ICONARP
International Journal of Architecture and Planning
Received: 27.01.2023 Accepted: 21.12.2023
Volume 12, Issue 1/ Published: 30.06.2024
Research Article *DOI: 10.15320/ICONARP.2024.283 E- ISSN:2147-9380*
ICONARP

A Conceptual Approach to Abandoned Industrial Sites within the Scope of Brownfield in the Context of Regenerative Design

Hande Apak*
Gökçe Tuna Taygun**

Abstract

Built environments and technologies produced to provide for people's requirements can also create environmental problems. The approaches used in the management of these problems are generally technology-based, focusing on reducing the damage to the environment, considering human beings independent from nature. As a critical view of these approaches, regenerative design has been placed in the literature. In contrast to environmental approaches that focus on the problem in design, regenerative design focuses on "turning the problem into potential". In this article, abandoned industrial areas (AIA) within the brownfield (BF) context of the degraded environment are discussed as one of the examples of the concept of turning the problem into potential in the built environment. These areas are problematic with intertwined ecological, sociological, economic, etc. degraded environments at different scales. However, they are built environments that can produce ecological, cultural heritage, social, etc. values as a result of their regeneration within the framework of their potentials.In this article, although not defined in the context of regenerative design and renewal, the projects implemented on AIA within the scope of BF, which can be evaluated in the context of transforming the problem into potential, are selected and analyzed. These projects are cases that have been successfully managed in the design, implementation and life processes, where the community and professionals have participated in a coordinated partnership, have been recognized globally with national and international awards. The lack of a systematic approach based on the different site-specific degradations in the BF in the regeneration of the analyzed projects has been seen as a gap in the literature. The aim of the article is to present an approach that can integrate different disciplines in a joint cross-section with a holistic approach to the area and to address the issue within the scope of the regenerative design process.

Keywords:
Regenerative design, Brownfield, Abandoned industrial area

* Department of Fine Arts, Istanbul Gelisim University, Istanbul, Turkey (*Corresponding author*)
Email: hapak@gelisim.edu.tr

**Department of Architecture, Yıldız Technical University, Istanbul, Turkey.
Email: tuna@yildiz.edu.tr

To cite this article: Apak, H., & Tuna Taygun, G. (2024). A Conceptual Approach to Abandoned Industrial Sites within the Scope of Brownfield in the Context of Regenerative Design. *ICONARP International Journal of Architecture and Planning,* 12 (1), 234-254. DOI: 10.15320/ICONARP.2024.283

INTRODUCTION

Built environments produced by humans cause different levels of negative impacts on natural environmental systems depending on their production, use and destruction. As a result of these negative impacts, approaches such as sustainable, green, ecological architecture have emerged that focus on reducing and/or eliminating environmental damage. Approaches are generally based on technological innovations to meet conditions such as energy efficiency, comfort and health. In this context, it has led to the development of a perspective that the building is considered on a single building scale without considering its relationship with other environments (APAK, 2022). As a response to critical approaches, the necessity of a perspective that redefines the relationship between human and natural environment within the scope of integration has come to the fore. In this context, the concept of regeneration, which aims the development and improvement of human and other environmental systems within the framework of an equal symbiosis by providing mutual benefit, has developed (REED,2007). In this framework, regenerative design, which is reflected in architecture, has been included in the literature. Regenerative design encompasses all environmentalist movements as an umbrella concept.

Instead of a problem-focused approach, regenerative design has a "turning the problem into potential" approach that focuses on the potential of the place (Miller, 2012). Focusing on the existing potentials of the place provides a different context for addressing the problem in the design process. In this article, abandoned industrial sites within the brownfields, which contain degraded environments at different scales, are discussed as examples of the concept of turning the problem into potential.

Abandoned industrial areas are considered as environmentally problematic areas because they contain degraded environments (ecological, sociological, economic, etc.) intertwined with each other at different scales (Pahlen & Franz, 2005). On the other hand, they are built environments that can produce values by providing equal symbiosis in ecological, spatial, cultural, etc. environments with their regeneration within the framework of their potentials in the context of regenerative design (Apak & Tuna Taygun, 2020). The coexistence of different degraded environments in the area may cause the subject to be taken with an interdisciplinary approach. The integration of ecological, sociological, economic and built environment regeneration with each other should be handled in a way that feeds each other. It is thought that addressing the issue with a single aspect in turning the problem into potential will create obstacles in producing values for related environments at different scales.

In the article; projects implemented on abandoned industrial areas within the scope of brownfields are selected and analyzed. Although the projects analyzed are not defined in the context of regenerative design

DOI: 10.15320/ICONARP.2024.283

and renewal, they can be evaluated in the context of transforming the problem into potential. Because these projects are examples of successful management in the processes of preliminary research, design, implementation and life/use of the area, and participatory living with the equal partnership of the community and experts. In addition, the selected projects have been recognized nationally and internationally with awards such as the European Culture Erasmus Award and Unesco as World Heritage.

The gap in the literature is the lack of a systematic approach in the regeneration projects selected within the scope of the article. In addition, the site-specific ecological, sociological, economic, psychological and built environment degradations at different scales in brownfields are integrated with each other. For this reason, it is thought that addressing the area from a single dimension will be insufficient in revealing its potential values within the scope of regenerative design. In this framework, the common dimensions that stand out in the methods of addressing the issue in the projects examined were analyzed. By making inferences from the perspective of regenerative design, it is considered to read the steps of a conceptual approach to address abandoned industrial areas with regenerative design through selected projects.

For this reason, the aim of the article is to present an approach that can integrate different disciplines in a collaborate cross-section with a holistic approach and ensure that the issue is addressed within the scope of the regenerative design process. The regeneration of the area from this perspective is thought to be important in terms of raising awareness about the sustainability of its development and the values it can produce.

REGENERATIVE DESIGN

In the regenerative design approach, it is argued that it is possible to regenerate lost environmental systems in the built environment. The subject is defined as "self-regeneration" (Reed, 2007). In this context, Miller defines regenerative design as "the effort to create favorable conditions for the regenerative capacity of the place itself". In Cole's work, the concept is considered as "the development and improvement of human and natural systems through a design approach based on the potential of the place, contributing to each other, within a framework of a mutual symbiosis" (Reed, 2007).

Regenerative design can be thought of as the ability to understand different environments that are unique to "place" and to use this as a tool and catalyst in architectural practice (Tillman, 1996). In Mang and Reed's studies, it is emphasized that with regenerative design, the building should be understood within the environmental systems with which it is related and in this context, a similar feature can be created in the built environment.

In the literature review, different principles (Tillman Lyne, 1996 & Mang, 2016 & Cole, 2012) were observed within the scope of regenerative design. In the **holistic systems approach**, the relationship and interaction of environmental systems with each other is comprehended. In the **co-evolutionary development approach**, the creation of a process in which the natural, social and economic environment can be related through the built environment and can develop together within the framework of co-evolutionary symbiosis. **Place-based design approach** involves investigating and comprehending all environmental features, both the larger and smaller environmental systems, and determining relationships in the area to be designed. In the **collaborative integrated design approach**, the comprehension of environmental systems requires different professionals, as well as changing and differentiating conditions depending on time. In this context, it is emphasized that the designer, owner/investor, producer and user should cooperate for adaptation, thus ensuring the continuity of the regenerative process. The understanding of **turning the problem into potential**; it is emphasized that the design problem should be handled within the framework of the potentials provided by the place.

In this context, the principle by which regenerative design differs from environmental movements that focus on the problem is "turning the problem into potential". The concept of turning the problem into potential is quite crucial in terms of revealing the inherent values of the place and making a positive contribution to the environmental systems with which it is associated (Reed, 2012). Assessing the potentials of place provides a different context for how problems are addressed. In order to realize these currently intangible potentials, it is necessary to **understand site-specific environmental systems**, **to establish mutually beneficial relationships with the built environment within the framework of an equal symbiosis, and to ensure development and regeneration** in this context. This approach constitutes the essence of regenerative design. The process of turning a problem into a potential and in this context the process of value generation of the built and related environmental system is given in Figure 1.

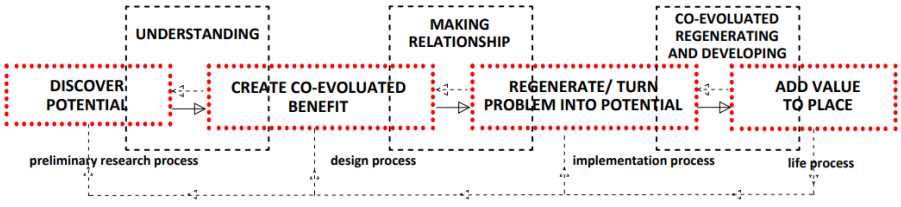

Figure 1. Evaluation of the concepts/principles covered within the scope of regenerative design through the architectural design process (model created by the author Apak, 2022)

In order to discover potentials in the **preliminary research process**, it starts with understanding the place in the context of different scales and inter-scale relationships, and in this context, it starts with providing interdisciplinary work. In the **design process**, the relationship between the construction and the related environmental systems that will count

DOI: 10.15320/ICONARP.2024.283

as a partnership/benefit at the same level is constructed. With the **implementation process** of the design within the framework of the established relationships, it is expected that the potentials determined by the start of short and long term regeneration in the implementation process will be realized. The capacity of the site to generate value through common development and improvement in different environments related to the **living/using process of the site is monitored**.

When considered with the values that it can produce according to the potential of the place, abandoned industrial areas within the scope of brownfields can be defined as environmentally degraded problematic areas that have the potential to be reintegrated into the 'place' where it is located and to contribute sociologically, ecologically and economically (Alker et al., 2020). In this context, abandoned industrial areas may contain ecological, environmental, spatial, sociological, psychological, cultural, technological and economic values depending on their characteristics. (Apak & Tuna Taygun, 2020).

In terms of the values of place, these are the areas where the phenomenon of turning problems into potentials in the regenerative design approach can best be observed. It is also important that these degraded areas are addressed with creative methods to ensure that they can add value to the urban area, as opposed to traditional 'cleaning methods'.

ABONDONED INDUSTRIAL AREAS WITHIN THE SCOPE OF THE BROWNFIELD

It is known that the socioeconomic and technological developments brought about by the phenomenon of urbanization, which started with the industrialization process, have had a great impact on the cities to take their current forms (Koksal & Ahunbay, 2006). Industrial areas located in urban core areas have been shifted to the peripheries of the city where land prices are more attractive for investors due to developments in technology and transportation industries, proximity to raw material resources, and cheap labor (Dixon et al., 2008). In 1970, with the emergence of the oil crisis, economic growth began to decline and as large-scale production slowed down, factories and industrial areas lost their importance, leading to a rapid increase in vacant and abandoned areas in large cities and the formation of isolated areas within the city (Cengizkan, 2006). All abandoned port and heavy industrial buildings/structure groups and their surrounding areas have become economically disadvantaged as well as socially problematic, abandoned and ecologically degraded.

Although the first use of the term "brownfield", which is generally used within the scope of abandoned industrial areas, started in the 1990s, its conceptualization has developed differently since the 1970s, especially in countries with a history of industry. Figure 2 presents the historical

sequence of definitions that have influenced the conceptualization of brownfields.

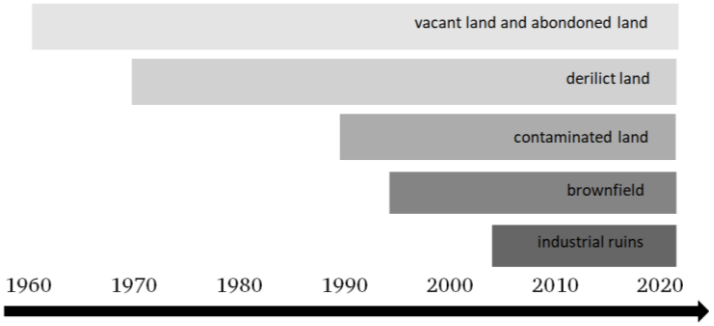

Figure 2. The historical sequence of definitions affecting the conceptual formation of the brownfield (model created by the author Apak, 2022)

Brownfields are defined as areas that contain industrial structural assets, where environmental and physical deterioration is perceived due to abandonment and functional use, and where there is existing or potential contamination (Apak, 2022).Although there are definitional differences, in general, the concept can be defined as a previously developed and contaminated area with environmental deterioration in ecological, sociological and economic contexts (Concerted Action on Brownfield and Economic Regeneration Network, 2006) (Figure 3).

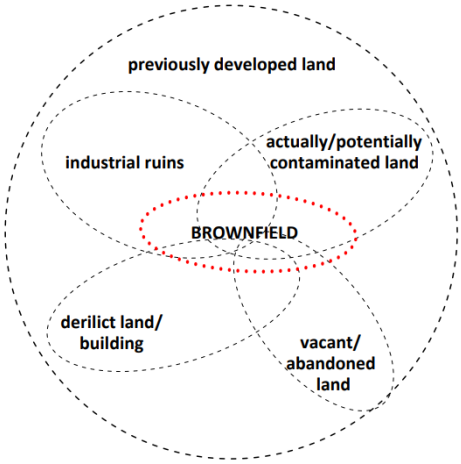

Figure 3. Conceptual framework of brownfield (Adaptation of the model created by CABERNET by the author Apak, 2022)

Projects are carried out at international, national and local scales in order to provide financing within the framework of regulations that develop depending on the definitional differentiation in countries. In the literature research, it has been observed that there are two different approaches to brownfield regeneration in the national legislation of countries (Adams et al, 2010, Vanheusden, 2003, Heberle & Wernstedt, 2006). The first of these approaches is the emphasis on reclamation in countries such as the USA and Canada, which only aims to clean up the environment and remove contaminated soil without considering future/potential uses. In countries such as the UK, Germany and the Netherlands, on the other hand, there are efforts to make the area suitable for reuse upon necessity, taking into account future use. However, brownfield regeneration requires an integrated approach

DOI: 10.15320/ICONARP.2024.283

between planning, reuse and cleanup legislation (Vanheusden, 2003). In this context, the literature highlights the need for more specific regulations to meet environmental, economic and social requirements.

AN EVALUATION OF PROJECTS FOR THE REGENERATION OF ABANDONED INDUSTRIAL AREAS WITHIN THE SCOPE OF BROWNFIELDS IN THE CONTEXT OF REGENERATIVE DESIGN

In this article, projects implemented on abandoned industrial sites within the scope of brownfields are discussed. These projects are not defined as renewal within the scope of regenerative design. However, the fact that the area is managed in the context of the transformation of the problem into potential in the preliminary research, design, implementation and life/use processes overlaps with the processes of regenerative design (Figure 1).

The criteria for the selection of the projects analyzed in this article are that **the projects have large groups of participants, have registered successes in national or international platforms, and have a large number of tools produced** at the same time. The projects selected in this context are given in Table 1.

Cooperation networks such as REVIT (Revitalizing Industrial Sites), CABERNET (Concerted Action on Brownfield and Economic Regeneration Network) and projects have been developed in different countries with various funds and support systems at national or international scale for the regeneration of abandoned industrial areas. In these projects, stakeholders participating in the regeneration of abandoned industrial areas were identified and different road maps were created for the process.

APA (American Planning Association) emphasized that the regeneration process will be shaped by the unique characteristics of the brownfield site, such as its physical characteristics, industrial history, community dynamics, location, potential/existing pollutants, ownership status and financing (government or private sector initiative) (APA, 2010). In this context, the community-based brownfield redevelopment model developed by APA is presented in Figure 4.

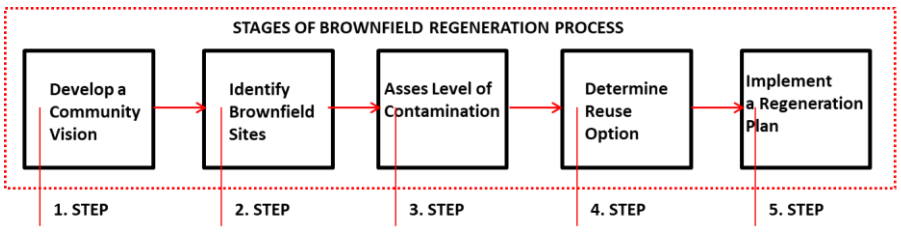

Figure 4. Implementation steps of the brownfield regeneration in the planning dimension (Adaptation of the model created by APA by the author Apak, 2022)

The first step is the process of developing community vision that will allow bringing together public, private and community interests and build collaboration and consensus. This involves developing ideas on

Table 1. Examined projects and administrative networks for the regeneration of abandoned industrial areas within the scope of brownfields (table created by the author Apak, 2022)

EXAMPLES OF PROJECTS SUPPORTED FOR THE REGENERATION OF ABANDONED INDUSTRIAL AREAS			
PROJECT-SPECIFIC FEATURES		**STUDIES/OUTPUTS CARRIED OUT WITHIN THE SCOPE OF THE PROJECT**	
PROJECT NAME / TIMELINE	**PARTICIPATING COUNTRIES IN THE PROJECT**	**LOCATION AND TYPE OF REGENERATION PROJECTS**	**TOOLS PRODUCED (design guide, database, etc.)**
Brownfield European Regeneration Initiative (BERI) 2004-2007	*Belfast Gas Works,uk *Bristol City Council,uk *Affaires économiques et Internationales,Fransa; *Linnaplaneerimise Amet, Estonya; * Stockholms stadsbyggnads kontor, İsveç; *Hansestadt Rostock, Almanya	*Belfast Gasworks North Foreshore, Bristol Harbourside Temple, uk * Lyon Vaise Le Carré de Soie / La Vallée de la Chemie, fransa *Stockholm Hammarby, Sjöstad Hjorthagen Värtan, İsveç *Tallinn Ilmarine Quarter Harbour Area,Estonya	–
Revitalising Industrial Sites (REVIT) 2003-2007	*City of Stuttgart, Thomas Zügel,Almanya; * University of Twente, Netherlands	* an old railway yard in Stuttgart, Germany * dockyards Nantes, France * abandoned textile works in Tilburg, Hart van Zuid in Hengelo , The Netherlands * dockyards Medway, United Kingdom * old coalmines Torfaen, United Kingdom	*stakeholder Engagement Tollkit (REVIT) *brownfields START-UP Tool
Concerted Action on Brownfield and Economic Regeneration Network (CABERNET) 2002-2008	*University of Nottingham, UK	*Berryhill Fields, Stoke on Trent *Havnestad, Copenhagen *Holgate Development, York *The Lowry, Manchester *Urbis, Manchester *Gasometers, Vienna, Austria	*Sustainable Brownfield Regeneration: CABERNET Network Report * Brownfield standards and tools Product
Regeneration of European Sites In Cities and Urban Environments (RESCUE) 2002-2015	*Montan-Grundstuckgesellschraft mbH, France, Germany, England	*Radbod, Ruhr and Espenhain, South of Leipzig, Germany *Dolomites Sports Valley, Bytom and Sosnowiec Coal Mine, Sosnowiec, Poland *Markham Vale, Derbyshire and Gateshead Quays, Tyne and Wear, UK *Loisinord and Les Tertiales Nord Pas de Calais, France	* Best Practice Guidance for Sustainable Brownfield Regeneration * Brownfield Sustainability Assessment Tool
Tailored Improvement of Brownfield Regeneration in Europe (TIMBRE) 2011-continue)	*Center for Applied Geosciences at the University of Tübingen, Germany * Academy of Sciences of the Czech Republic *University Ca' Foscari of Venice, Italy *Technical University of Denmark *The National Environmental Protection Agency	*C-Mine,Park Spoor Noord Antwerp, Pieper Site,Belgium * Babylon Liberec, Fabrika Svitavy, Galant Mikulov, Kukla Complex Oslavany, Technical Muzeum Brno, Çekya * Bernburg,Bitterfeld-Wolfen,Eckolstädt, Freight Station Sonneberg,Gehlberg Geraberg, Germany	* Information system for brownfield regeneration handbok *Site Assessment and Re-use Planning Tool (SAT) *The Prioritization Tool
Promoting Sustainable Inner Urban Development (PROSIDE) 2003-2006	*UW Umweltwirtschaft GmbH Stuttgart, Universität Karlsruhe, Germany * Municipality of Milan, Italy * Budapest Urban Planning Ltd, Hungary * Municipality of Lodz, Polonya	*Bad Cannstatt, Stuttgart *Bovisa, Milan *Mester Business Park, Budapeszt	*Internet Based Information System for Investors *Integral Investigation Cost Prognosis Tool
Holistic Management of Brownfield (HOMBRE) 2010-continue	*University of Nottingham, UK; *Geo-Logik, Poland; *Wageningen University, Netherlands; *AGH-University of Science and *Technology/Cracow, Poland; *University of Rome, Italy; *Environmental Technology Ltd, UK; Stadt+, *Germany; Acciona, gmbh	*Gelsenkirchen former coal mining area, Germany *Solec Kujawski, urban and post-industrial area, Poland *Turceni /Jiu mining and rural area, Romania *Terni industrial area, Genoa industrial and urban area, Italy *Markham Valemining and urban area, UK	*a roadmap for the zero brownfields perspective *The Brownfield Navigator (BFN) *technology train concept *Brownfield soft re-use matrix

DOI: 10.15320/ICONARP.2024.283

how to clean up and redevelop brownfield land based on the needs of the community. The brownfield to be redeveloped is then defined (legal limitations, ownership status, etc.) and environmental site assessments are conducted to determine the contamination status of the area. The results of these assessments are instrumental in determining the suitability of the project to proceed in the selected area. The regeneration option is determined through a participatory process and implemented in line with the planning in the last step.

In the general framework developed in the TIMBRE (Tailored Improvement of Brownfield Regeneration in Europe) project, steps are given within the framework of socio-economic values, including decision-making processes based on communication focus within the scope of effective participation of stakeholders (Figure 5).

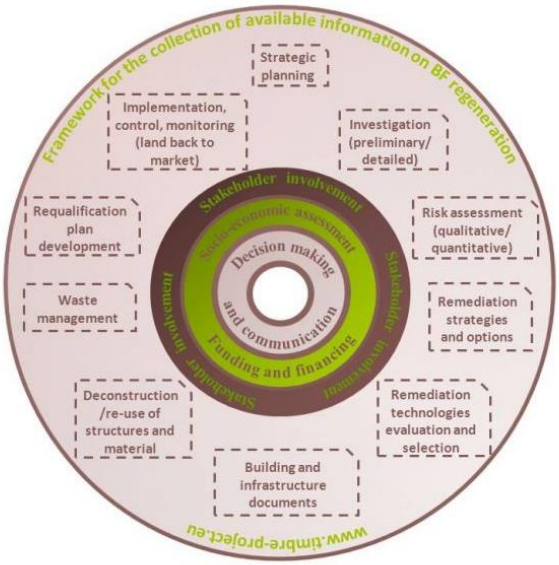

Figure 5. Framework for the collective of available information of brownfield regeneration (TIMBRE, http://www.timbre-project.eu/)

One of the common issues emphasized in the examples in terms of the healthy spatial development of the area and the continuity of regeneration is the inclusion of **different participant groups (local administrations, universities, experts, NGOs, etc.) from the beginning of the regeneration process** due to the different deterioration of the area. The need for **collaborative decision-making processes** between participating groups and the need for the **creation of permanent monitoring groups** are other common points emphasized.

Within the collective objectives of the projects, the elimination of environmental deterioration (REVIT, RESCUE, etc.) is prioritized. Among other objectives, revitalization of regions and cities is also prioritized. In order to create a certain data infrastructure, there are also studies such as the classification of relevant existing information, creating accessible literature in this context, collecting and evaluating data (TIMBRE, HOMBRE, etc.). The selected projects were evaluated in terms of environmental-ecological, project management, economic,

technical, social, marketing and cultural heritage dimensions. **While the environmental, project management and economic dimensions are evaluated as common to all cases, the technical, social and cultural heritage dimensions differ depending on the specific characteristics of the cases.**

The environmental dimension considers the use of new techniques such as biological remediation based on natural processes, protection of habitats and legally protected species, mitigation of adverse environmental impacts on the site and its vicinity, including human health risks, and characterization, monitoring and remediation of subsurface pollution (Figure 6).

In this context, the RESCUE network, which is discussed within the scope of this article, has implemented practices in line with the goals set by the Ruhr master plan project that started in 2010. The objectives of the project were to preserve unused and abandoned landscapes in the area, to consider fragmented areas in the landscape as a whole, to re-zone the areas separated from the whole under the heading of park areas, to provide benefits on both local and regional scales by producing long-term designs, and to protect open green spaces within the regional park system (Pahlen & Franz, 2005).

Figure 6. The transformation of Emscher valley in line with the master plan (https://fgvprojetos.fgv.br/sites/fgvprojetos.fgv.br/files/arquivos/mario_sommerhauser.pdf)

IBA planners considered **that environmental improvement was seen as a prerequisite for economic regeneration**, on the basis that business was becoming increasingly sensitive to environmental factors. These include sewage treatment and biological treatment, maintenance of waterways, natural remodeling of open sewage channels, flood protection, water flow regulation and biodiversity enhancement, groundwater and stormwater management. Figure 7 shows the implementation and impact of the C-Mine, Park Spoor Noord Antwerp project, which resulted in the abandonment of 24 hectares of land by the National Railway Company of Belgium (NMBS) in Belgium, where TIMBRE is involved.

Figure 7. C-Mine,Park Spoor Noord Antwerp regeneration (https://oppla.eu/casestudy/19438)

Within the scope of the **project management dimension**, it was investigated to develop a management plan and then support it with

DOI: 10.15320/ICONARP.2024.283

monitoring, review and supervision plans. The primary objective was to identify the responsibilities of all actors to avoid incompatibilities between different public institutions during the project phases. **Creating interdisciplinary teams that integrate social, economic and environmental aspects, and ensuring the integration of teams for the successful completion of the project** were addressed. Within the scope of the examples analyzed, it is seen in Figure 8 that the planning group (IBA) established sub-working groups for collective decisions for each pilot project within the scope of the implementation in the Ruhr region. In each project, management was ensured through the appointment of the planning group and the organization of the members of the planning group (architect, urban planner, urban designer, landscape architect, etc.) in relation with other disciplines.

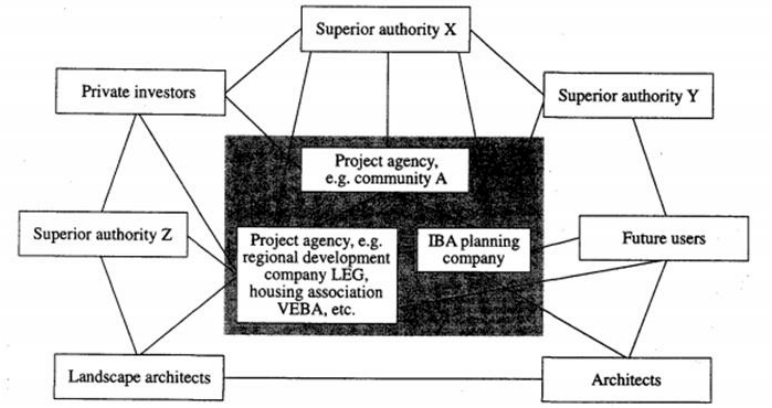

Figure 8. The Emscher park International building Exhibition Project planning groups (Kilper & Wood, 1995)

Within the scope of the **economic dimension**; creating potential for tourism businesses that will provide economic vitality, using existing facilities and infrastructure, modernizing and improving the urban fabric. Urban neighborhoods to generate economic growth, increasing public and private income, improving the perception of the area and increasing the value of the area, and providing employment. Consideration of potential economic benefit and inclusion from the beginning of the assessment, innovative financing, partnership and dividend provision, and research for funding and incentives. Among the projects examined in this context, the Belfast Gasworks regeneration project in the UK, realized within the scope of the BERI network, changed the perception of the area and increased commercial vitality and tourism (Figure 9).

Figure 9. Belfast Gasworks Regeneration (https://sticerd.lse.ac.uk/dps/case/cr/casereport54.pdf)

The **technical dimension** includes establishing **advanced monitoring and field investigation technology approaches**, selecting soil cleanup

techniques based on the site, its vicinity and future use, using screening methods to characterize brownfields, and identifying infrastructure networks (water supply connections, sewerage, electricity, etc.). In this context, the decision to isolate contaminated soil from topsoil and groundwater by using a protection layer to prevent further contaminants from entering the groundwater was used as an implementation decision in the Ruhr region (Figure 10). Due to the risk of the horizontal spread of pollution from production, the Landschaftpark GMBH permanent group regularly monitors pollution levels and distribution in the industrial park at 3-year intervals and continues to take action accordingly.

Figure 10. Site-specific cleanup operations in the Ruhr region (https://www.ruhrcleanup.org/en)

Within the scope of the **social dimension**; community participation in the regeneration process, increasing the permeability of brownfields, changing the image of brownfields to prevent negative impacts on the neighborhood and the region have been observed. In this context, it has been determined that efforts have been organized for the re-adoption of the public. Within the scope of social needs, the development of regeneration plans, making functionalization analyzes in accordance with the population density, and providing opportunities to improve education based on the education level of the region were discussed. Figure 11 shows the tours of the abandoned textile works Hart van Zuid in Hengelo for the program organized for local people to visit the abandoned textile works Hart van Zuid in Hengelo before regeneration. Various activities were organized in order to maintain the vitality of the site and to ensure that the site could be functionalized according to the needs of the region.

Figure 11. Excursions for the program organized for local people to visit the Abandoned textile works Hart van Zuid in Hengelo before its regeneration (REVIT, 2003)

Within the **marketing dimension**, networks, events, competitions and promotions, strengthening a positive image for renewal and the efficient use of communication channels for this purpose are discussed. In the projects researched on this topic, promotional initiatives for tourism

DOI: 10.15320/ICONARP.2024.283

purposes were prominent. The organization of various events was used as a tool to promote the place. In the Loisinord and Les Tertiales project, the old mine was transformed into a ski area and brought to the forefront of tourism activities, and the festivals in the Ruhr region brought economic and social vitality to the region and improved the quality of life as a result of highlighting the tourism marketing dimension of the area (Figure 12a-12b).

Figure 12a. Prominent events within the scope of the marketing dimension Loisinord and Les Tertiales regeneration (https://bassinminier-patrimoinemondial.org/la-reconversion/terril-n42-piste-de-ski-de-loisinord-et-plan-deau-**noeux-les-mines/)**

Figure 12b. Prominent events within the scope of the marketing dimension Zollverein food festival (https://www.waz.de/staedte/essen/zechenfest-auf-zollverein-das-sind-die-schoensten-fotos-id239647779.html)

Within the **cultural heritage dimension**, the process begins with an assessment of the industrial heritage potential of the brownfields by creating an inventory prior to the development of the master plan.
The use of this assessment for future actions without compromising the integrity of the site and its cultural past, the use of industrial heritage as a driving force for regeneration and investment, and the restoration and re-functioning of buildings with historical and technological value were discussed. Protecting cultural heritage, especially in the Ruhr region, is one of the core concepts of the IBA. In addition, the industrial history and cultural heritage of all assets of historical and cultural value have been given brand new definitions and have led the local people to be proud of their culture and history, strengthening their sense of belonging. It played an active role in the regeneration of the area (Figure 13).

Figure 13. Preserving industrial heritage and using industrial heritage as a driver for regeneration and investment in the Ruhr Project (https://www.archdaily.com/970632/adaptive-reuse-as-a-strategy-for-sustainable-urban-development-and-regeneration)

When the projects supported for the regeneration of abandoned industrial areas are analyzed, it is inferred that the regeneration process requires an integrated approach. When evaluated in terms of dimensions, it is seen that they are not considered separately but are interrelated. For example, it describes the post-industrial transformation of industrial areas, including the evolution of the natural landscape in the Ruhr region over time. In addition, the industrial heritage and industrial landscape of Emscher Landscape Park is unique to the Ruhr region (Figure 14).

Figure 14. Use cases of industrial landscapes in the Ruhr area (https://bioclearearth.com/techniques/industrial-nature)

Throughout the projects, the interactions between the environmental and industrial heritage dimensions, and the economic and sociological vitality as a result of these dimensions, have not been considered separately in the regeneration of the area. **They are place and time specific and intertwined, influencing and being influenced by each other.** In the design and planning process, ecological and cultural regeneration was recognized as an important prerequisite for future economic development.

EVALUATION OF ABANDONED INDUSTRIAL AREAS WITHIN THE SCOPE OF THE BROWNFIELD IN THE CONTEXT OF REGENERATIVE DESIGN

It is obvious that the dynamics in the regeneration process of abandoned industrial areas involve different dimensions (environmental, social, economic, etc.) and therefore the process is inevitably complex. **Collaboration with experts from different disciplines** is a collective requirement in all the projects examined in order to systematically understand and relate abandonment and different potentials in the context of regeneration. In this context, it may be necessary to establish relationships between the systems (ecological, sociological, economic, etc.) that make up the dimensions and to plan **collaborative partnerships and collective decision-making processes** to ensure benefits. In addition, depending on the diversity and intensity of deterioration, the regeneration process is considered as long-term (gradual adaptation). The creation of **permanent groups/associations to ensure the developmental continuity/sustainability of the area**, to generate regenerative values and to be adopted by the occupants, and to explore new potentials that may emerge is very important in terms of monitoring and feedback.

DOI: 10.15320/ICONARP.2024.283

All these characteristics overlap with the conceptual and theoretical framework of the regenerative design approach. In this framework, in the process of addressing the area, which includes different dimensions, in a regenerative context**, it is necessary to first determine the potentials on the individual site basis through an interdisciplinary study. In this context, it is important to understand the built environment and related dimensions, to establish relationships in this context, and to make and implement collective decisions for mutual benefit between dimensions. Monitoring the development and improvement of the area in the process of living/using, and evaluating it jointly with all its dimensions on an area based approach is a necessary process for the sustainability of regeneration.**

The regeneration of the area requires sharing and collective decision-making processes. In this context, one of the conclusions of the study is that a **multi-participatory process model should be applied depending on the needs of the are**a. Depending on the scope of the projects evaluated collective study grup has been created based on the needs of the area, where the project manager and experts and organizations from different disciplines will come together.

In order for the regeneration to be long term and to ensure its continuity depending on the dynamic feature of the area, it has been determined that an approach that is coordinated between the working groups and that involves collective decision-making processes where they cooperate at different steps is necessary**. In the context of establishing a common approach in an area that requires different specializations, collective decision-making processes were found to be important.**

The systematic interdisciplinary relationship network that can be created for regeneration at different scales (ecological, sociological, etc.) depending on the needs of the area is presented in Figure 15**. The relationship network presented is defined in the form of working groups with the inferences within the framework of the dimensions addressed in the projects analyzed.** In the working group, which may require different specializations (sociologist, land developers, ecologist, etc.), the members of the built environment working group may include urban design, restoration, landscape, building, etc. within the discipline of architecture. The regenerative design process, which starts with the identification of potentials, constitutes the first collective step for the correct discovery of all regenerative values that can be produced. Other working groups may differ in the approach and methods they take, the steps they follow and their scope. However, it is important that the decision, monitoring and evaluation steps are shared for the maintenance and continuity of the healthy co-evolutionary development and improvement in the life/using process of the area. In this context, based on the potentials of the place, the capacity of the area to produce regenerative value is ensured

through understanding, establishing relationships and the co-evolutionary process that constitutes the regenerative process.

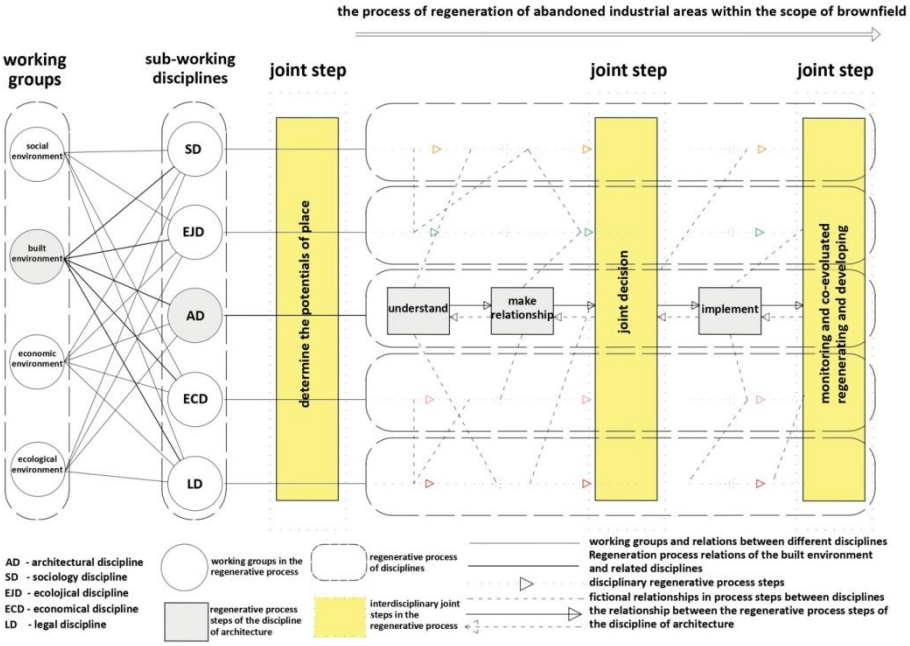

Figure 15. Dynamic relationship network between architectural discipline and related working groups that can play a role in brownfields (model created by the author Apak, 2022)

In the process where the problem can be turned into potential, it is thought that working groups from different disciplines will contribute to the emergence of regenerative values. Thus, how to establish a relationship with systems at different scales, how to benefit from these systems and how to benefit these systems can be determined through collective decision-making processes. The action prescriptions that can be generated have the possibility of affecting the applications of different disciplines such as the use of the building/area, legal regulations, spatial hierarchy, functional distribution or restoration. Therefore, they should be developed within the scope of a collective decision-making process.

The role of the architect, as part of the built environment working group, has an interactive role in addressing the issue in the context of regenerative design. It may be necessary to consider the environmental system created by the built environment (structural assets) existing in the area and its related environment in different dimensions (ecological, economic, sociological, etc.) as a whole. This will contribute to the collective development/improvement of the environmental system and transform the built enviroment into an entity capable of generating positive value for its related environment. In this context, there is a necessity to **create a systematic approach to understand and associate the area with all its dimensions, and to improve and develop it synchronously between all dimensions.** In the context of the analyzed projects, the article proposes an approach that abandoned industrial areas can be handled within the framework of regenerative design (Figure 16).

DOI: 10.15320/ICONARP.2024.283

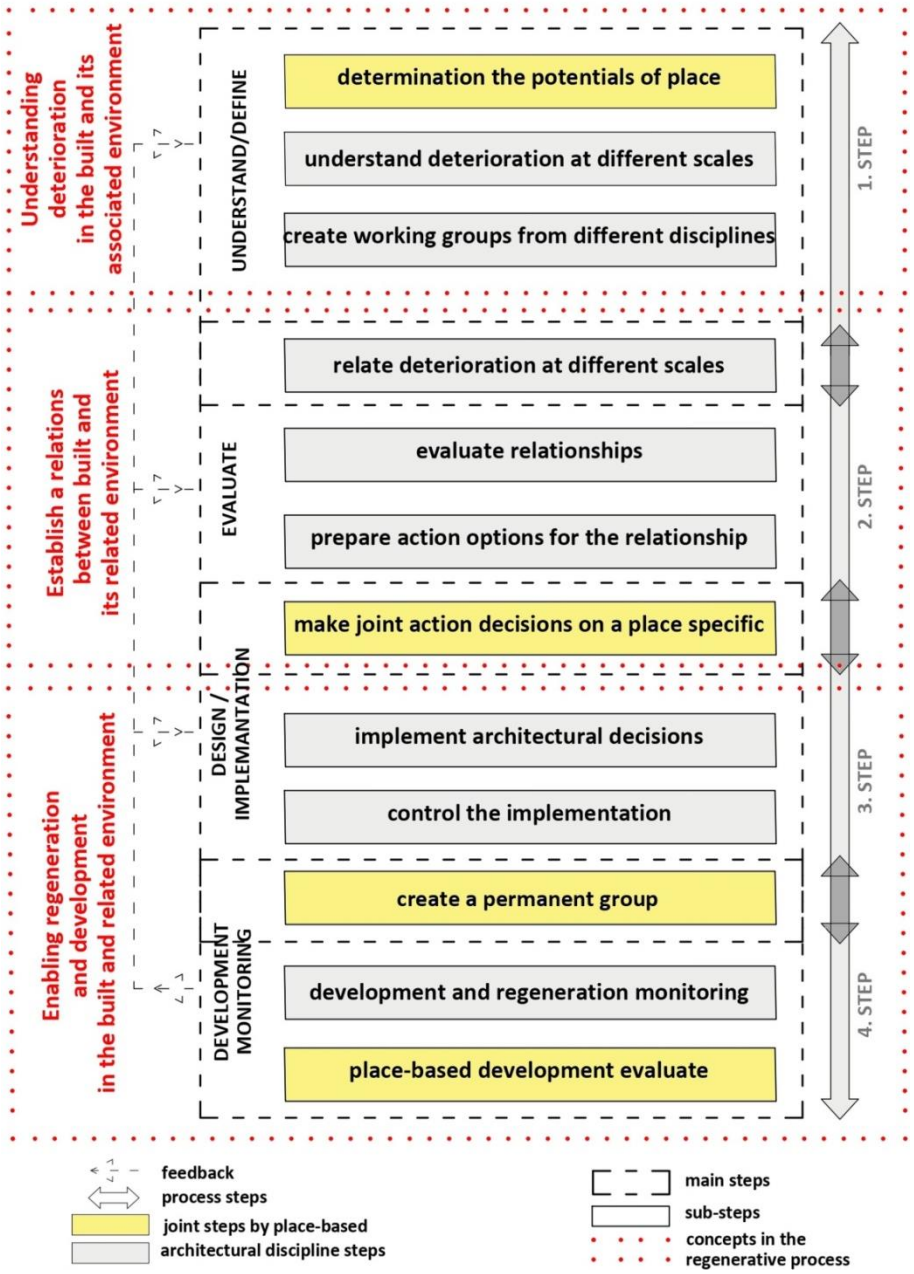

Figure 16. An approach that can be considered from a regenerative design framework in the context of deterioration in the built and associated environmental system of abandoned industrial areas (model created by the author Apak, 2022)

The steps in the approach begin with the process of **defining the area within the framework of its dimensions.** Potentials (ecological, sociological, economic, cultural, technological, etc.) should be identified by different disciplines. In this context, working groups are formed within the scope of the dimensions addressed depending on the needs of the place.

In the evaluation step; the defined dimensions are considered from an integrated framework and the relationships between the dimensions are established and evaluated. In this context, action options specific to the needs of the place are prepared.

In the design and implementation step; collective decisions are taken for action options that affect each other created by different disciplines.

In the implementation process, the relevant decisions are implemented and monitored.

In the development monitoring step; the regeneration process is monitored in terms of its long-term development and continuity. A permanent monitoring group is formed to play a role in the life/using process of the area in order to discover new potentials that may arise, to maintain the dynamic structure and vitality of the area, and to evaluate the actions implemented.

CONCLUSION

In this article, an approach to the application of regenerative design in architectural practice is presented through abandoned industrial areas. With the approach proposed in the article, the reuse of abandoned industrial areas is considered to provide equivalent improvements in different environments. It is considered that healthy spatial conditions for different environments will be created within the scope of this approach. In addition, it is thought that the approach will contribute to the following issues and raise awareness on the subject.

- In the process that starts with the understanding/defining step, establishing the proper relationships between different environments and selecting the appropriate mutual solution methods, and in this way, ensuring process gain in the implementation phase,
- The formation of working groups from the beginning of the process in understanding, defining, designing and evaluating relationships, and the use of a mutual approach in the communication and transfer of information in the steps and the formation of proper decision-making processes in this context,
- Increasing awareness on the issue, which is also on the agenda in Turkey and has a large number of application areas, will help the development of the issue by lighting the way for policy and law makers in Turkey through the evaluation and analysis of policies, programs and legislation in different countries,
- Raising awareness with a new approach in the context of the potentials of these areas, which are considered as "problematic" areas,
- Highlighting the relationship between the building to be regenerated or newly produced and the existing environmental systems. Making conscious decisions by including this issue in design, renovation and utilization criteria. Ensuring the sustainability of the improvement and development of the area by monitoring the implementation and life cycle of the area.

ACKNOWLEDGEMENTS

The manuscript produced from a doctoral dissertation;
Hande Apak (2022). Kahverengi Alanlardaki Yapıların Kirlenmişlik ve Bozulmuşluk Bağlamında Yenilenmesine Yönelik Çevresel Risk Tabanlı Yaklaşım Önerisi, yayınlanmamış doktora tezi, Yıldız Teknik Üniversitesi Fen Bilimleri Enstitüsü, 2022, İstanbul.

DOI: 10.15320/ICONARP.2024.283

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Resume

Hande APAK graduated from Faculty of Architecture, Department of Architecture at ITU. In 2022, she completed her doctorate at YTU. She has been involved in academic activities such as papers in national and international congresses and articles in journals. She continues her academic studies as a guest lecturer in undergraduate and graduate courses at Ytu and Gtü. Her research areas are sustainability in architecture, environmental risk management, life cycle assessment, indoor air quality.

Gökçe TUNA TAYGUN has been working at Yildiz Technical University, Faculty of Architecture, Department of Architecture since 1996. She gives lectures in undergraduate and graduate education, manages master's and doctoral theses, takes part in academic and administrative commissions and juries. She has academic studies such as national and international articles, papers and research projects on green building, green building products and materials, life cycle

DOI: 10.15320/ICONARP.2024.283

assessment of building products and materials, environmental impact assessment and building biology.

ICONARP – Volume 12, Issue 1 / Published: 30.06.2024