

Brownfield Remediation in Austria – Successful Stories

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Abstract

Deindustrialization created brownfields throughout all traditional European industrial regions. Their significance is understood due to their adverse socioeconomic impacts. The regeneration of derelict and underused sites for inner urban development can limit the pressure on greenfield sites around cities. The process, involving their reintegration into economy, is a key element of sustainable urban development, tackling environmental, social, economic and cultural issues. Recent European brownfield policies simultaneously address environmental protection and spatial planning. Brownfield sites are an opportunity for saving resources and delivering sustainable urban development. Countries with comparable strong spatial planning institutions (e.g., Austria, the Czech Republic, Italy, Poland, Slovakia or Germany) created and developed specific instruments in order to identify the best practice for sustainable brownfield regeneration by carrying out studies in industrial core regions in which they analyzed the current practices and improved the applied procedures. During the last 50 years, structural changes (e.g., some industrial sectors disappeared, companies merged, and higher quality production is organized on smaller areas) increased the number of brownfields in Austria. Land is a valuable resource and its effective use essential for sustainable development. An important component is the increased number of brownfield sites and complexity of their renewal. This article presents representative Austrian case studies (the Styrian Iron Road, Sargfabrik in Vienna, remediation of the hydrogeological basin unit Mitterndorfer Senke, Tabakfabrik in Linz, Anker Brot Factory, W18 Simmering Gasworks and the Gasometers in Vienna), indicating that brownfield regeneration is a sustainable solution for land and opportunity for introducing sustainable solutions in design.

Keywords: Brownfield, Land Use, Urban Planning, Austria, Urban Regeneration

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1. Introduction

Deindustrialization has resulted in the creation of “Brownfield Sites” throughout all the traditional industrial regions of Europe. The significance of the brownfield issue is well understood at the European level. Their adverse socioeconomic impacts have brought brownfields high on the radar of European Union regional development, environmental protection and urban initiatives (Franz et al., 2006).

The reduction of the agricultural land transformation rate into urban uses and protection of agricultural lands as resources for future food production and environmental sustainability became the European Commission objectives. Regenerating derelict and underused sites and devoting them to inner urban development might be a major way to limit pressure on valuable greenfield sites around cities (Siebielec et al., 2012).

While many European directives come from a technical environmental protection and control background, addressing relevant brownfield aspects separately, a shift can be observed in European brownfield policies to simultaneously address environmental protection and spatial planning issues. Brownfield sites are not solely discussed in technical terms anymore, but as an opportunity for saving resources and delivering sustainable urban development. Such integrated thinking reflects the complexity of brownfield regeneration, and its social, environmental, economic and institutional implications (Franz et al., 2006).

In Romania, the term “Brownfield” is obviously misunderstood. Countries with comparable strong spatial planning institutions such as Austria, the Czech Republic, Italy, Poland, Slovakia or Germany have created and developed specific instruments in order to identify the best practice for sustainable brownfield regeneration by carrying out studies in industrial core regions of their territories in which they analyzed the current practices and derived improvement for the applied procedures. The result was a sustainability assessment tool – SAT, which does not stand alone, but is based on an elaborate framework of objectives, indicators, best practices and tools that reflect the multidimensional and multi-stakeholder complexity that characterizes sustainable brownfield regeneration (Franz et al., 2006).

Other efforts to address environmental and spatial planning issues simultaneously and develop an integrated approach have also resulted in a shift in attention of policy makers from the assessment of problems to the formulation of solutions that will meet the needs of society in a sustainable way, e.g., the CLARINET approach, the CircUse strategy.

The aim of this paper is to explore the spatial effects of the brownfield regeneration process on sustainable urban development by making use of the international experience of Austria in order to come up with spatial planning recommendations that might be taken as models and suit Romania’s needs for public funding and planning security.

2. The Austrian brownfield related practices

2.1. The general context

Austria is a relatively small country land-locked in central Europe and shares borders with eight countries: the Czech Republic, Germany, Hungary, Slovakia, Slovenia, Italy, Switzerland and Liechtenstein. Austria's location in the middle of Europe gives rise to specific environmental issues such as the pressures from intensive freight transit traffic (e.g. air emissions, habitat disruption) and the trans-boundary exchange of acidifying air pollutants and tropospheric ozone precursors (e.g. damage to forests and soil). In addition, only 37% of the national territory is suitable for permanent settlements. This is due to the country's geo-morphological conditions with more than 60% of the territory occupied by mountains. As a consequence, urban sprawl and land consumption occurs in restricted areas, with resulting high pressures on the environment and therefore on finding fast and effective measures for brownfield redevelopment.

Austria is among the European countries with the highest share of renewable energy sources in total consumption, and with the largest share in the use of biomass for heating and energy production. The European Union directive for energy and buildings commits the public sector to start constructing by 2019 only buildings which have almost no emissions and consume no energy (zero-energy buildings). Austria is one of the only five countries in the European Union which already fully met the target set for 2020 - that is, at least 20% of energy comes from renewable sources.

The policy document "Austria Spatial Development Concept" (ÖEROK, 2011, *3rd Strand - Climate Change, Adaptation and Resource Efficiency*) states that the protection from the effects of climate change implies the preservation and expansion of forests, which contribute to the reduction of greenhouse gases emissions. The reduction of emissions can be achieved by reducing energy consumption and increasing energy efficiency through the replacement of fossil fuel with sustainable sources. The same document mentions the following concepts that could be used in spatial development: a compact form of housing, careful and efficient use of land, building of energy efficient houses, underground multilevel parking instead of spacious parking lots typical for commercial areas, environmentally sustainable transport, recycling and renewal of land and buildings (ÖEROK, 2011).

During the last 50 years, structural changes in Austria resulted with increase in a number of brownfields. Some industrial sectors disappeared, companies merged, and higher quality production is organized on smaller areas. In 2009 the term brownfield (*Brachfläche*) was defined by the Austrian Standards Institute as a previously used site or part of a site, which is derelict or underused. Owing to the site characteristics, it offers a potential for reuse.

According to several sources (CLARINET; Battle; Marot, Cernic Mali, 2012; Siebelec, 2012), the main barriers for bringing the brownfields back to use in Austria are:

- Lack of government programs for support of the brownfield renewal at the national level;

- Lack of clear administrative procedures to handle brownfields; as a result, decisions are usually made on case-by-case basis;
- Lack of specific legislation for brownfields;
- Lack of incentives and detaxation for brownfield redevelopment;
- Lack of reliable data on brownfields;
- Brownfields are considered a low priority when it comes to receiving finances for redevelopment;
- Better conditions exist to invest on greenfield sites and investors still prefer them;
- Problems related to potential contamination and costs of remediation;
- Unsolved ownership;
- Different interests of investors and the city; opposing interests within the city administration;
- In Vienna in addition to these barriers, a significant problem is the site availability and the high price of land, especially for former railroad sites;
- More intensive use of cultural potentials of industrial sites can be hampered by low public support, lack of adequate legal support, finances and consistent heritage conservation.

The actors in the brownfield redevelopment process are: national government, regional government, local government, national institutions, private companies and NGOs. Federal Environment Agency (*Umweltbundesamt*) is responsible for the cleaning of brownfields, while the local government is responsible for brownfields redevelopment. There are no specific funding opportunities for brownfield redevelopment in Austria, but subsidies can be gained indirectly from other funding pools: housing, business, development and preservation of historical monuments.

Austria has a federal system where regional development competences are primarily decentralised to the nine Länder. Austria is an example of a country where regionalisation and multi-level governance is long-standing, with a complex distribution of policy responsibilities between and within government tiers. A new perspective on regional policy has taken place over the past decade or so, encouraged by factors such as the recognition of the ineffectiveness of more traditional approaches, changing socioeconomic conditions, slower macro-economic growth limiting any spill-over effect of growth from centre to periphery and the lessening importance of external and mobile location factors. The Structural Funds supported a more coordinated approach to the process, bringing together actors who might not otherwise have worked together within the more fragmented governmental institutional set-ups of the Länder. As early as 1989, ÖROK publication stated that "...the weak region' should no longer just be treated top down as an object of national regional policy but should be viewed as a bottom up self-steering subject.

The two most important federal-level organisations involved in regional policy are the Federal Chancellery and ÖROK, the Austrian Spatial Planning Conference. The Federal Chancellery is the coordinating Ministry for regional policy in Austria and, since 1995, the main federal-level contact with the European Commission on the Structural Fund programmes. The other federal level organisation with direct regional policy responsibilities is ÖROK, the Austrian Spatial Planning Conference, established by the Federal Chancellery in 1971 to coordinate regional and spatial planning at federal level. Its political executive body comprises all the Federal

Ministers, the Lander governors and the presidents of the Austrian Union of Towns and Union of Municipalities. Representatives of the social partners have an advisory role. At Land level, administrative considerations have formed an integral part of the reorientation of Austrian regional policy towards a strong systemic approach, and, during the past decade, a growing engagement of Länder in economic development issues can be observed. To a great extent, the initiative came from the Länder themselves, stemming from increasing awareness among policy-makers (Sturn, 1999). The Länder are increasingly transferring their research and economic policy activities to devolved units which are able, as a rule, to be more targeted and efficient and therefore are in a better position to develop and implement complex strategic programmes.

Below, we present few case studies in Austria where increasing the building density, building compact forms, recycling already used land and buildings, and including the civil and creative class in the regeneration process are successful strategies for a sustainable urban development.

3. Brownfield reclamation case studies

3.1. Styrian Iron Road

The region around the Erzberg in Styria was European pre-industrial center for iron production and manufacture. In the course of globalisation of the resource market the decline started in 1960s. Despite drastic job cuts the region still hosts the only working Central European iron mine due to modern extraction methods and production of high-quality products. The *Steirische Eisenstrasse (Styrian Iron Road)* was created in 1978, aiming at retracing the history of iron in Europe and saving it from disappearing. Protection and tourism contributed to the development of a more positive image and creation of the common regional identity. In 2007 the *Central-European Iron Trail (Mittleuropäische Eisenstraße)* was officially recognized as a cultural route by the Council of Europe. This route is a part of the UNESCO's Tentative List for inclusion in the World Heritage List since 2002. It contains a network of sites and has 18 member municipalities.

The industrial heritage along the Styrian Iron Road features 19 ironworks dating back to the 16th century, the Gösser brewery (including a museum), the Leoben Donawitz VÖEST Alpine Plant tour, the wheelworks in Vordernberg and many other traces of the mining legacy. Significant heritage represents old railway from Leoben to Eisenerz. Its most spectacular part is the so-called 'Erzbergbahn' a railway which was opened in 1891 to bring the iron ore from the iron ore mountain to the blast furnaces in Vordernberg and Leoben. The line passes eight viaducts and five tunnels. Goods and personnel were transported until 1978. In the last years railway enthusiasts from all over the world come to watch the steam engines working, and it contributes to doubling the number of overnight stays in the region.

Eisenerz is a town next to the Erzberg (Ore Mountain) where miners' houses, old railway, show-mines and City museum (Stadtmuseum) in the former administrative headquarter of the state-owned mines can be seen. The "Abenteuer Erzberg" (Adventure Erzberg) is probably the most successful project in the area. It is the event facility that uses underground galleries and surface landscape as a spectacular set.

This attraction has a high acceptance among local and regional residents. Those who gain the most from the project are young people, unemployed and former miners. 20 new jobs were created as a result of the project.

Styrian Iron Road is today an identity-forming symbol of the region. Erzberg is the most prominent ore mining example in Central Europe (UNESCO website). Research (Cizler, 2011) revealed that people identify very strongly with the reconstruction of the railway and steam trains, whose success can be attributed to the voluntary work on its functioning. But at the same time, only 26% of young people in Eisenerz consider themselves attached to the region (Funkl, 2010). Similar studies (Cizler, Pizzera, Fischer, 2014), show that attachment to mining as the traditional activity of the region is moderate. Despite the cultural and historical importance of the local mining heritage, these potentials do not contribute significantly to the attractiveness of the region. Although the number of overnight stays increases continuously, tourism is still not an important economic factor. Developing the region into a tourist area requires the establishment of a strong identity and forming a tourist organization which would allow for the joint work of all municipalities. Notwithstanding all these positive initiatives the tourist performance remains below expectations.

3.2. Sargfabrik in Vienna

Sargfabrik is a residential complex for 120 people, located on the former coffin manufacture built in 1895. Sargfabrik was one of the pioneer projects in creating apartments on former factory sites. Production stopped in 1967 and reuse was considered since 1984. The goal of the new project was to achieve the integration of housing and culture. The project was a social experiment, and attempts were made to achieve the alternative and socially conscious way of life and the creation of the village in the city (Cizler et al., 2014). In 1996 the first tenants moved in and in 1998 the state bought the other part of complex, where in the 2000 a new project named Miss Sargfabrik with 39 residential units was completed. Design was created in cooperation with Sargfabrik residents.

People living in the complex have different backgrounds, age and nationalities, and there are subsidies for tenants. The project has received numerous awards, and the long waiting list for move-in shows its success. However, the authenticity of constructions is arguable - only a chimney, building layout and the name "Sargfabrik" resemble the old factory. In Sargfabrik and Miss Sargfabrik environmental aspects are taken into account. Applied concepts are: optimized energy consumption (energy-saving technology, good insulation), composting of waste, solar water heating, heating for the pool secured by PV panels, and large windows allowing for the maximum use of sunlight. Intelligent system of divided levels in sleeping areas increases useful built area in Miss Sargfabrik (Cizler et al., 2014).

3.3. Remediation of the hydrogeological basin unit Mitterndorfer Senke

Mitterndorfer Senke is a hydrogeological unit that stretches from the mountain ridges approximately 50 km south of Vienna towards the north until the Danube River and is home to an important Central European groundwater resource as part of the Vienna basin. This region developed its geological structure by the sinking of a basin along a geological fault system. During the ice ages this basin formed a large depository for

alluvial sands and gravels, sediments which nowadays hold a groundwater aquifer being unique and one of the most important in Central Europe.

Given its significance for groundwater, exploitation for the supply of drinking water to Vienna and its surrounding started during the early 1950s. By the early 1980s analytical laboratory methods and devices became generally available and, referring to the aquifers within Mitterndorfer Senke, a widespread contamination of groundwater by chlorinated hydrocarbons was identified. In this context, the “Fischer-Landfill” gained a remarkable negative publicity. Already since the 1970s competent authorities started combating illegal activities as well as withdrawing existing licenses for waste disposal. However, as the former operator of the landfill made full use of legal courses, it took a long time for a final verdict to come into force (Eionet NRC Soil Report, 2015). The remediation project was terminated by January 2008 and operations November 2009. Whereas the hydraulic barrier limited groundwater contamination and therefore prepared the recovery of several public drinking water wells of towns and villages south of Vienna, Mitterndorfer Senke nowadays is not at risk anymore from leaking barrels and spreading of chlorinated hydrocarbons and it contributes safely to supply drinking water to the City of Vienna and its surrounding.

3.4. *Tabakfabrik in Linz*

Peter Behrens and Alexander Popp designed the tobacco factory in Linz in 1935. It was the largest and most modern tobacco factory in Central Europe. With the exception of few new buildings, the whole ensemble (including the interior decorations) is listed under the historical monument protection since 1981. It was bought by the city in 2009 and a group of architects, urban planners and social scientists are engaged in the process of transforming the building today. Sponsors are private supporters, federal, provincial and local governing bodies. Since 2010 the Tabakfabrik hosts a non-profit organization *Linzukunft*, as well as the *Umbauwerkstatt*, a think tank and research lab for the future of the factory, providing independent information and transparency to citizens. The rental structure is differentiated according to the quality categories of premises and is based on transparent criteria. Financially weaker initiatives have a permanent place in the complex, according to the principles of the just society, and there are three rate levels: commercial rate, special rate and cultural rate. 2% of the complex is permanently used and about 100 people work there. There are about 15-20 events every month (Cizler, Pizzera, and Fischer, 2014).

Though the city invests in the projects, it agreed to an experiment with an open end and there is no master plan for the area. City planners recognised that since the site is a great chance for the city it should be planned carefully (Meinhart, 2012). The development of the Tabakfabrik is not planned in a conventional sense, but the space is open to experiments. This is in accordance with the approach that Behrens had while designing the Tabakfabrik and its big, open and adaptable spaces. The Tabakfabrik is not seen as solely commercial, but as a cultural policy and urban planning project, that should belong to everyone and stay public.

3.5. *Anker Brot Factory (The Loft City) in Vienna*

Ankerbrotfabrik is a bakery built in Vienna in 1891. This was one of the largest manufacturers of bakery products in Austria and one of the biggest bakeries in Europe. Thanks to the advancement in technology and logistics, production continues only in part of the complex and unused parts of the complex were sold. Since 2009 the new project, the Loft City has been implemented. Some of the buildings in the complex are protected and the goal is to obtain the status of a cultural monument for more buildings in the complex. As Walter Asmus, one of the architects and investors of the project stated in the interview, owners and residents generally prefer when the object is not protected, mostly because then they have greater freedom in using it. In his opinion, industrial heritage in Austria does not enjoy great protection and no importance is given to it as to other types of heritage, or as it would be the case in some other countries (Cizler, Pizzera and Fischer, 2014).

The Loft City project is characterized by great flexibility. Investors have only partially restored buildings and lofts only minimal design. Users can adapt the space according to their possibilities and needs. Lofts accommodate studios for artists, photography gallery with public library, Hilger Brot-Kunsthalle, exhibition space, music and media academy and a charity organisation. The small hall from 1912, Expeditihalle, serves as a temporary space for exhibitions, musical and theatre performances, functioning through a special program allowing artists to use temporarily the space under favourable conditions (Cizler et al., 2014).

3.6. *W18 Simmering Gasworks-Vienna*

On October 31st 1899 the newly constructed gasworks in the Vienna district Simmering began its operation. It was the beginning of gas production by the municipality of Vienna. Previously gas had been supplied by about 20 private gasworks, mostly under foreign ownership. In the years following 1899, the private gasworks were steadily diminished. Most of the older gasworks were decommissioned and finally the entire gas production was in the hand of the municipality.

During the Second World War, the Simmering Gasworks, like other important infrastructure, were a primary target for air raids. After the end of the war, fission of natural gas became viable and the primary technology for producing “city gas”. As a consequence, the production of gas from coal at the Simmering Gasworks was terminated on May 11th 1966. Causing serious contamination of soil and groundwater, Simmering Gasworks was one of the first historically contaminated sites to be listed in the national remediation program in 1990. Since 1993 several investigation campaigns were conducted to identify contamination hot-spots and develop a good understanding regarding the distribution of contaminants. Accordingly, by the year 2000 the site was classified as “priority class 1”, indicating urgency for financing and implementing remediation measures within the national remediation program. In parallel to the remediation activities at the hazardous site W18 Simmering Gasworks, the location of the former Simmering Gasworks has been developed as a new city quarter during 1999-2016, linking the functions of housing, recreation and commercial activities.

3.7. *Gasometers in Vienna*

Gasometers were built in 1899 in Vienna. They were the biggest gasometers in Europe at that time and they were used until in 1975. They are protected as cultural heritage since 1986. Vienna Business Agency has played an important role in the restoration of the site and acted as a mediator between the private and public sector. It owned about 20,000 m² of land that was sold to three non-profit contractors who worked on the project. Four architectural teams that won the competition in 1995 were in charge of re-using four gasometers (Gasometer A - Jean Nouvel, Gasometer B - Coop Himmelblau studio, Gasometer C-Manfred Wehdorn and Gasometer D - Wilhelm Holzbauer).

Although Gasometers are recognised as a successful urban renewal project in the architectural and social terms, there are doubts about their economic viability. The project has contributed to the restoration of the previously poor and neglected area, and three of the four buildings are used for social housing (Cizler, Pizzera, and Fischer, 2014). However, a large number of stores intended for commercial functions is now unused.

In the years 1998 to 2010 the site was successively adapted to the needs of a modern gas network operator. In this development phase 14 buildings were constructed or rehabilitated. Historical buildings from the time of the city gas production were partially retained and given a new purpose. In 2013 three municipal enterprises, Wien Energie Gasnetz GmbH, Wien Energie Stromnetz GmbH and Wien Energie Fernwärme were merged into a new enterprise: Wiener Netze GmbH (“Vienna Networks”), combining networks for gas, electrical power, district heating and communications in one enterprise (Eionet NRC Soil Report 2015).

4. **Conclusions**

Due to the relatively small size of the country, land is a valuable resource for the Austrian state and its effective use is essential for sustainable development. The threat to this is the urbanization and expansion of urban areas. Sustainable urban development involves protection of the natural landscape and the development of compact forms of housing. An important component of land use is the increase in the number of brownfield sites and the complexity of their renewal.

Brownfield renewal is of particular importance in countries such as Austria, where one of the major challenges in the planning is migration to urban areas. Increased demand for housing and work space leads to the pressure on urban areas and to the urban sprawl. It is necessary to increase awareness of the importance of brownfield renewal and of the incorporation of climate-labile solutions, initiated through projects such as the Smart City. Awareness of the possible use of cultural resources that brownfield sites have is growing, even among private investors who want not only to preserve the original structure, but aim at social inclusion of the people into the project. Considering the fact that Austria is among European countries with the highest share of renewable energy sources in a total consumption, potentials for the further development of innovative, climate-labile solutions are great and case studies from this country can serve as good examples.

In Austria, spatial development and spatial planning are considered a joint task of the federal level, Länder and municipalities. In this context, a specific form of distribution of spending and competences has evolved historically and has become established within the multi-level system of the territorial authorities and taking into account the diverse interests to be satisfied. The further improvement of these basic cooperative structures is one of the most important ideas of the Austrian Spatial Development Concept which advocates a “space for all” (ÖREK, 2011). The hubs need to be optimised and the mutual consideration of the actors guaranteed within the current system of spatial planning and spatial development. Today, more can be achieved in collaboration; “space for all” also stands for a participative planning process that includes the political-administrative system as well as companies, associations and civil.

As shown through the case studies, brownfield regeneration is not only a sustainable solution for the land, but it is also an opportunity for the introduction of sustainable solutions in the design. Measures in redevelopment of brownfields, especially recycling of land and buildings, have a direct positive impact on adaptation to climate changes. They increase the capacity for dealing with change. These measures will reduce emissions, increase resistance and make adaptation to the impacts of climate changes. The positive impact is reflected in encouraging a compact development, preservation of natural ecosystems, conservation of resources, and the reduction of energy consumption, which are the main causes of climate changes (Cizler, 2013).

References

- Battle, S., “*Public-private partnerships in brownfields redevelopment: Chicago, Illinois and Vienna, Austria*”, [Online]. Available at: www.sre.wu-wien.ac.at/neurus/battle.pdf
- Cizler, J., “*Reuse of derelict industrial sites: opportunities for regeneration of industrial heritage in Pancevo, Serbia*”, *Arhitektura i urbanizam*, vol. 33, 2011, pp. 75-80.
- Cizler, J., Pizzera J. and Fischer, W., “*Industrial heritage as a potential for redevelopment of post-industrial areas in Austria*”, *ACEG+, Journal for Architecture, Civil Engineering, Geodesy and other related scientific fields*, 2(1), 2014, pp. 53-61.
- Cizler J., “*Brownfield redevelopment as a measure for climate changes mitigation - Case study: Austria*”, *Journal of the Geographical Institute “Jovan Cvijic” SASA*, 63(4), 2013, pp. 57-73.
- CLARINET, “*Activities and Results – Summary*”, http://www.commonforum.eu/Documents/DOC/Clarinet/aktivities_results.pdf
- CLARINET, “*Contaminated Land Rehabilitation Network for Environmental Technologies. Activities and Results – Summary*”, http://www.commonforum.eu/Documents/DOC/Clarinet/aktivities_results.pdf
- CLARINET (2002): *Brownfields and Redevelopment of Urban Areas*. Federal Environmental Agency, Vienna, 117.
- Franz M., Pahlen G., Nathanail P., Okuniek N, & Koj A., “*Sustainable development and brownfield regeneration. What defines the quality of derelict land recycling?*”, Taylor and Francis, 3(2), 2006, pp. 135-151.
- Funkl W.. “*Jugend in Blickfeld der Regionalentwicklung. Eine Analyse der Abwanderungsregion „Erzbergland, unteres Enns- und Salzatal“*“. Master thesis, Graz, Institut für Geographie und Raumforschung, 2010, pp.63-68.
- Loft City Brot Fabrik website. Internet: <http://www.loftcity.at>
- Marot, N., Cernic Mali, B., “*Using Potentials of Post-Mining Regions – A Good Practice Overview of Central Europe*” in: Wirth, P., Cernic Mali, B., Fischer, W. (eds.) “*Post-Mining Regions in Central Europe - Problems, Potentials, Possibilities*”, Oekom, Munchen, 2012, pp.130-147.
- Meinhart, E., “*FALK-Landinsel,: Die Linzer Tabakfabrik soll zum Kreativquartier werden*”, *Profil*, (2012). <http://www.profil.at/home/falk-landinsel-die-linzer-tabakfabrik-kreativquartier-34870>.

ÖEROK, “*Austria Spatial Development Concept*”, Viena, 2011, pp. 13-47, Available at: www.oerok.gv.at/fileadmin/Bilder/2.Reiter-Raum_u_Region/1.OEREK/OEREK_2011/Dokumente_OEREK_2011/OEREK_2011_EN_Downloadversion.pdf.

Payá Pérez A., Peláez Sánchez S., Van Liedekerke M., “*Remediates sites and brownfields. Succes stories in Europe*”, Eionet NRC Soil Report, European Union, 2015, pp. 110-128.

Siebielec G. Rabl-Berger S., Bluemlein P., Schweiker M., Huber S., I. Wieshofer I., Biasiol M, Ajmone Marsan F., Medved P., Sobocka J., Galuskova I., Vokurkova P., “*A brownfield redevelopment as an alternative to greenfield consumption in urban development in Central Europe*”, URBAN SMS, 6.1.3, 2012, pp. 5-23.

Sturn, D., „*Innovationspolitik auf der Suche nach ihrem Raum*“, RAUM, Vol. 35, Österreichisches Institut für Raumplanung, Vienna, 1999.

Umweltbundesamt – UBA, „*Wiedernutzungspotenzial Industrielle Brachflächen in Österreich*“, Umweltbundesamt GmbH, 2004, pp.10-52.

Umweltbundesamt, „*Handlungsempfehlungen für ein effektives Flächenrecycling*“, Berlin, 1999, http://www.umweltbundesamt.de/altlast/web1/deutsch/3_1_1.htm

Umweltbundesamt, “*The Future lies on Brownfields, Reactivation of Urban Land Reserves - Redevelopment Potentials and Practical*”, Translation from German Edition: Die Zukunft liegt auf Brachflächen Jan Votoček, 2005.

UNESCO website, “*Iron Trail with Erzberg and the old town of Steyr*”, [Online]. Available at: <http://whc.unesco.org/en/tentativelists/20/>

WUK website. Internet: <http://www.wuk.at>

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