The Issue of Post-Industrial Brownfields in Piraeus, Greece: Suggesting International Best Practices in the Era of Globalization

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Abstract

Piraeus, Greece's capital port city since the ancient times, is now home to many abandoned industrial sites that present an opportunity for revitalization through regeneration. This article presents applications of brownfield regeneration policies from the United States Environmental Protection Agency and the EU Brodise Program for the case of Piraeus, Greece. The paper includes a theoretical framework that introduces the historical patterns of development through globalization and changing economic systems that led to the presence of brownfield sites around the world. The research utilizes field work at major brownfield sites in Piraeus including site visits and stakeholder interviews, alongside literature review. The ultimate goal of the article is to exemplify areas of proven brownfield regeneration success internationally that can be applied to future policies to support efficient, transparent, and sustainable regeneration projects in Greece.

Keywords: brownfields, de-industrialization, policy, sustainability, urban regeneration.

Introduction

This paper presents a general overview of industrial brownfield sites around the Port of Piraeus in the capital of Greece and makes suggestions for further development and improvement, taking into account international best practices. Reflecting on the European and American brownfield regeneration experience, we highlight the BRODISE program from Spain, Italy, and Portugal, to outline policies useful for initiating the regeneration process, alongside the US EPA's grant structure, to outline potential funding mechanisms in Greece. Additionally, we aim to use differences in the EPA structure as a potential blueprint for brownfield policy in Greece: the US takes a centralized approach towards brownfield management with funding, programs, and regional offices put in place by the EPA. Conversely, Greece does not currently have a national-level policy on brownfields and typically follows a case-by-case strategy, with regeneration projects decided by political or municipal authorities (Tousi and Serraos, 2020). As a result, this paper highlights the current absence of policy in Greece and provides examples of successful policies from the international experience for potential future application.

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The history of the area of Piraeus dates back to the ancient times as a significant centre for maritime activities. During the Ottoman period, Piraeus lost its prominence and it was not until the liberation from the Ottoman Regime (1821) that Piraeus regained its role as a major port. In 1833 Athens became the capital of the New Greek State and Piraeus functioned as the capital's central port. After the 19th century, Piraeus became also a hub for manufacturing activity. According to literature, industrial activity in Greece followed different patterns than in the traditional industrial centres of the Global North. In particular, after WWII, urbanization procedures were not followed by analogous industrial growth. On the contrary, emphasis was placed on tourism and on the construction sector (Lefebvre, 2007). The expansion of the tertiary sector during the 1980s is strongly connected to the decline of manufacturing activity in Piraeus. Thus, after the 1980s Piraeus experienced rapid de-industrialization procedures that affected the physiognomy of the urban fabric. Gradually, scattered brownfield sites emerged around the port and along Pireos avenue. Without a consistent legal framework and action taken on a case-by-case basis, some of the brownfield sites in Piraeus have been repurposed. However, today the majority of brownfield land sits derelict.

During the past ten years, cross-border economic transactions have altered the existing urban balance, affecting brownfield management in the area. The opening up of the local economy to foreign investors has led to the inauguration of a new era of economic activity, influencing the existing land uses. To facilitate these new transnational financial collaborations, the new master plan of Piraeus includes regeneration proposals at some of the area's significant brownfield sites. From this point of view, the paper tries to define the crucial issues related to industrial brownfields, focusing on suggestions for future development. Taking into consideration international experience on brownfield management and regeneration, the paper attempts to suggest good practices from abroad that might provide suitable analogies for the case of Piraeus. Using key-categories of funding and R&D strategies, the paper presents useful planning tools derived from the European Union's policies and programs, in addition to practices of the American Environmental Protection Agency.

Given the current urban planning policies in the area, this paper makes suggestions for incorporating sectoral focus on brownfield redevelopment. Particularly, these policies revolve around the contemporary "Plan for Integrated Urban Development" of Piraeus. This type of plan has been introduced to the Greek legislation since 1999, following the general concept of sustainable development. It is linked to Law N. 2742/1999, and especially to article 12. Using the three main pillars of sustainability, "Society-Environment and Economy", these plans are considered useful guidelines for municipalities and local authorities so as to implement strategic interventions in degraded enclaves. They recognise the opportunities and challenges of the areas and offer a multilevel socio-economic and geographical analysis of the selected area. Funding for these interventions is offered by the European Union's ESPA Program, which aims to improve urban living conditions.

The Plan of Integrated Urban Development in Piraeus proposes seven areas of intervention, using 15 action groups and 66 actions, according to pertinent sources Panagiotakis (2016) and Argyropoulos (2020). The seven enclaves selected for regeneration are located along the waterfront (Mikrolimano, Karaiskaki Stadium, Neo Faliron, Palataki, Hellenic Naval Academy) and within the city's core, peripheral to the center of Piraeus (Karava, Maniatika, Agios Dionisios Drapetsonas). The main goal of the Plan is to transform Piraeus into an international hub for business and tourism by increasing competitiveness and by supporting investments in research and innovation. This approach is strongly connected to the goals of Blue Economy where maritime activities are of high priority. Nonetheless, the Regulatory Plan of Athens (2014), provides an eminent role for Piraeus as an international point of reference, strengthening the already existing port activities and offering connection to the airport by expansion of the blue metro line. Furthermore, the Plan recommends strategies for sustainable mobility, suggesting new pedestrian routes and a bike path around the municipality. In addition, green policies are proposed for existing buildings, such as

green roof tops and vertical gardens. Moreover, the Plan puts emphasis on cultural heritage with its focus on management of Listed Monuments: mostly neoclassical and post-industrial buildings that have fallen into disuse over time. We note that the Plan does not include brownfields as one of the categories of intervention, rather, select brownfield sites are included as a part of the policies regarding the aforementioned Listed Monuments and estates along Pireos Avenue. Last but not least, the social goals of the Plan target reducing unemployment and extreme poverty in Piraeus.

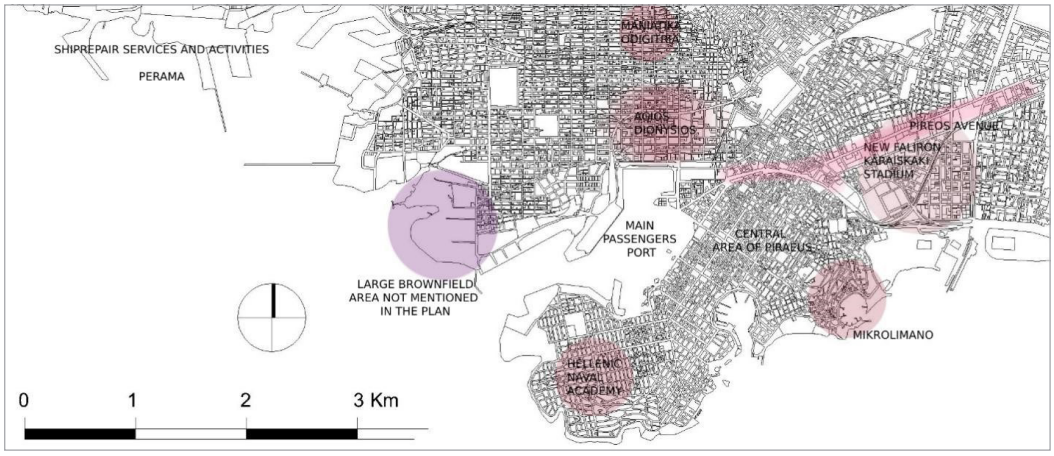

Fig. 1

The areas proposed for regeneration according to the "Plan for Integrated Urban Development" of Piraeus, authors' work

In this context, this paper provides useful strategies derived from the international experience so as to better facilitate the Plan's goals to foster socio-spatial cohesion in Piraeus. Given the lack of consistent policy on brownfields in the area, future urban interventions might overlook specificities connected to brownfield rehabilitation and regeneration. Thus, the paper puts in the forefront significant issues for further consideration and application. With the view to highlight different shades of the brownfield management issue, this paper seeks to draw attention to the specificities of the selected case studies relevant to the unique historical evolution and cultural heritage of Piraeus, making proposals for future application.

Methods

The methods used during the research comprise of both field work and literature review. This field work has included visits to relevant sites throughout Piraeus to record contemporary conditions, interviews with relevant stakeholders, and studies of the varying states of preservation. The authors have visited numerous scattered post-industrial facilities located in the Regional Administrative area of Piraeus: already re-generated brownfield sites, key business hubs, museums, administrative buildings, derelict refuge housing, cultural hubs, and transportation centers. The authors have also conducted 20 semi-structured interviews on living conditions with relevant stakeholders in the area including students and professors, local residents, civil servants, and small business owners. This research has taken place in a preliminary period from 2018-2019 and has been updated and upgraded in the current academic year of 2021-2022. This work represents the first conclusions and results of ongoing quantitative research gathering data on desired land uses at current brownfield sites, which will be completed by May 2022. Findings from authors prior research have also been evaluated so as to adumbrate the contemporary situation of Piraeus' brownfields. The authors have studied publications relevant to de-industrialization and brownfield redevelopment, focusing both on the impact of de-industrialization and on international best practices and strategies for post-industrial sites. Moreover, the authors have delved into the case of Piraeus in Greece, so as to reveal the specificities of time and place which characterize the Greek example. Thus, the literature review includes publications that focus on the case of Southern Eu-

rope, Greece, and in particular Piraeus. Furthermore, archival material from the Greek Ministry of Public Works has been studied so as to create cartographic depictions that illustrate the spatial distribution of industrial land uses in the regional administrative area of Attica.

Theoretical Framework

About de-industrialization

To analyse and interpret the nature and role of post-industrial brownfield sites, it is important to briefly review the international experience on the de-industrialization process. The phenomenon of de-industrialization is strongly associated with technological advancements in the manufacturing sector and globalization. According to Saskia Sassen (2005), after World War II, new forms of economic transactions were observed, where key-financial institutions (insurance funds, non-bank corporations etc.) and the equities market play a nodal role crucial in the transformation of the urban economy in many areas around the world (ibid). This transition to the global market replaced the traditional Fordist model and the so called "chain production". According to Sassen (2005) one of the key-aspects of de-industrialization is the increasing mobility of capital as a result of the improvement of information services. Since the 1960s, accretive privatizations combined with cross-border economic transactions have altered traditional economic patterns. Furthermore, the liberation of the headquarters from the location of manufacturing units altered existing balances: this affected the identity of metropolitan areas, as the re-location of manufacturing units overseas transformed the economic structure and organization of cities, thereby affecting the existing land uses and the social synthesis of the urban fabric.

In this new socio-economic context, the role of metropolitan areas has severely changed. Gradually, certain districts inside the city became strongly connected to the global market, accommodating international economic transactions. By acquiring an international architectural style and by changing the existing land uses, many metropolitan areas around the world became the global centres of today. Examining New York, London and Tokyo, the traditional centres analysed in Sassen's 2005 work, it is evident that their physiognomies have changed severely with globalization. In most cases, the opening up of local economies to the global market has evident spatial side-effects. The transformation of the existing land uses and the application of contemporary urban planning strategies are often linked to gentrification procedures. As described in Vanessa's Watson work "The planned city sweeps the poor away", the level of influence is strongly associated with pre-existing local conditions and local policies. (Watson,2009). From this point of view, different cities experience the socio-spatial effects of globalization differently. However, the emergence of post-industrial brownfield sites created a challenge of worldwide significance: to find sustainable strategies to repurpose former industrial sites and facilities.

Brief overview of the international experience on de-industrialization

According to international literature, there is a clear distinction between "positive" and "negative" de-industrialization (Rowthorn and Wells, 1987; Clavijo et al., 2014). The first type refers to the shrinkage of industry because of the transition of former industrial workers into the service sector as a consequence of the new interrelations among different economic sectors; while the second focuses on the degradation of former industrial centres due to the emergence of new areas of strategic interest. In the first case, de-industrialization is perceived as a positive externality of successful urban development, with noticeable improvement on citizens' living conditions. On the contrary, the second type of de-industrialization is linked to the re-location of manufacturing units, followed by job losses and often by long-term unemployment. Such examples are found in the United Kingdom with the cases of Manchester and Glasgow (Schett, 2012). Statistical data reveals that in 1913 Manchester was an international centre for cotton production but by 1992 it lost 44,9% of its population due to the gradual reduction of the manufacturing activity (ibid). London on the other hand has managed to change its economic structure rapidly to keep up with the new forms

of economic transactions, leading it to be described as one of the first global cities of the world, alongside Tokyo and New York (Sassen, 2005).

On the other side of the Atlantic, areas like Pennsylvania and Ohio, which help make-up the "Rust Belt", have experienced severe changes because of the de-industrialization process. Significant job losses and population decline dramatically affected their physiognomy (Fukuyama, 1999). However, other north American cities have achieved balance between former industrial growth and recent transnational changes by emphasizing opportunities for research and development. New York serves as an example of this path of development (Leeman, 2007).

The issue of post-industrial brownfields is significant for cities located in the Global South as well. The rapid changes in China and the East Asia Pacific Region towards new forms of services and new technologies have had a major impact on the organization and structure of urban areas. According to Wang (2013), these alterations are responsible for the presence of a large number of brownfield sites in large and medium Chinese cities. Factories constructed during the period 1958-1961, known as the "Great Leap forward", are now obsolete and derelict. According to pertinent literature, brownfield management and regeneration in Asia is strongly informed by strategies employed in the Global North; however, in practice this has often meant that specificities of time and place have been overlooked (Roy and Ong, 2011). This uptake of planning principles from the Global North and the resulting standardization of forms and morphologies in brownfield regeneration in Asian cities is further perpetuated by the frequent comparison of cities from both regions (Roy and Ong, 2011; Watson, 2009). As Wang (2013) notes, partial clean-up is common, which raises concerns for human health, further highlighting the need for public awareness and risk acceptance in the field of brownfield regeneration. In African cities, the management of industrial brownfield sites is connected with the confinement of urban sprawl and the overall upgrade of the surrounding areas, known as the co-location phenomenon (Smith, 2010). The applied polices are incorporated into the framework for social and spatial cohesion following regeneration patterns from the USA and Australia (Van Rooyen, 2001).

In the former USSR countries, socio-political facets were a main driver behind the formation of brownfield sites. During the 1990s, political changes in the former USSR countries altered the prior manufacturing model, leaving many brownfield sites behind (Schett, 2012). Following these socio-political transformations, the fall of the Berlin Wall affected eastern German metropolitan areas, which experienced a sudden de-industrialization process. Cities like Leipzig and Cologne previously contained many brownfield sites, however, today most have been repurposed, largely due to effective policies at the national level in Germany (Dixon and Raco, 2007). It is important to mention that at the European Union level, there is no single definition for a brownfield site: there are different approaches to the issue and a variety of sites with different scales and former uses (Grimski et.al, 2001). Since the losses in coal, steel, and textile manufacturing in the 1980s, many European cities have followed different brownfield management strategies to refurbish abandoned industrial sites (ibid). With the strategy of reinforcing compact urban forms, many countries like Germany, the Netherlands, and the UK focus on brownfield management in order to offer social and spatial cohesion in major metropolitan areas.

Across Southern Europe similar patterns of spontaneous industrial growth have shaped the physiognomy of cities. As globalization increased, localized production lost competitiveness leading to deindustrialization and high unemployment (Gambarotto et al. 2019). While some of this deindustrialization can be attributed to costly changes required to adhere to European Union policies upon becoming a member state, the EU does not have coordinated policies for governing industrial change or brownfield regeneration. As a result, EU countries have national-level approaches to brownfield policies at various levels of development and centralization. Since Greece's industrial activities mainly supported textiles, apparel, and metal products, the country faced additional

challenges with price competitiveness after adjusting to WTO agreements (such as the Multifibre Arrangement in 1974 which allowed for quota restrictions on textiles) and after crowding out by Eastern European and Asian production of housing sector goods (Gambarotto et al. 2019). Today, lower domestic manufacturing in Greece and higher presence of abandoned industrial sites, create a significant opportunity for brownfield regeneration.

Results and Discussion

Policies on industrial brownfields: Lessons from the international experience

Revitalizing brownfield sites in Greece is a key policy initiative set by the European Commission. The Commission sees a lack of urban green space for the country's residents and notes challenges in the preservation of coastal and marine areas. According to the European Commission's 2019 Environmental Implementation Review for Greece, the challenges currently accompanying brownfield regeneration are due to the following factors: "(i) a high concentration of human activity and land use; (ii) a lack of political will; (iii) no comprehensive planning for the preservation and management of these areas; (iv) inadequate control mechanisms; and (v) a lack of coordination between the relevant authorities." Liddle (2009) has also recognized significant levels of clientelism that obstruct regeneration efforts, despite EU driven efforts on culture, tourism, and agriculture. The European Commission's September and June 2021 Enhanced Surveillance Report outlined a suggestion for Greece to develop an integrated geospatial data mapping tool by year end-2021, as detailed below:

1. Develop a State Infrastructures Registry to encapsulate technical and geospatial information about all public infrastructure projects to enable better planning and management of these projects, including for construction and maintenance purposes
2. Develop an Integrated Geospatial Data Mapping tool (Single Digital Map) to increase transparency to investors concerning land use rules across Greece and reduce unpredictability in relation to investment licensing decisions

The creation of this single digital map would centralize data on land ownership, occupancy, and contamination, which is expected to help reduce current unpredictability on licensing for real estate investments. While measures to reach this goal were still not in place as of 3Q2021, under Greece's Recovery and Resilience Plan the country is targeting a contract awarded for creation of a unified digital map by 4Q2022.

Policies and Expertise from the European Union: BRODISE Program

The Brownfield Decontamination in Southern Europe (BRODISE) Program was an EU-level initiative in 2015 that focused on public and private collaboration for soil decontamination and brownfield regeneration in Bilbao, Spain, Sexial, Portugal, and Trieste, Italy. The project developed a Common Conceptual Model for standard data collection at brownfield sties, utilized new technology for measuring soil contamination, developed a pre-commercial procurement (PCP) procedure, and created an open dialogue for researchers, SMEs and companies that provide decontamination solutions.

Given that Piraeus does not currently have a database that records the contamination present at its brownfield sites, we believe that the scenario system used in the BRODISE program would benefit parties interested in redevelopment. The BRODISE system has guidelines on how to measure and record contamination data at each site and offers various policy guidelines based on the desired use of each site, in order to lower the costs associated with regeneration (Park, 2019). Policies are broken into the following scenarios:

1. Residential land use desired in presence of high concentration level of contaminants
2. Mixed land use or parceling out desired based on presence of varying concentration levels of contaminants
3. Industrial land use desired in presence of high concentration level of contaminants

This system of land use subdivision allows for remediation of higher cost zones only when residential use is desired or in the presence of high concentration levels of contaminants. This increases cost effectiveness, as less remediation is required when industrial use is desired or for land with lower known concentrations of contaminants. In regards to testing contamination present at various sites, the BRODISE methodology of 500 sq meter surface field tests with 100m minimum distance between test sites, may be applied in Piraeus since there is not presently a uniform method to obtain or store this information. To achieve a balance of cost-savings and accuracy, only one test may be required where high pollution is known to be present, whereas multiple tests with the same results will be required to confirm contamination concentration at sites with unknown pollutant levels (Bedin, 2019). In addition, applicable coring and water samples along with chemical analysis on soil and groundwater are necessary to determine the concentration of subterraneous contamination. This data combined with the land-geological-morphological data should then be used to develop a site sample that can analyze the environment and health risks from contamination at each site.

We believe the PCP methodology proposed by the BRODISE Program could also be applied to the case of Piraeus to outline simultaneous research and development by different suppliers competing in different phases of development. This can enable simultaneous identification of the best value solutions, make use of competitive development, and ensure risk-benefit sharing of market conditions. The research and development schedule may include testing suppliers simultaneously for the following three phases: (1) solution, exploration, and technical design, (2) prototyping, and (3) field testing; with the final supplier chosen for each consecutively as follows: (1) most economically advantageous offer, (2) ability to best meet stakeholders' needs, and (3) robustness at that unique site (Bedin, 2019).

To ensure fair competition, we uphold the BRODISE policy that the start of the tendering procedure should be published with a description of the scope, scale, and estimated value of the contracts in addition to application procedures both in the Official Journal of the EU and on the project websites (Bedin, 2019). All submissions should be made public in order to prevent discrimination and the contracts should state the terms and conditions, deliverables expected, timeline, and financial payment schedule. The general financing guidelines of value-for-money, transparency, and ethics should also be maintained for the case of Greece. These include selecting services that offer the maximum benefit for the cost and meet the requirements in the most cost-effective way, ensuring fair competition and non-discrimination in addition to record keeping for accountability, and prohibiting conflicts of interest.

The BRODISE Program offers a technical example for the soil testing, R&D, and PCP stages of a brownfield regeneration project that is in line with the standards and best practices of the European Union. For the financing of case-by-case projects, we look to the funding mechanisms used in the United States.

Lessons from the United States Environmental Protection Agency

The Environmental Protection Agency (EPA) is an independent executive agency of the federal government of the United States that works to improve and protect environmental and human health outcomes. The EPA writes national level regulations after Congress passes an environmental law, and it enforces the national standards that it sets with regional offices around the US. While the administrative organization and structure of authorities of the EPA differs from the institutional organization in Greece, certain EPA funding mechanisms for brownfield regeneration could be utilized in the case of Piraeus.

EPA assessment Grants provide funding for brownfield inventories, planning, environmental assessments, and community outreach. Applied to the case of Greece, this type of grant could sup-

port the creation and maintenance of a database in each municipality that maps out abandoned land and includes details on contamination present. The EPA also has Revolving Loan Fund Grants which provide funding to capitalize loans that are used to clean up brownfield sites, along with Cleanup Grants that provide funding to carry out cleanup activities at brownfield sites owned by the applicant. These grants can be used on a site-by-site basis to support the funding of proposed regeneration projects. This type of funding may present an opportunity to prevent future brownfield sties as additional industrial sites become obsolete given shifts towards decarbonation: companies or current land owners could proactively use this funding to cleanup newly obsolete factories before the sites may reach more challenging levels of degradation. Additionally, the EPA offers Multipurpose Grants that provide funding to conduct a range of assessment and cleanup activities at one or more brownfield sites in a target area. In Greece, a similar version of these grants may be created to provide funding for archaeological research at necessary brownfield sites. Finally, a version of the EPA's Job Training Grants, which provide environmental training for residents impacted by brownfield sites in their communities, may be created to increase local employment and training on reclamation of contaminated brownfield land.

Through this variety of grants, the US has seen success in brownfield regeneration at a local level, as municipal governments and residents are encouraged to collaborate on revitalization projects. We see this participatory urban planning method as key to the case of Greece, due to high rates of home ownership and strong intergenerational community ties resulting in residents maintaining significant interest in their localities.

Focusing on the case of Piraeus

Piraeus is the main port of Athens and one of the most important ports of the Mediterranean region. During the late 19th and the early 20th century, Piraeus focused on industrial activity to such an extent that scholars describe the area as the "Greek Manchester" (Kotea, 1995). The area has had a dynamic history since the ancient times, with archaeological findings suggesting that the area has been inhabited at least since the 26th century BC. Piraeus experienced the prosperous times of the ancient Golden Era (5th and 4th century B.C.) and later became a part of the Roman and Byzantine Empires. Given the geographical distance between Istanbul and Athens, Piraeus lost some of its pertinence during the Byzantine era and gradually became degraded.

Following the liberation from the Ottoman Regime and the nomination of Athens as the capital of the New Greek State (1833), Piraeus prevailed again as a focal point for the capital's economic activity. The urban development of that time focused not only on maritime activities and trade but also on industrial production. Moreover, the refugee inflow during the interwar period after the 1922 Asia Minor Catastrophe, led to further development of the industrial activity in the area. According to literature (Sarigiannis, 2000) there is an evident socio-spatial pattern regarding the location of the refugee settlements; in the urban periphery, near the existing industrial units. Additionally, there are cases where new manufacturing units were erected after the refugee settlement (ibid). The refugees became the new force that fostered the ongoing industrial activity in the area, creating working class suburban neighborhoods all around central Piraeus (Tousi, 2014). Unfortunately, WWII and the Civil War, severely affected the development of Piraeus. Piraeus experienced heavy bombings that resulted in near-total destruction of the port area. The Port of Piraeus Authority was responsible for returning the port to its pre-war form and modernizing both the port and the area of Greater Piraeus (Hadjimanolakis, n.d.).

After the 1960s, Piraeus managed to recover from WWII damages and setbacks, with most manufacturing units remaining active. However, the excessive evolution of the tertiary sector during the 1980s and the 1990s altered the existing balances. According to pertinent literature, the majority of Piraeus' factories fell into disuse during this period (Tousi and Konstantinos, 2020). Whereas manufacturing, light industry, and processing accounted for nearly 20% of the country's GDP

in the 1970s, by the mid-2010s this sector accounted for less than 6% of GDP (Kanoupakis, 2017). This is further demonstrated by a decrease in operation permits for manufacturing sites, with the country reporting 1,156 new permits granted and 739 permits extended in 2001 but only 302 new permits granted and 307 extended in 2015, according to the Hellenic Statistical Authority. As a result of this shift away from manufacturing, many brownfield sites around Piraeus port and in the Greater Piraeus Region have appeared since the mid-1990s, which we depict in Figures 2 and 3.

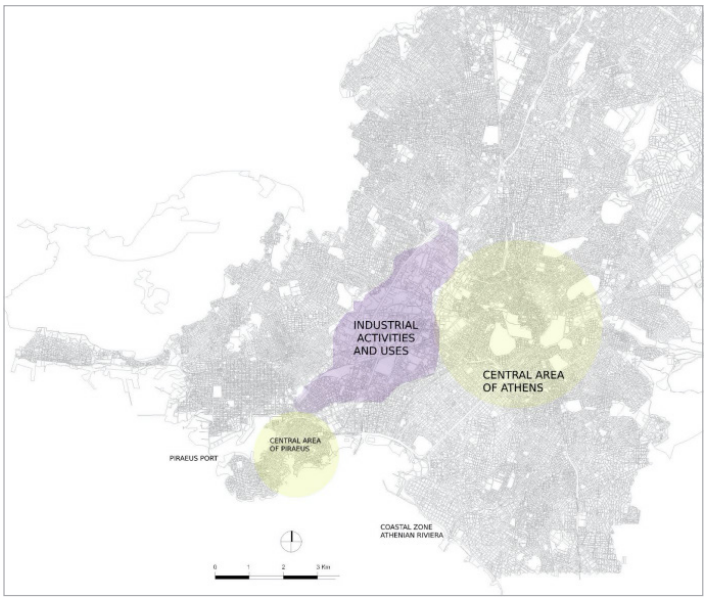

Fig. 2

Location of industrial uses in the capital of Greece, authors' work

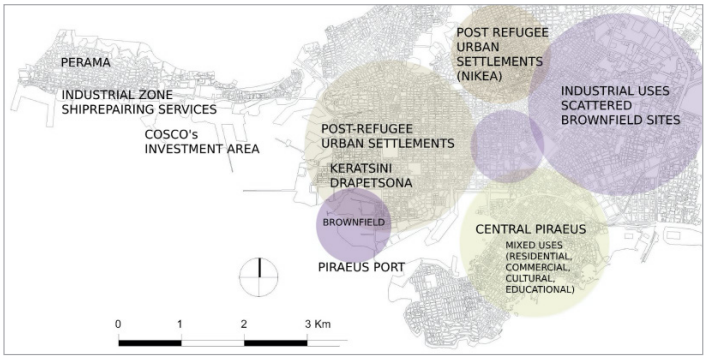

Fig. 3

Location of industrial uses around Piraeus Port, authors' work

During the last decade, the cooperation between Piraeus Port Authority and the Chinese firm COSCO, has influenced the forthcoming regeneration projects. Given that COSCO has leased Piers II and III for 35 years, urban development in the area will inevitably become connected with the company's interests. On account of this, the new masterplan of Piraeus includes regeneration proposals for some of the area's most significant brownfield sites that today sit derelict (Fig. 2).

Given the ancient past of the Piraeus region, there are archaeological concerns at many sites (ibid). From this point of view, Piraeus' brownfields are strongly associated with issues of cultural management. Consequentially, the presence of archaeological remains introduces a sizeable legal and administrative consideration for moving forward with future land uses. Permission for state owned land must come from the Archaeological Service of the Ministry of Culture, which may be regionally handled by the local Ephorate of Antiquities or General Directorates, which go through the Central Archaeological Council for advising for decisions whether a land-use request may be accepted (Hartzoulaki, 2019). Additionally, outside of ancient archaeological considerations, some of these brownfield sites have been classified as Listed Architectural Monuments, which requires that any regeneration at the site must maintain the original façade of the building (Law 3028, 2002).

The current heightened foreign interest in Piraeus (following COSCO's 2016 investment) presents an economic opportunity for the municipality through tourism. The OECD found that only 16.5% of cruise ship passengers stay in Piraeus, with the average expenditure per cruise visitor in Piraeus rarely exceeding EUR 20. Due to the location of the cruise ports relative to the most attractive parts of Piraeus, most passengers only pass through the area before commuting to the Athens

Fig. 4

Currently derelict building in Piraeus to be transformed into a museum according to the new masterplan, authors' field work 2021

city center (OECD, 2017). While Piraeus itself hosts an impressive archaeological museum and pedestrian streets with restaurants, shopping, and art galleries, the lack of hotels and public transportation options from the port present barriers to keeping visitors within the municipality. Tourists often opt for private tour buses that skip over Piraeus and head directly to Athens, to circumvent the lack of translation and information on routes, stops, and schedules. The OECD also found that the immediate surroundings of the port further perpetuate the perception that Piraeus is not an area to visit, but a pass-through city on the way to Athens. Improving tourism within Piraeus can contribute to the local government's goal of job creation to help the municipality's high rate of youth unemployment. Attica may also experience environmental benefits from keeping visitors in Piraeus for longer, as it can help reduce hyper tourism in the center of Athens, lower pollution and improve air quality, and prevent an intensifying urban heat island effect by reducing both the number of vehicles and individuals in the city center at any given time.

Given the current case-by-case strategy of brownfield regeneration, one-off regeneration projects have begun across the greater Piraeus area. One such example is the new building complex at the Papastratos tobacco industry in Piraeus, which has created office facilities at the prior tobacco warehouses of the Piraeus Port Plaza (Asimakopoulou, 2021). Progress has also been made at Drapetzona, one of the listed monuments on the shore of peripheral area of Piraeus. In recent years the seafront area below the prior industrial site has been transformed into a boardwalk, bike path, and café area, as shown in **Fig. 5** and **Fig. 6**. This part of the larger brownfield site is well attended by local residents as it offers an outdoor meeting place with parking available. However, the majority of the land remains idle, given the need to maintain the façade of the prior factories onsite due to Drapetzona's Chemicals and Fertilizers Factory's classification as a Listed Architectural Monument. Overall, this case-by-case method differs broadly from the successful strategies from abroad, which further emphasizes the need for a centralized approach that includes surveying, cartographic depiction, assessment of current sites, and financial instruments mentioned.

Early results of authors' ongoing surveys of residents and visitors in Attica show a clear preference for regeneration projects that create public greenspaces at current brownfield sites. These include community gardens, parks, nature trails, and outdoor athletic fields. After preference for green space, stakeholders also expressed interest in transforming brownfields to host cultural sites, museums, galleries, and exhibition spaces. According to ongoing field work, citizens seem to converge to the importance of brownfield management, with some noting that there is a lack of consultation of the general public on these issues and little movement to begin regeneration processes. Taking into consideration field work findings, the local community's outlook on brownfield regeneration includes undoubtedly participatory forms of planning and design so as to enhance top-down policies with a bottom-up perspective. From this point of view, local residents' vision for the future of Drapetzona's brownfield sites

Fig. 5

The brownfield site of the Chemicals and Fertilizers Factory in Drapetzona before the regeneration of the waterfront, authors' field work, 2019

Fig. 6

The brownfield site of Chemicals and Fertilizers Factory in Drapetzona, regeneration of the waterfront and derelict post-industrial facilities, authors' field work, 2021

ascribes high significance on the preservation of urban collective memory. According to the interviews, local residents propose solutions that combine industrial architectural monuments with land uses that cover their contemporary needs. Policies that fail to incorporate citizens' opinions would probably neglect a wide range of critical factors that affect the physiognomy of the area (low socio-economic strata, high unemployment rates, high population density, poor housing facilities, scarce landscaped outdoor spaces etc.). Regeneration projects that facilitate a market driven approach have already been documented across the Mediterranean region, as in the case of Barcelona, presenting a tourism-led gentrification process (Cocola-Gant, et.al, 2020). To avoid this socio-spatial pattern in Piraeus, local communities should be perceived as an important stakeholder in the planning process. The risk of creating urban spaces for visitors and investors could be counterbalanced by collaborative and inclusive forms of planning, so as to foster social cohesion in Piraeus.

Conclusions

Deindustrialization has impacted economies and cities globally and will continue to do so as technology and environmental considerations continue to adapt. Since the 1990s Greece has experienced deindustrialization and increased reliance on imports, as evidenced by a nearly a 20% decrease in the use of domestic production to meet domestic demand compared to 1995 levels (Kanoupakis, 2017). The urban landscape of deindustrialization in Piraeus, while challenging in its current condition, presents opportunities for economic, environmental, and spatial benefits for residents. However, these opportunities will require an organized, centralized policy approach to address the area's unique challenges. The current legislation is fragmented with small pieces of information scattered inside different laws on environmental specifications, military facilities, the Attica Regulatory Plan, and the local General Urban Plan (Tousi and Konstantinos, 2020).

Given the history and scale of deindustrialization in Greece, the country would benefit from centralized brownfield-specific legislation with national standards for decontamination, licensing, coordination among authorities, and archaeological considerations to help streamline and add transparency to the regeneration process. As Lefebvre (2007) describes, tourist consumption in areas surrounding Athens' monuments and sites along with disorganized new constructions around the city center, has created a cycle of economic reliance on tourism and the construction center in Greece. This rapid form of expansion has created a network further perpetuated and maintained by the network of continued construction. Given these specificities of the economic network in Greece, which differs from those of the traditional industrial centers post de-industrialization, brownfield regeneration has the ability to help maintain both the shape of the city and the country's unique economic model. The country should take into account the lessons from international experience on brownfields including EU-level suggestions for national digital cartographic depiction of sites, the BRODISE program's PCP system, and the US EPA's funding options.

While the case of Piraeus presents unique challenges given archaeological findings, current lack of cartographic data, and fragmented legislation, once progress is made in these capacities the area has opportunity for significant benefits to the local community and economy given its strategic location. The municipality has the chance to define its history of deindustrialization as "positive", by better utilizing both international economic interest and touristic opportunities in the area to increase employment and improve local facilities and conditions. With a more centralized approach towards brownfield management that takes local residents' needs into account, alongside focus on marketing the already-present tourist attractions, we believe Piraeus can shift from a pass-through point, to an innovative and green hub for both its current population and future visitors.

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