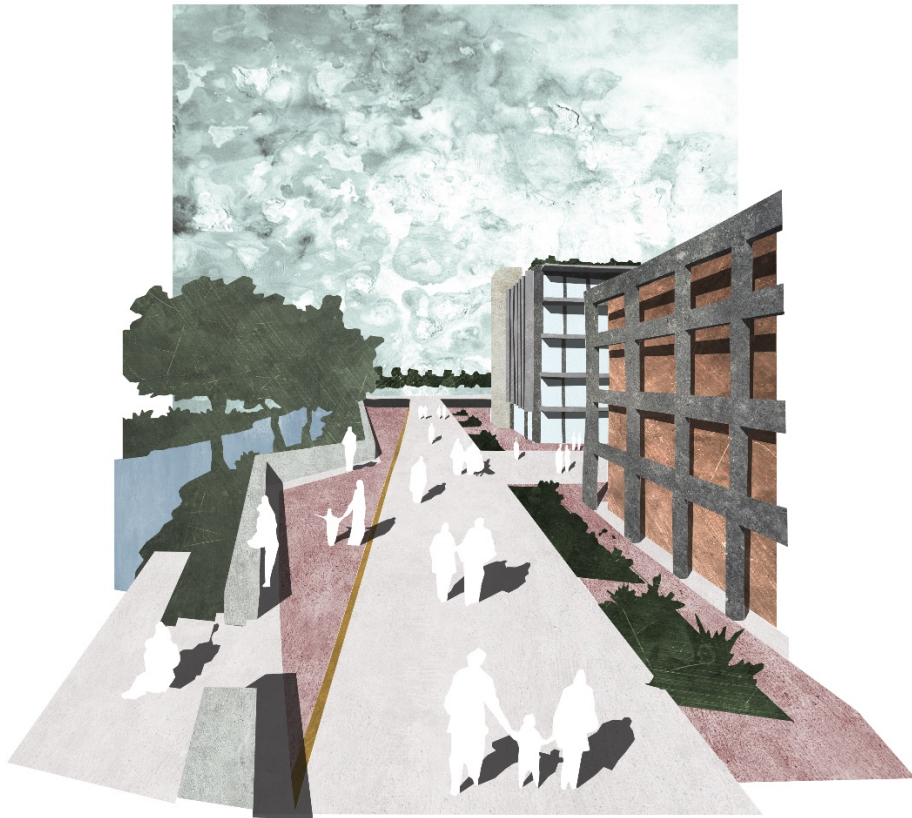


Industrial Revival: A story of a new factory in the city center of Athens

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Research Paper and Reflection



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Prelude

Europe has seen in the last thirty years industrial buildings and districts being abandoned and relocated to other continents. Globalization offered entrepreneurs and capitalists a new opportunity; to relocate their industrial facilities in far fanged lands with great economical gains, as workhours, wages and working conditions allow for maximum profit (Beck, 2015). Beyond the various socio-political implications of this tactic for the involved countries that experience this change, the problem that this report is dealing with is the desolated industrial buildings.

Background - Eleonas, Athens

As part of this broader reflection, I choose to investigate the former industrial area of Athens. The reasons for this choice, aside from the personal ones (cultural upbringing), is the particularity of this industrial area, as it is located in the center of the city, and it encounters many challenging factors that both hinder any efforts for redevelopment as much as they provide the stimulus for numerous hypothetical scenarios.

Eleonas (or Elaionas¹) is an area in the west of the city center of Athens, that in ancient times was the olive tree forest of the city, and remained as such until the late 19th century [Image 1]. It is stated that it was not only impressive for its size but for it was the single closest “green area” to the city (Mpofilias, 2007, pp. 83-86). Yet, this impressive district of perennial olive trees is no more; the only place that reminds of the importance of the area is the Geoponic University and an uncovered part of Cephissus river. Today's image of the once verdant “park” is the result of a rapid and unorganized urban and industrial expansion, as the private sector under this general urbanization of the area in the last century paralyzed any attempt of the administration to prevent the swift destruction of the area. Soon industries covered the area, as the river was the perfect waste disposal stream (Mpofilias, 2007, p. 86).

Today, a complete unorganized network of roads as well as changes in the economy has led most of the industries away (Panayotopoulos-Tsiros, 2016, p. 9), leaving the area covered mainly by warehouses, car-repair and used-car retail shops as well as empty plots, while the exception are the already mentioned Geoponic University, the Athens central bus station and the first state-owned mosque. Central road axes fragment the space, while the ancient road Iera Odos (trans. Sacred Way) is still a major avenue that passes through the district [Image 2]. To add to the list of problems that the area has is that of the administrative division; the area is part of five different municipalities (Sapountzaki & Wassenhoven, 2004, p. 7) creating a discord between administrative bodies on the future of the

¹ Elaionas: [Etymology]: from Koine Greek ἐλαιών (elaion) < ancient Greek ἐλαία. + -ώνας [Meaning]: area of land on which olives are cultivated

area. On a bigger administrative scale, during the past 20 years many preliminary designs have been issued by the central state for the redevelopment of Elaionas, yet none passed this preliminary state (Mpofilias, 2007, p. 87).



Image 1. August Ferdinand Stademann. *Panorama von Athen, 1840*, As can be seen from Stademann's drawing, the only forest in sight from Philopappou hill westwards is that of Eleonas, Source: <https://el.travelogues.gr/item.php?view=38880>



Image 2. Eleonas area from a satellite image, Source: Bing Maps

Site review and Research

The area of interest inside the massive industrial zone is Votanikos district, the westernmost part of the prefecture of the city center of Athens

A. Site Selection - Votanikos and the former Papermill factory

The starting point of the topic was the design investigation of the transformation of a central urban area, so that it could work as an example of transition towards a better version of the present city, with functional and environmental advantages.

Votanikos area, apart from its paramount contrast of urban and social fabric with the rest of the city, has some features that differentiate it from the rest of the industrial district. These features are; the Geoponic University of Athens, the biggest educational institution of the area, that also contains the Botanical Gardens which gave the name to the region. Iera Odos, the road that passes through the area and connects the city center with the western suburbs is one of the most historic avenues of the city (Travlos, 2005, p. 120). Finally, the various abandoned or underutilized industrial facilities in the area, with the former Papermill Factory in the middle along with its close proximity to the city center (2km from Acropolis) elevate, in a way, the area in comparison with the rest of Eleonas.

The plot of the project has an area of about 50 acres and is located at the point where the industrial complex of the "Athenian paper mill" operated on Iera Odos, Chartergaton and Agios Polycarpos in the Votanikos area of the Municipality of Athens. The "Athenian paper mill" was a factory that in its heyday had many hundreds of employees and operated on a 24-hour basis. (Tchadari, 2019, pp. 80-83)

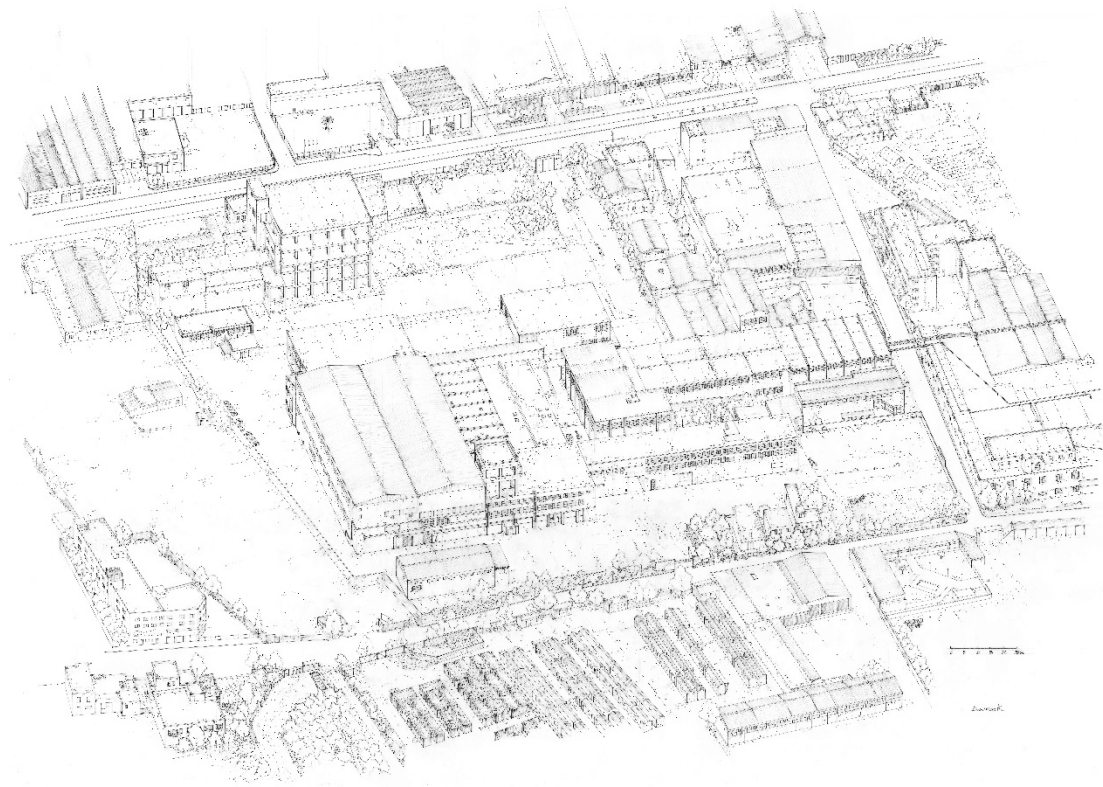


Image 3. Konstantinos Doukas, Axonometric Drawing of the former Papermill Factory in Votanikos, Athens, before its demolition

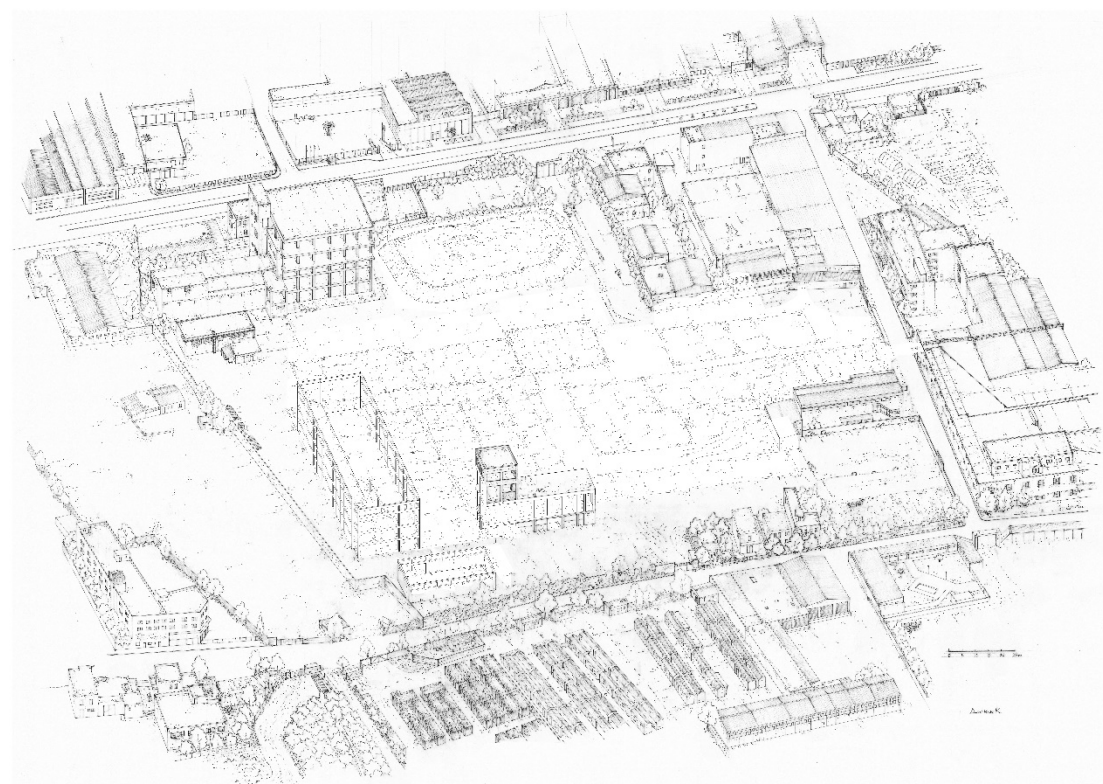


Image 4. Konstantinos Doukas, Axonometric Drawing of the former Papermill Factory in Votanikos, Athens, before its demolition

B. Special characteristics:

a. Key position

The location of the property is central, taken into account that it is located on the axis that connects the center of Athens with the port of Piraeus and the western districts of the city, at a distance of 500 meters from the metro station "Elaionas".

The areas flatness, the proximity to the city center, the low density of the built environment and the low height of buildings, give an unobstructed view of the Acropolis of Athens.

b. The site is a kolaz all the heterogeneous characteristics of the Eleonas.

It is a part of the center of Athens that was already degraded and dysfunctional long before the period of the economic crisis and remained throughout its duration without improvement and positive prospects. It remains on the fringes of productive and economic activity, constituting a major depreciation of resources.

Meanwhile the number of spaces in the center of Athens that can be developed and be cost-effective is extremely limited due to extensive construction, multi-ownership and co-ownership. Eleonas is a place in crisis, linked to industry and manufacturing but has been in various ways "the backyard" of Athens. Although large industrial units no longer operate, the area is still a productive subunit of the metropolitan foundation with a diffuse network of industrial and wholesale activities from small units. It remains somehow functional and has many positive features. Yet, it lacks awareness and accessibility although it is bounded by major roads, as the smaller roads are narrow, have no geometry and many of them are dead ends. The area is not easily accessible by pedestrians because of the non-existing sidewalks and has no cohesive tissue or unitary character.

Large-scale urban developments are planned in the area like a new football stadium (Municipality of Athens, 2022) and a new Intercity Bus Station (Tchadari, 2019, p. 80) (Ministry of Environment and Energy, 2023) while many of the processing units, wholesalers and garages, are to be transferred to the institutionalized receptor of these uses, outside the city in accordance with the urban planning legislation².

² Edict passed on 2014: N.4277/2014 (ΦΕΚ 156/Α/2014) «Νέο Ρυθμιστικό Σχέδιο Αθήνας-Αττικής και άλλες διατάξεις» [Trans. «New Regulatory Plan of Athens-Attica and other provisions»]

c. The “lost” River

Profitis Daniil stream is an old tributary of Ilissos river, flowing in the core area of Eleonas, being now derived into Kifisos river near its junction with the rail lines. In the past 60 years it has followed the usual pattern of hydro-morphological degradation, though canalization and coverage, but still a big part of it is still open. The stream is encased in a closed duct in its upstream part up to St. Polycarpou Street, and in that part, any sense of physical trace has been lost.

It remains, however, a continuously flowing stream with the potential to restore its natural state and it is a natural element that can connect this seemingly ataxic pattern of Eleonas.

d. Existence of inactive open space and undeveloped plot

On the plot of 49.340,76 m² the demolition of the largest part of the buildings took place in December 2022 and only 7.804,79 m² are left in coverage. From the still standing former facilities, all building elements have been demolished except the bearing structure which is made of concrete.

The durable structures with the stable load-bearing body and the shells carefully designed to carry large loads and withstand stresses are characteristics that today are perhaps prohibitive based on the criteria of sustainability. In addition, the free floor plans, with minimal supports and large openings and spaces specially shaped by the need to accommodate the papermill’s production line, offer flexibility to the new composition and make the industrial shells adaptable to reuse.

The existence of inactive, undeveloped open space gives the possibility of avoiding further demolition of buildings and minimizing the economic, social and environmental costs for the construction of new buildings and installation of new uses. To add to the above, the former industrial complex and its unused space, provides the opportunity for reconnection with the urban fabric, often densely built, and in need for open spaces.

Overall, the site is defined by the above parameters, making it an ideal field for the redevelopment of a formerly industrial district and suitable to highlight a design paradigm of the city's future.

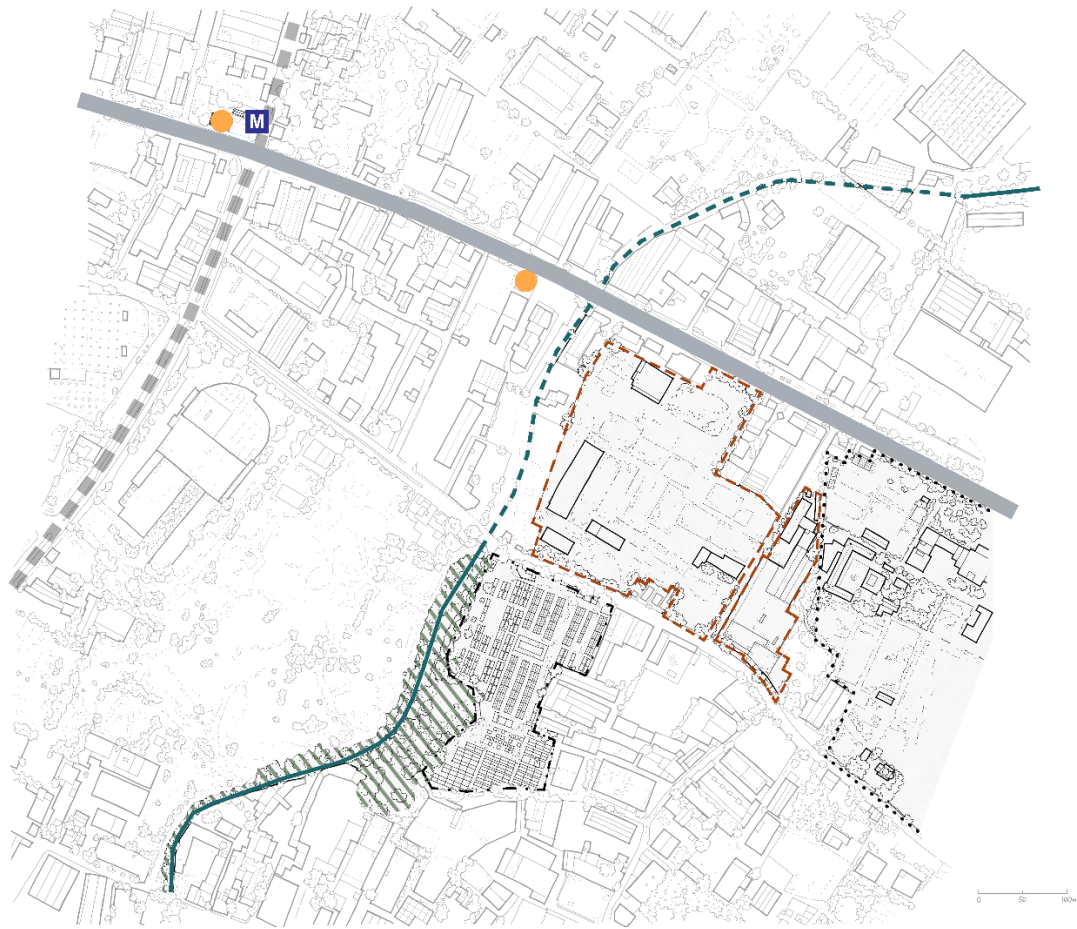


Image 5. Konstantinos Doukas, Votanikos Area showcasing the Papermill Factory (Center, Red outline), The Geoponic University (East, Black dotted outline), the former refugee Camp (South, Black dashed outline), the river named Prophet Daniel which is partially covered (West, blue line) and Iera Odos with (North, gray line) with the closest metro line stop and two uncovered tombs in either side of the road (orange dots)

A Vision of new Opportunities

In the field of my personal interest is the idea of self-sufficiency of cities and is a part of the inspiration for the proposal presented.

Urban self-sufficiency can have many positive impacts on all aspects of sustainability, contribute to energy transition, social cohesion, resource saving, productivity enhancement, adaptability and empowerment of individuals and local communities. (Guallart, 2014) The course of urban sustainability, assuming that it encompasses the concepts of resilience³ and self-sufficiency, results in the combination of production and consumption in the same space, the urban space. The production and assembly of goods in the cities, maintaining their cultural identity and enhancing technological innovation, leads to the independence and empowerment of the local community and economy. (European Commission, 2020, pp. 2-5)

One of the problems of the Athenian capital is the reduction of the population which is largely due to the migration of young people with a high educational and specialization level, who migrate to other countries as a combined effect of socio-economic crisis, austerity and recession. The city is in need of new investments and development patterns to improve unemployment rates and reverse population decline. (Pratsinakis & Labrianidis, 2016) (Marinakou, Giousmpasoglou, & Paliktzoglou, 2016)

a. Vision for the site

The proposed intervention introduces the secondary production sector always with a study of the conditions and effects on the environment, with the aim of strengthening the function of the city as a place of sustainable development where people can find work and have a quality of life.

A new factory is placed on the site of the former industrial complex, preserving the memory of the area and acting as a new landmark. The reuse of the space and the remaining buildings will contribute to maintaining the continuity of the urban fabric and the identity of the area. It can also generate public interest by contributing to the promotion of business activity.

The proposal is related not only to the history of the city but also to its future as it is a field for the development of a transformation of an urban area based on sustainability and longevity.

The regeneration of the open areas of the plot into blue and green spaces, will contribute positively to redefining the problematic spatial relations of the densely built urban fabric, and the performance of public spaces and will help in the gradual upgrading of the wider urban area. Emphasis will also be given on

³ (Kafkalas, Vitopoulou, Gemenetzi, Giannakou, & Tasopoulou, 2015 , p. 14)

reshaping of the urban morphology with open, semi-open and indoor spaces to provide comfort and spatial variety for visitors and workers.

The project set in this specific location gives the opportunity to use all the possibilities of the intervention area:

i. The river, can become receiver of rainwater provide irrigation water and mitigate the risk of flooding. By recreating the river's ecosystem, the aesthetic quality, the microclimate conditions and the attractiveness of the area are improved at the same time. The river can also be an access corridor for pedestrians and cyclists, to and from other areas of the city, improving accessibility.

ii. The main access road which is Iera Odos has archaeological layers of the ancient road, at a shallow depth beneath the modern pavement. This gives the advantage of highlighting the archaeological findings and an additional reason for the connection with the historical importance of the area, the visual contact with the Acropolis and the significance of the location. [Image 6]

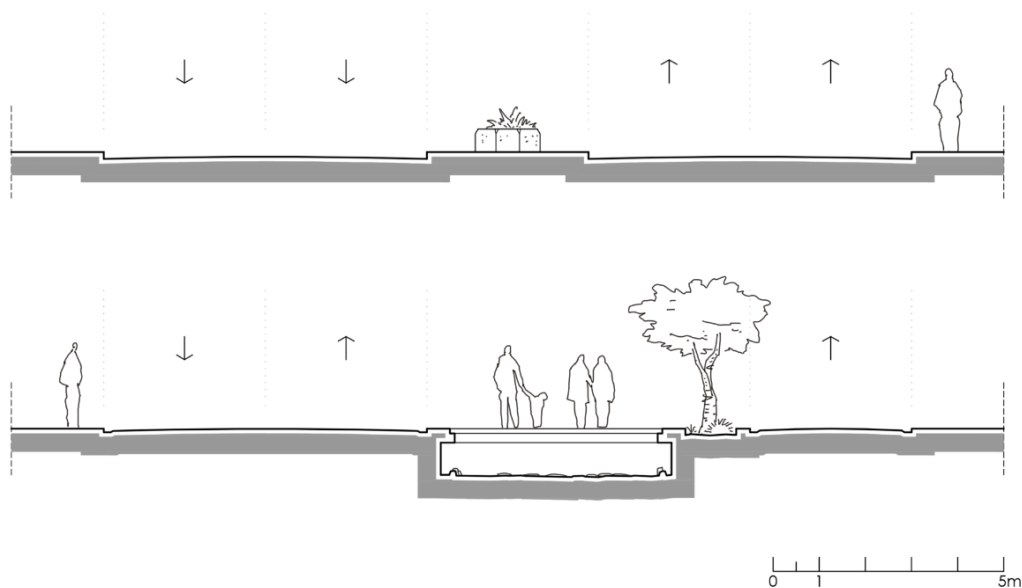


Image 6. Konstantinos Doukas, Iera Odos Sections, current state (above), proposal (below)

To conclude, the reuse of existing infrastructure and of the existing buildings, as well as the utilization of the area's features saves resources and adds value as it has important reference connections in collective memory.

b. Towards a new use

For this redevelopment project I envision a new Industrial use, not in the sense of the heavy industries that already left the area, but a new one, that will become an integral part of the city's urban and cultural tissue. For this reason, an industry is needed that will cover three main parameters:

- i. a use that will less affect immediately⁴ the environment, as such not having outlets that leave chemicals to the atmosphere and hence polluting the air in the city
- ii. Workforce of highly educated individuals (Industrial Designers, marketing managers, IT specialists etc), as Greece lacks these positions while leaving young highly trained people unemployed, or employed to jobs far below their qualifications. (Marinakou, Giousmpasoglou, & Paliktzoglou, 2016)
- iii. Finally, direct market accessibility.

Taking the above into account, a 3D Printing Factory, also termed Additive Manufacturing (AM), would be an appropriate use for the abandoned Industrial buildings. It does not have direct emissions to the air, so it can maintain its presence in an urban environment, needs highly educated personnel, and its proximity to the main traffic arteries of the city give it direct access to the market and vice versa.

The new factory will contain machinery for both the creation of household objects and furniture as well as machinery for the construction of 3d printed structural elements and even small-scale buildings which, in time, will build the new facilities in the plot. Offices for the designers, IT support and marketing team will surround the main factories, while installations, workshops and spaces for open exhibitions will surround, in turn, all of the above, in the new reclaimed site of the factory and its periphery. [Image 7]

⁴ As every Industrial building need energy, it will have emissions as it is connected to the energy grid of the city, yet the emissions will not be in the same area, but rather in the energy production facilities that supply the grid



Image 7. Konstantinos Doukas, Masterplan of the site, Scale 1:400, The road on the right is Iera Odos

The fact that there is no other such industry in the metropolitan area, makes the production process interesting to display, for educational and commercial promotion purposes. Combining industrial use with new recreational, commercial and business uses will attract more residents and visitors to the area.

Benefits of 3D Printing

Additive Manufacturing Facilities and the techniques they are using, make possible the production of goods in the place of distribution and at the time where they are needed, “whatever we want, wherever we want”. (van Wijk & van Wijk, 2015)

The advantages of Additive Manufacturing include local production, low start up and supply chain costs, speeding, with no need of mass production in factories and large-scale storage and global logistics. Furthermore, 3D printer techniques have the possibility of using industrial or other type of waste (Sitharam, Dey, Srinivas, Panda, & Suraneni, 2022), biodegradable filaments, bio-plastics, produce less waste and use less raw materials and energy. Additionally, the way the products are designed and produced makes personalized, on-demand design possible, which can enhance the commercial promotion of both the product and the industry itself along with the production site. These characteristics combined supports sustainable manufacturing through reduced material waste, energy use, and carbon emissions, also contributing to circular economy (van Wijk & van Wijk, 2015), as both financial and specifically environmental costs are reduced.

Additive Production Specification

3D printable buildings and building parts has a potential for the rapid industrialization of the housing sector, combining unique shapes and personalized design with reduced construction time and material use. (Chandra , van Zijl, Tan Ming, & Gibson , 2018)

Concrete building components are relevant to all formwork-heavy applications and can integrate reinforcement from steel or other materials. A process that could be used alternatively in order to overcome the challenges that extrusion-based 3D concrete printing technique faces, such as weak interlayer bond and difficulties in building vertical elements, is the Robotic Shotcrete Printing that has its roots in the classical shotcrete process. With robot-assisted production, it makes it possible to apply concrete in layers and produce large-sized components in an unlimited variety of shapes without a formwork. Innovative materials such as carbon fiber reinforcement or fiber concrete can also be incorporated into SC3DP technology. (Lindemann, et al., 2018) (Šavija, 2020) (Dörrie & Kloft , 2022) (Heidarnezhad & Zhang, 2022) (Xiao, Hack, & Kloft, 2022)

In short, the flexibility and potential demonstrated by 3d printing applications and appliances showcases a fine candidate for the use of the plot, that eventually will expand and develop this new industrial site.



Image 8: 3D printed structures include living green walls, Photo by Tom Daly at: <https://www.thisiscolossal.com/2022/09/living-3d-printed-walls/>

There are a large number of materials available for 3D printing and as research advances the availability increases.

Conclusion

To conclude, the project started by the question of how the area of Eleonas could act as a connector rather than a post-industrial barrier between the city center of Athens and the Western suburbs. While trying to establish a connection between the two areas, it was evident that I needed to create a hub where the characteristics of both areas will meet. This would mean not only ensuring accessibility, but also allowing the uses, the materials, the forms of each area to mix. The idea presented itself in the form of the abandoned and desolate papermill factory in the center of Eleonas district, and by utilizing each and every feature of the site I can create a hub that will become a center in between two centers. It will cover much needed workplaces, public spaces and offices while re-introducing a new clean form of industrial use in an area that is heavily deindustrialized in the past 30 years. This new project has the intention to become both a landmark for the city of Athens, as well as the future of other post-industrial cityscapes around Greece and Europe.

Reflection

I. The relation between my Graduation Project and the Architecture Masters and Track

The project that I elaborated relates to designing of buildings on small and larger scales and focusses on the societal impact that the architectural design has on the spatial-societal dynamic challenges/factors of the area. In order to highlight a design example of the future of the city, I was looking for an urban area in transition, which is changing, in an interesting central point with free space to develop a new project.

A city in order to have a future, must remain alive, attractive, flexible, resilient and continue to develop. The intent of my proposal was to develop an urban building complex that would reclaim and re-use abandoned space and structures in the core of Athens.

This project is related to the studio because it includes the concept of developing over time, and brings an innovative approach proposing industry and production to new standards of a sustainable future city. This is proposed in an area in which deindustrialization has been going on for years. The challenge, through my project, of rejuvenating the area, highlighting its possibilities and features, the connection with history, the public and the other areas is closely connected both with the studio and the Masters of Architecture.

II. Influence of Research on Design/Recommendations and Influence of Design/Recommendations on Research

The research was initiated with the question: How Elaionas can be turned into a connecting link instead of a post-industrial division between the center of Athens and the Western suburbs (gray zone, “black hole”). This exploration began by analyzing the area and looking for focal points in the area that could be redesigned to allow for this change. Such a focal point was found in the middle of Eleonas district, a plot belonging to former factory, adjacent to Ieras Odos. From the site analysis, features were found that, through the right design approach, would be able to revitalize the wider area.

However, after the site investigation and research, I reformulated my original question as I determined that the special characteristics the area has do not make it suitable to act as a link between the center of Athens and the Western Suburbs, but rather is better to focus on creating an independent hub, to be a new focal point between two areas, “a point between two points”. In turn, this new quest to design a new landmark led me to search for a new use for this area, suitable of the vision of this new hub.

III. Assessment of approach, methods and methodology

The main methods initially focused on literature research, studying of governmental documents and permits as well as legislations and plans/maps of the last 100 years. A visit to the site was then carried out, while at the same time a morphological mapping of the area was started through photographs, many sketches and axonometric drawings. After the holistic profile of the area was completed with bibliographic documentation and design impression, the research proceeded with a bibliographic search again for the new uses that will make up the new project along with diagrams, sketches and plans.

IV. Academic and Societal Value, Scope and Implication

From the social context of the wider region emerge the problems of unemployment, especially of young people, immigration (brain drain), the lack of participatory democracy, the possibility of interaction of different social groups in a shared private or even public space. People need suitable space to work, to socialize, for recreation, for exchange of ideas. Another theme that came up is the character of a place through its history, both ancient and more recent, such as that of the old factories that inevitably affected the whole area when they operated and when they stopped operating. This particular character survives through the constructions (tangible/intangible), in the configuration of the public space, the names of places and streets and the memories of the inhabitants.

Thus, the graduation project is a case study of addressing these challenges in the urban environment in order to produce positive results in the field of employment, the quality of the urban environment, economic revitalization and productivity growth.

The space through design is consciously used as a catalyst and tool for the development of the urban economy and the intervention to recover the degraded urban part, aims not only to stimulate the depressed local economy but to diversify, if not transform the functional bases of the city, providing diverse and accessible employment, creating space for local innovation, seeking at the same time to create a new urban image ensuring that city can be maintained and developed.

V. Value of Transferability of Project Results

The project can be an example on how to approach the design assignments in an already deindustrialized area to bring back industrial production with advantages in two sectors, on the one hand the treatment of unemployment and on the other hand the achievement of self-sufficiency in certain products. At the same time, we can have positive results, in the most economical and efficient production with reduced costs in the use of raw materials, assembly of products as well as logistics.

The regeneration of an area of the urban center and the reuse of infrastructure and industrial buildings are important issues for many large European cities, where there is a lack of space for new buildings and new uses and where there are degraded areas that "prevent" an inwards development of the city.

VI. Personal Reflection Questions

a. What is the impact of introducing Additive production in that scale?

The idea of Additive production (3d printing) was introduced through my research on finding the ideal use for the site. As already mentioned, the plot has only few industrial buildings still standing (after the demolition of the factory in 2022 (N/A, 2022)) and as my focus was to make the site into a focal point of Eleonas, I envisioned a new industrial use, rather than a simple housing or/and office complex. 3d printing is much cleaner than conventional industries, noiseless and less polluting. To add to this, in a large scale, such as the one in the plot, occupying the abandoned skeletons as well as new facilities, it offers, apart from new workplaces for the area, an introduction to new construction techniques for the city, on both, smaller and bigger scales. In addition, its positioning in a central space on the Athenian metropolis offers visitors the opportunity to come closer to this new technology and its current and future applications.

b. Is the introduction of a new industrial use on the site enough reason to attract visitors and becoming a new landmark.

It is evident that an industry alone cannot attract that many people on its own (people aside the workforce). This was also the reason that through my site research and visit I tried to find all the features that had a prospect on rejuvenate the area, both the historical road of "Iera Odos", as well as the existence of a covered small river, through design approaches would enhance the aesthetic, historic and public importance of the area. In addition, the additive production, in contrast to other types of industries, is both friendly to the pedestrian as well as through my vision of in situ construction and assembly of smaller and bigger buildings will create new spaces and uses for the plot for both workers and visitors alike, while the process of the assembly will be an attraction of itself.

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