.; investigation, F.B.; resources, M.S.; data curation, F.B.; writing—original draft preparation, F.B.; writing—review and editing, M.S.; visualization, F.B.; supervision, M.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Data used for this research is available through the “search engine for funded projects” (“Támogatott projektkereső” in Hungarian), available to the public on the following website: https://www.palyazat.gov.hu/tamogatott_projektkereso#.

Conflicts of Interest: The authors declare no conflict of interest.

References

- Ahmad, Naveed, Yuming Zhu, Muhammad Ibrahim, Muhammad Waqas, and Abdul Waheed. 2018. Development of a Standard Brownfield Definition, Guidelines, and Evaluation Index System for Brownfield Redevelopment in Developing Countries: The Case of Pakistan. *Sustainability* 10: 4347. [CrossRef]
- Bardos, R. Paul, Sarah Jones, Ian Stephenson, Pierre Menger, Victor Beumer, Francesca Neonato, Linda Maring Uwe Ferber, Tomas Track, and Katja Wendler. 2016. Optimising value from the soft re-use of brownfield sites. *Science of The Total Environment* 563–64: 769–82. [CrossRef] [PubMed]
- Barnett, Clive. 2001. Culture, policy, and subsidiarity in the European Union: From symbolic identity to the governmentalisation of culture. *Political Geography* 20: 405–426. [CrossRef]
- Commission of the European Communities (CEC). 1999. *European Spatial Development Perspective: Towards Balanced and Sustainable Development of the Territory of the EU*. Luxembourg: Office for Official Publications of the European Communities. Available online: https://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/sum_en.pdf (accessed on 10 November 2010).
- Concerted Action on Brownfield and Economic Regeneration Network (CABERNET). 2006. Sustainable Brownfield Regeneration: CABERNET Network Report. Available online: <https://www.yumpu.com/en/document/view/43804816/sustainable-brownfield-regeneration-cabernet-network-report> (accessed on 10 November 2021).
- Cotic, Bostjan. 2019. Industrial Symbiosis in Brownfields in Kranj, Slovenia. *IOP Conference Series Materials Science and Engineering* 471: 112073. [CrossRef]
- Czirfusz, Márton. 2014. Obliterating creative capital? Urban governance of creative industries in post-socialist Budapest. *Europa XXI* 26: 85–96. [CrossRef]
- Dannert, Éva, and Gábor Pirisi. 2017. Rusty Hungary: New Insights in Brownfield Research. *European Spatial Research and Policy* 24: 5–22. [CrossRef]
- Doleželová, Lucie, Michal Hadlač, Milada Kadlecová, Stanislav Martinát, and Milan Polednik. 2014. Redevelopment potential of brownfields: A-B-C classification and its practical application. *E a M: Ekonomie a Management* 7. [CrossRef]
- EUcalls. 2021. 8 Most Important EU Funding Programmes for Culture 2021–2027. March 2. Available online: <https://eucalls.net/blog/funding-prorammes-culture> (accessed on 20 March 2022).
- European Commission (EC). n.d. Territorial and Settlement Development OP Hungary. Available online: https://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/hungary/2014hu16m2op001 (accessed on 15 January 2022).

- European Network of Cultural Centres (ENCC). n.d. Supporting Culture Is Supporting Europe. Policy Paper. Available online: <https://encc.eu/resources/database/supporting-culture-supporting-europe> (accessed on 20 March 2022).
- European Union (EU). n.d. Celebrating Europe's Cultural Heritage and Diversity. Available online: https://european-union.europa.eu/priorities-and-actions/actions-topic/culture_en (accessed on 20 March 2022).
- Ferber, Uwe, ed. 2006. *Brownfields Handbook*. Ostrava: VŠB—TU Ostrava.
- Foster, Gillian. 2021. Circular economy strategies for adaptive reuse of cultural heritage buildings to reduce environmental impacts. *Resources, Conservation and Recycling* 152. [CrossRef]
- Han, Qingye, Yuming Zhu, Ginger Y. Ke, and Keith W. Hipel. 2018. An ordinal classification of brownfield remediation projects in China for the allocation of government funding. *Land Use Policy* 77: 220–30. [CrossRef]
- Heidenreich, Martin. 2015. The New Museum Folkwang in Essen. A Contribution to the Cultural and Economic Regeneration of the Ruhr Area? *European Planning Studies* 23: 817545. [CrossRef]
- Interreg Europe Local Flavours. n.d. Project Good Practices. Available online: <https://www.interregeurope.eu/localflavours/good-practices/> (accessed on 15 January 2022).
- Jamecny, Lubomir, and Milan Husar. 2016. From Planning to Smart Management of Historic Industrial Brownfield Regeneration. *Procedia Engineering* 161: 2282–89. [CrossRef]
- Kabisch, Nadja. 2019. Transformation of urban brownfields through co-creation: The multi-functional Lene-Voigt Park in Leipzig as a case in point. *Urban Transformations* 1: 2. [CrossRef]
- Kolosz, Ben W., Ioannis N. Athanasiadis, Georg Cadisch, Terence P. Dawson, Carlo Giupponi, Miroslav Honzák, Javier Martinez-Lopez, Antonino Marvuglia, Vahid Mojtahed, Keroboto. B. Z. Ogutu, and et al. 2018. Conceptual advancement of socio-ecological modelling of ecosystem services for re-evaluating Brownfield land. *Ecosystem Services* 33: 29–39. [CrossRef]
- Krzysztofik, Robert, Renata Dulias, Iwona Ikantor-Pietraga, Tomasz Spórna, and Weronika Dragan. 2020. Paths of urban planning in a post-mining area. A case study of a former sandpit in southern Poland. *Land Use Policy* 99: 104801. [CrossRef]
- Lorance Rall, Emily, and Dagmar Haase. 2011. Creative intervention in a dynamic city: A sustainability assessment of an interim use strategy for brownfields in Leipzig, Germany. *Landscape and Urban Planning* 100: 189–201. [CrossRef]
- Loures, Luis, and Eric Vaz. 2018. Exploring expert perception towards brownfield redevelopment benefits according to their typology. *Habitat International* 72. [CrossRef]
- Marian-Potra, Alexandra-Camelia, Ramona Işfănescu-Ivan, Sorin Pavel, and Cătălina Ancuța. 2020. Temporary Uses of Urban Brownfields for Creative Activities in a Post-Socialist City. Case Study: Timișoara (Romania). *Sustainability* 12: 8095. [CrossRef]
- Martinat, Stanislav, Petr Dvorak, Bohumil Frantal, Petr Klusacek, Josef Kunc, Josef Navratil, Robert Osman, Kamila Tureckova, and Matthew Reed. 2016. Sustainable urban development in a city affected by heavy industry and mining? Case study of brownfields in Karvina, Czech Republic. *Journal of Cleaner Production* 118: 78–87. [CrossRef]
- Morio, Maximilian, Sebastian Schädler, and Michael Finkel. 2013. Applying a multi-criteria genetic algorithm framework for brownfield reuse optimization: Improving redevelopment options based on stakeholder preferences. *Journal of Environmental Management* 130: 331–46. [CrossRef]
- National Round Table on the Environment and the Economy (NRTEE). 2003. *National Brownfield Redevelopment*. Strategy for Canada. Ottawa: National Round Table on the Environment and the Economy, ISBN 1-894737-05-9. Available online: https://ocpm.qc.ca/sites/ocpm.qc.ca/files/pdf/P85/5.10.2_cleaning-up-the-past.pdf (accessed on 30 November 2021).
- Orosz, Éva. 2012. The changing interpretation of the term brownfield (in Hungarian). *Tér és Társadalom* 26: 73–87. [CrossRef]
- Osman, Robert, Bohumil Frantal, Petr Klusáček, Josef Kunc, and Stanislav Martinát. 2015. Factors affecting brownfield regeneration in post-socialist space: The case of the Czech Republic. *Land Use Policy* 48: 309–16. [CrossRef]
- Pediaditi, Kalliope, Kieron J. Doick, and Andrew J. Moffat. 2010. Monitoring and evaluation practice for brownfield, regeneration to greenspace initiatives: A meta-evaluation of assessment and monitoring tools. *Landscape and Urban Planning*, 97. [CrossRef]
- Peric, Ana, and Milutin Miljus. 2021. The regeneration of military brownfields in Serbia: Moving towards deliberative planning practice? *Land Use Policy* 102: 105222. [CrossRef]
- Petriková, Dagmar, Maroš Finka, and Vladimír Ondrejčka, eds. 2013. *Brownfield Redevelopment in the Visegrad Countries*. Ostrava-Poruba: Vysoká škola Báňská—Technická Univerzita, Fakulta Stavební, pp. 1–90. ISBN 978-80-248-3125-1.
- Rey, Emmanuel, Martine Laprise, and Sophie Lufkin. 2022. Urban Brownfields: Origin, Definition, and Diversity. In *Neighbourhoods in Transition*. The Urban Book Series; Cham: Springer. [CrossRef]
- Rizzo, Erika, Lisa Pizzol, Alex Zabeo, Elisa Giubilato, Andrea Critto, Luca Cosmo, and Antonio Marcomini. 2018. An Information System for Brownfield Regeneration: Providing customised information according to stakeholders' characteristics and needs. *Journal of Environmental Management* 217: 144–56. [CrossRef] [PubMed]
- Romaniak, Alicja, Judit Skaliczki, and Árpád Szabó. 2014. Strategies Resolving Spatial Fragmentation: Case Study in the Brownfield Zone of Budapest. *Periodica Polytechnica Architecture* 45: 67–74. [CrossRef]
- Rostow, Walt Whitman. 1959. The Stages of Economic Growth. *The Economic History Review* 12: 1–16. [CrossRef]
- Science for Environment Policy. 2016. *No Net Land Take by 2050? Future Brief 14*. Produced for the European Commission DG Environment by the Science Communication Unit. Bristol: UWE.
- Simmie, James, and Ron Martin. 2010. The economic resilience of regions: Towards and evolutionary approach. *Cambridge Journal of Regions, Economy and Society* 2010: 27–43. [CrossRef]

- Song, Yinan, Niall Kirkwood, Čedo Maksimović, Xiaodi Zheng, David O'Connor, Yuanliang Jin, and Deyi Hou. 2019. Nature based solutions for contaminated land remediation and brownfield redevelopment in cities: A review. *Science of The Total Environment* 663: 568–79. [CrossRef]
- Taraba, Judit, Claudiu Forgaci, and Arie Romein. 2021. Creativity-driven urban regeneration in the post-socialist context—The case of Csepel Works, Budapest. *Journal of Urban Design* 27: 161–180. [CrossRef]
- Tonin, Stefania, and Pietro Bonifaci. 2020. Assessment of brownfield redevelopment opportunities using a multi-tiered approach: A case in Italy. *Socio-Economic Planning Sciences* 71: 100812. [CrossRef]
- Turečková, Kamila, Jan Nevima, Danuta Duda, and Pavel Tuleja. 2021. Latent structures of brownfield regeneration: A case study of regions of the Czech Republic. *Journal of Cleaner Production* 311: 127478. [CrossRef]
- Varga, Mihály. 2002. Urban houses from gas tank—Wien, Gasometer. Available online: <https://epiteszforum.hu/gaztartalybol-varosi-hazak-becs-gasometer> (accessed on 10 January 2022). (In Hungarian).
- Vojvodíková, Barbara, Radim Fojtík, and Iva Tichá. 2021. Design and Verification of a Simple Approach to Brownfields Categorization. *Sustainability* 13: 11206. [CrossRef]
- Zhu, Yuming, Keith W. Hipel, Ginger Y. Ke, and Ye Chen. 2015. Establishment and optimization of an evaluation index system for brownfield redevelopment projects: An empirical study. *Environmental Modelling & Software* 74: 173–82. [CrossRef]