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# Re-Implant

## Executive Summary:

**Premise** The rapid de-industrialization of Western economies has left an enormous impact on the urban landscape in Europe. Once thriving eco-systems of industrial growth have vanished and left behind vacant warehouses and production facilities. Urban planners are reintegrating these 'brownfields' into the urban fabric as mixed-used developments and are therefore overwriting their industrial heritage, which is undeniably a part of our cities. Furthermore, the disappearance of manufacturing caused many people to lose their jobs and for their skills to become obsolete, thus leaving an even greater impact on society itself. An ex-steel mill in Settimo Torinese, just outside of Turin, is one such example that was abandoned by the dissipating metallurgy industry years ago and has been left to decay. Based on this case study, we argue that the reintegration of these brownfields can lead to more benefits than affordable living space in undesirable areas in the outskirts of urban agglomerations. In fact, sustainable re-industrialization can reinvigorate a stagnant economy, create jobs and allow manufacturing to return to our cities.

**Case Study** The case study is based on the former industrial site of Lucchini, which manufactured steel on the 93.000m<sup>2</sup> area located in an industrial cluster in the municipality of Settimo Torinese. Its two manufacturing halls were vacated in 2002 and left to degenerate. Today, the structures remain in place, severely damaged, partially collapsed and covered with vegetation and graffiti. The lax environmental rules of the time have left their mark on the territory in the form of heavy metal pollution in the backfill material covering the soil. Isolation from the city center, poor accessibility for pedestrians and the location within an industrial zone make this site inadequate for any form of residential development.

**The strategy** is based on exploiting three core elements that these cases have in common: industrial heritage, productivity and innovation. Industrial productivity has fueled growth all over the world and although most large-scale manufacturing has been outsourced, it still forms the backbone of our economy. Industrial activity creates jobs and wealth for society, while shaping the identity of our cities over the last two centuries. Industrial heritage is an integral part of our modern history, and worth perpetuating. In fact, our focus is on adaptive reuse, which finds use in the existing structures, rather than preserving them as an industrial museum. Yet, re-shoring low-skill mass-manufacturing is not a sustainable strategy and urban manufacturing has since undergone a transformation



RE-IMPLANT: Sustainable Re-Industrialization of an Ex-Steel Mill

towards the advanced manufacturing. Innovation plays a key role in this environment and recognizing this transformation allows us to develop a solution that shows that manufacturing is ready to make a comeback and fuel dynamic growth. These three core elements are the recurring themes that appear throughout the project and act as a red line for the development of the masterplan.

**Analysis** A thorough market analysis identified two potential functions for the site, logistics and manufacturing. The logistical function is rooted in the current market conditions and the excellent accessibility of the site, underlined by an existing logistics cluster in the area. The analysis of the manufacturing sector found more complex trends that pointed towards the use of advanced manufacturing, which is the foundation for Industry 4.0. Advanced manufacturing is based on innovative technologies such as 3D printing and robotics, interconnected through the cloud and supported by big data analytics. This transition into high-tech manufacturing, which is focused on low volume and high variety, requires a highly skilled work force, as well as a functioning eco-system and support infrastructure for innovative small businesses. Both of these aspects were found to be present in Turin already, reinforcing our strategy to focus on advanced manufacturing. This analysis led to the concept of the Industry 4.0 Campus.

**Business Solution** The Industry 4.0 Campus is a technology innovation center that unites all aspects of the new industrial reality. It connects different actors in a local and virtual community to enable exchange of knowledge and expertise, while developing innovative products on-site. Researchers investigate current trends related to Industry 4.0 from a technological and economic perspective, while students and makers work on their individual prototypes in state-of-the-art labs. SMEs will find space to set-up and test small production lines within the same building, while large companies enjoy the privacy of a separate, customizable facility. In addition to exhibition spaces and offices, rooms are available for educational activities such as training and workshops. All of the infrastructure is supported by an IT system which allows researchers to assess the entire value chain from a system's perspective using data analytics. The concept is focused on creating a collaborative community, enabled by common spaces around the site designed to bring people together and allow everyone to learn from each other. Additionally, a modern, Industry 4.0 enabled distribution center will be located on the campus, leased to an external logistics provider, yet integrated into the community of the site. The common spaces are also open to the public, with regular cultural events intended to attract interest to the site and its activities.

**Architectural Solution** A sustainable development consists of a business model and an architectural masterplan that complement each other in all aspects. Based on the principles of adaptive reuse, the design juxtaposes the old and the new. The aim of the project was not to retain the site as an industrial museum and thus, buildings only remain if they have a future use, and new buildings were constructed where necessary. The logistics and production buildings are, in fact, new constructions due to the requirements of these specific functions. However, the main structure on the site remains as an industrial cathedral, a large open space, delimited by its concrete columns and steel trusses that once used to carry a roof. Within this space, community functions and services will be hosted, immersed in an urban green space meant to foster communication. In addition, the design plays with the contrast of open and closed spaces, which represents the difference between traditional and modern manufacturing. The former, noisy, smelly and polluting, hidden away in the industrial belts around the city versus the latter, clean, green, quiet and inviting. The technological solution adopted relies on modularity and expandability to ensure the flexibility of the space, while the materials used reflect the elements that defined the old site like steel and iron yet interspersed with modern elements of glass and timber.

**Feasibility and Implications** In addition to the preliminary market analysis, the feasibility of the project is demonstrated by a discounted cash flow analysis, which estimates a net present value of approximately €10 million. The construction process is carried out in phases based on cash flows and risk mitigation, while the business is scaled up as the phases are completed. The numbers show that the project could be attractive to investors and developers who are interested in stepping out of their comfort zone and approach this innovative solution to industrial redevelopment. This strategy has the potential to reinvigorate the local economy by bringing an evolved form of industry back to a region whose identity is strongly tied to manufacturing, without erasing its industrial heritage. It will create jobs for people who have the chance to be retrained, learn new skills and foster innovation through research and development in an integrated laboratory. Teaching activities and cultural events will attract young people to Settimo Torinese and turn the city into a hub for advanced manufacturing and learning. Small enterprises will be able to transition towards Industry 4.0 with the help and resources of the Industry 4.0 Campus and further contribute to growth in the region. This project demonstrates that the sustainable re-industrialization can have far-reaching benefits for all stakeholders.

**Key Words:** Industry 4.0 campus, innovation, industrial productivity, industrial heritage, adaptive reuse

**Project description  
written by the  
Principal Academic  
Tutor**

The industry had a key role in the development of contemporary cities. From the eighties, delocalization of production facilities in east countries left behind huge voids, large unused skeletons, partially transformed by post-industrial development programs. Today, the occurring shift inside an economic model in crisis, a digitalized production process and the necessity of a re-organized energy model underline the importance of production as a key factor of innovation in the development of our cities.

The project defines and tests on a real case study a holistic approach to the regeneration of dismissed industrial sites, developing mixed uses design where production and life are connected in the same model. Adaptive reuse, preservation of industrial heritage and identity in different time phases guided the construction of the scenario. Economic feasibility and possible revenues are part of the project. The approach is based on the multidisciplinary integration of knowledge and skills during the whole design: risk assessment, remediation, and construction process in order to define real policy proposals trying to improve the technical framework for more sustainable reuse procedures.

The site of analysis and design chosen is the ex-industrial plant of Acciaierie Lucchini, the last steel plant appeared on the municipality of Settimo Torinese and symbol of a glorious industrial past, almost buried today. The factory was located on an existing plant, built by Maggio and Baldi, traders in ferrous materials since 1955. In 1966 the Lucchini company acquired the small foundry, bankrupted in the previous year, starting the first expansion of the site. The complex was definitely closed in 2000, putting an end to the steel industry in Settimo.

In a new industrial shift, the renewal of this urban industrial complex can bring new value to the city of Settimo, transforming an abandoned space into a innovative industrial hub able to combine logistic, production, leisure and temporary living, experimenting mixed-use programs and becoming an example of the new relation between innovative production and the city.

**Team description by  
skill**

Our team consists of five members, with a background in engineering and architecture. As a small team, we used an integrated approach and collaborated on all essential parts of the projects. Task leadership rotated based on the task at hand and each team member contributed with their expertise in several fields.

Beatrice Cappuccilli: Architect, coordinator of the team and responsible for the architectural design, analysis of case studies, drawings and the appraisal of the land.

Marini Saripuspa Dini: Urban planner, responsible for the analysis of the urban context, analysis of social structures and development of the core strategy.

Federico Lucchi: Building Engineer/Architect, responsible for the environmental analysis of the soil, the structural components of the design and the architectural cost analysis.

Sebastian Reimann: Management Engineer, responsible for market analysis, feasibility analysis and general strategy of the project.

Dennis Saiello: Architect, responsible for the architectural design, analysis of case studies and drawings.

## Goal

This project is emblematic for the reintegration of a mixed-use facility, in abandoned brownfields. The goal is to develop a strategy for the **sustainable reindustrialization** of these sites. While the project is anchored in the development of the masterplan for the ex-Lucchini area in Settimo Torinese, its aim goes beyond the constraints of the case study. This term was chosen deliberately as it unites the three sub-goals of the project itself. **Innovation** is a process of finding solutions that are more effective, efficient and longer-lasting, hence sustainable. Industrialization, because the designated use of the site is meant to be productive from an industrial standpoint and re-industrialization, because the site already possesses an industrial heritage that we aim to emphasize. Other examples show that the adaptive reuse of industrial building stock has become a common challenge for the modern urban planner, especially in the vicinity of previously heavily industrialized cities. The goal should therefore be to demonstrate a viable strategic approach that could be applied to a variety of similar cases throughout Italy and Europe. However, rather than developing a basic blueprint to be applied blindly, the strategy should present the planner with the right tools to consider all relevant factors for each individual project. While they all have certain things in common like the goal to preserve the industrial heritage and reclaim the land for productive use, each site has its own story and external conditions that cannot be generalized. Finally, the masterplan developed for this particular case study is supposed to show that the strategy can lead to desirable results, although the output can vary depending on the perspective and priorities of the designer.

## Understanding the problem

The industrial revolution changed societies and landscapes around the world and introduced technological innovation at a pace never seen before. The industrial revolution caused a spike in life expectancy, productivity, education and globalization. On the other hand, industrialization also led to increased exploitation of resources and pollution. Most importantly though, the industrial revolution led to rapidly transforming societies. Europe, as the birth place of industrialization, has experienced this transformation like no other place. Higher living standards drive up the cost of manufacturing, while globalization enables products to be outsourced to cheaper locations, leaving behind a brief but intense industrial heritage. Unlike Roman ruins and medieval castles, this type of heritage is often not proudly shown off, but rather hidden away experiencing abandonment and decay. These structures were built to last, yet the lack of consideration for the environment during construction and operation created polluted and hazardous brownfields, which are difficult to reintegrate into the modern city. However, just like, Roman aqueducts, Greek temples and catholic churches, these sites *"are important milestones in the history of humanity, marking humanity's dual power of destruction and creation that engenders both nuisances and progress."*

This project is concerned with the fundamental aspects of industrial heritage and how to incorporate brownfields back into the urban fabric as a value-adding element. The real case study for this elaboration is an abandoned steel mill in Settimo Torinese, a suburb of Turin in northwestern Italy. Located in the region of Piedmont, Turin is known for its industrious past. As the centre of Italian automobile manufacturing, Turin experienced a similar fate as Detroit in the United States in the late 20th century when FIAT had to let go of almost 75% of its work force and Turin lost almost 30% of its population.<sup>2</sup> With the decline of the automotive industry came the decline of all heavy manufacturing, including steel production. The abandoned steel mill in Settimo Torinese demonstrates the classic features of an industrial brownfield of the second half of the 20th century. Founded in the 1960s and closed indefinitely in 2000, the site consists of two large manufacturing halls and is located in an industrial area, just outside the city of Settimo Torinese. Soil pollution is omnipresent due to the industrial practices and lax environmental standards of the time and the remaining buildings are overgrown by weeds, prone to collapse. These considerations bring up the question of what to do with the site and how to design its requalification.



*Lucchini Ex-mill Production Building*

## **Exploring the opportunities**

The strategy's goal is the 'rebirth of a wasteland', through the understanding of the significance of the existing document. The strategy converges the three branches of innovation, productivity and Industrial heritage and find a commonality that allows the design of a masterplan that on the one hand respects all pre-conditions, but on the other hand presents a viable business model for the project. The design and the business model have to be complementary in nature to be sustainable. The first step of the analysis began with the Industrial Heritage and how the site can fit into the context of the environment while the next step introduces elements of analysis, evaluating the potential of certain functions in the new space. Although manufacturing and logistics both have proven to be viable options, certain conditions apply, as became evident in the analysis. Not all types of manufacturing and logistics would make sense in this context and innovation consists not only in new technologies, but in the way value is created today. Businesses have to adapt their business models in order to be truly innovative. In this case, the innovative eco-system of the city is the driver for a masterplan that satisfies the three conditions and serves as a building block for a sustainable business model. Industry 4.0 is the combination of productivity and innovation. On the other hand, adaptive reuse is the key word for an innovative way to deal with industrial heritage nowadays.

## **Generating a solution**

However, neither Industry 4.0 nor adaptive reuse satisfy all three conditions. Therefore, we use the term 'Sustainable Re-Industrialization' that aims to converge the three core elements together for this project. It is re-industrialization because it respects its industrial past, without dwelling on it. It does not aim to bring back what is gone, but transform into a new form of industry, which is what makes it sustainable. It is sustainable because it relies on productivity and innovation, looking towards the future. From this concept we derived our final master plan: 'The Manufacturing Campus'.

The Industry 4.0 Campus is a concept that aims to create synergies between researchers, experts and learners by bringing them together in the same space. A space that combines the historical significance of industry with the modern understanding of production: clean, green and quiet. The campus is an eco-system that fosters collaboration along the value chain. Researchers study the trends of industry 4.0 in state-of-the-art labs and provide support for students, makers and SMEs who are working on their own projects in a collaborative environment. From the design, to simulation, prototyping and testing, all the way to manufacturing using the latest technology: additive manufacturing, robotics and cloud computing. The campus is divided into four components: a high-tech distribution center, a manufacturing facility, a research and development lab and community spaces. These components, which will be presented in detail in the next slides, all work together to create an unique open innovation community.



Masterplan Solution

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