The Landscape of Transportation Nodes: A Design Statement for the Regeneration of Abandoned Railway Landscapes Through Case Studies

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Abstract: *Transportation nodes of urban landscapes such as airports, railways and ports have great potential since they are one of the major systems that shape the cities. Analysing their use through time and seeing how they were shaping the cities gives us the design principles to be considered for the transformation process into a public place after their abandonment. It is complex to plan their design, but the before-during-after processes should be acknowledged while dealing with a node of transportation. Referred sites are no longer just functional elements of the transport system but they also act as mixed-use urban nodes. Hence, they require a broader approach and broader urban planning strategies considering the future scenarios. This paper proposes a categorization of industrial areas that are a part of transportation systems and ultimately defines a design statement for abandoned railway landscapes through international case studies. The resulting statement proposes that 8 principles should be considered: community involvement, natural process as a design form, heritage & history, adaptability, sustainability, integration of users, perception, and mobility & flow.*

Keywords: *Post-industrial, transportation landscape, railway, regeneration, mobility*

Ulaşım Peyzajları:
Terk Edilmiş Demiryolu Peyzajlarının Kamusal Alana Dönüşümü İçin Tasarım Beyanı Önerisi

Özet: Havalimanları, demiryolları ve limanlar gibi kentsel peyzaja ait ulaşım düğümleri, kentleri şekillendiren en önemli sistemlerden olmaları nedeniyle çok büyük bir potansiyele sahiptir. Zaman içindeki kullanımlarını incelemek ve kentleri nasıl şekillendirdiklerini görmek, terk edildikten sonra kamusal alana dönüşüm sürecinde dikkate alınması gereken tasarım ilkelerini sunar. Bu alanları şehrin kamusal alan ağının bir parçası haline getirmek ve tasarımlarını planlamak kompleks bir süreçtir ve öncesi-sırası-sonrası süreçleri planlanmalıdır. Referans verilen alanlar artık ulaşım sisteminin işlevsel öğeleri değil, karma kullanımlı kentsel alanlar olarak faaliyet göstermektedir. Bu nedenle, gelecek senaryoları dikkate alınarak daha geniş bir yaklaşım ve daha geniş kentsel planlama stratejileri gerektirmektedir. Bu makale, ulaşım sistemlerinin bir parçası olan endüstriyel alanların bir kategorizasyonunu önermekte ve nihai olarak uluslararası örneklerin analizi yoluyla terk edilmiş demiryolu peyzajları için bir tasarım beyanı tanımlamaktadır. Sonuç olarak tasarım beyanı; topluluk katılımı, doğal süreçlerin tasarım biçimi olarak kullanılması, miras ve tarih, uyarlanabilirlik, sürdürülebilirlik, kullanıcı entegrasyonu, algı ve iletisim, hareketlilik ve akış olmak üzere 8 prensip altında toplanmıştır.

Anahtar kelimeler: Post-endüstriyel, ulaşım peyzajı, demiryolu, rejenerasyon, dönüşüm

1. INTRODUCTION

The industrial revolution introduced us with new infrastructures that characterized our landscapes resulting in the phenomena of industrial landscapes. Due to different reasons such as war, emergence of new technologies, urban development etc., these landscapes became abandoned, disused, or neglected. Traditional industries have decreased, leaving us with derelict lands. Many of these sites have been colonized and naturalized by the landscape, resulting in large fields that are now a part of the city's fabric. As the urbanization continues, urban planners and landscape architects began to find ways to reclaim these lands by transforming them into public parks. Although these parks are called "brownfield parks" and examined under the umbrella of this general perspective, this article proposes a function-based categorization of industrial landscapes and examines abandoned railway landscapes under the category of transportation as a branch of infrastructural landscapes. Because the abandoned railway landscapes are studied from a transportation viewpoint, categorization is an important part of this research. Furthermore, an understanding of the railway landscape sites and the reasons that lead to abandonment are studied. The statistics from across the world concerning the abandoned railway sites are presented to emphasize the potential of these places to become active public areas that can be part of larger urban planning strategies towards sustainable, resilient, and just cities. The third chapter is dedicated to case studies where a concentrated form of an in-depth analysis is completed. The case studies are selected according to their comparability considering their size, age and international recognition. Some case studies are relevant as regards to reclamation techniques, others concern the significant relationship with the community as well as the relationship between human and environment. Finally, a design statement is created for the transformation of disused railway landscapes into public places. The statement is created after a careful examination of the patterns and processes that appear in the selected 9 case studies and it consists of 8 principles that were interpreted from the analysis. The present research studies underestimate the influence of the "mobility" notion on transportation landscapes by examining the examples in comparison with brownfields that have other functionalities. By focusing on railway landscapes, this article aims to propose a heightened awareness of the enormous potential of abandoned transportation landscapes as an activator and connector on an urban scale and hopes to encourage further research into the other typologies that fall under the category of transportation landscapes.

1.1. Research Gap & Objectives

There are many research papers focusing on brownfield reclamation, transformation of post-industrial areas and management of disused infrastructural landscapes which do not take a special approach to disused transportation landscapes. They look into best practices under the umbrella of "brownfields parks," which is a broad term that does not allow them to look into specific techniques. Hence, in this article it is suggested that brownfield landscapes should be separated into categories according to their functions. A categorization of transportation landscapes into 3 typologies: airports, ports and railways is presented; and an examination focusing on their characteristics as linking destinations and the presence of the mobility action is proposed. Because of the scope of the study, this research focuses on the typology of "railways", hoping to encourage further research on other typologies presented.

The main objective of this study is to create a design statement that will act as a guideline for the transformation of disused, abandoned, neglected railway landscapes that are no longer operating. Taking railway landscapes under the category of transportation, rather than approaching them from a general perspective of brownfield reclamation or post-industrial etc., a heightened awareness of the patterns and processes of transformation is presented through the analysis of 9 railway landscape regeneration projects.

1.2. Methodology & Research Questions

The research is framed by the analysis of case studies where patterns, common strategies and processes are examined. The investigation of existing knowledge and the study of best practices are an essential component of research culture. Hence, the quantity and variety of projects in varied socioeconomic and geographical backgrounds provide adequate information to validate the research premise.

Ultimately, the mass of knowledge of literature and best practices are being used to develop a design statement on the issue through which the following questions are tried to be answered.

- What principles should we follow when transforming a former railway landscape into a public place and what are the factors that contribute to the success of the project? Is it possible to create a guideline that shows not specific actions but the approach and strategies towards post-industrial railway landscapes?
- What role does "history" play in post-industrial railway landscapes? And how can we use design to convey the many layers of history?
- What phases does a railway landscape go through until it is reclaimed and what can we learn from the life cycle of railways?
- What are the strategies for the preservation of characteristics of the railway landscape site?
- Can we talk about resilience to change during the transformation of a former railway landscape?

2. INDUSTRIAL LANDSCAPES

2.1 History

In order to understand the industrial landscapes of today, we need to understand how they emerged since landscape is a dynamic process between humanity and environment. Landscapes are shaped by the human activity. Hence, we should explore the activity that resulted in the emergence of industrial landscapes, which we can date back to the industrial revolution. The industrial revolution was the beginning of a new era that is characterized by the domination of industry and machine manufacturing, changing habits, labour, and landscapes. Since the industrial revolution, a critical alteration in population has occurred, resulting in a rise in the population in urban areas. People have started to migrate from rural areas to urban centres in order to find better jobs to be able to have better life conditions. As a result of this migration, urban settlements began to spread which led to the phenomenon known as urban sprawl. This term can be defined as the changes in the urban density at different distances from the city centre [1]. These distances rose in tandem with urban development, making transportation even more crucial in meeting the demands.

Around the end of the 19th century, with the second wave of industrialization, global systems of transportation and communication arose. Infrastructures to support the new urban life had to be developed. Hence, landscapes have changed accordingly. Industrial concerns have produced the logistics landscapes in which more land area is given over to accommodate the shipment, staging, and delivery of shipped goods [2]; networks of railway lines began to merge into huge areas of industrial landscape [3].

In the late 20th century, the transition from the second wave of industrialization to the third began. This wave was exposing an environmental crisis, primarily caused by the unsustainable use of resources in industry. Globalisation and de-industrialisation were the phenomena, and the landscape was eventually influenced by all of these developments, with new typologies emerging such as post-industrial landscapes [4].

2.2 Landscape of Infrastructures

The waves of industrialization presented us new typologies of landscapes such as manufacturing lands, mining lands, waste lands and transportation landscapes. In the next chapter, a categorization of these typologies will be presented. In the scope of this article, we will be concentrating on the railway typology as a leg of transportation landscapes under the umbrella of infrastructure landscapes.

According to Oxford Language, an infrastructure is the basic physical and organizational structures and facilities needed for the operation of a society or enterprise. Landscape on the other hand is described

as everything you can see when you look across a large area of land, especially in the country. Meanwhile, Charles Waldheim describes landscape as a model for urbanism and a disciplinary locus for discussion historically housed in architecture, urban design and or planning [2]. Hence, the understanding of both terms can be summarized as infrastructure being the alteration of natural environment while landscape being a vision of a piece of land that is already existing without any action but looking. Their combination offers an opportunity to redefine both notions into a more integral design brief where goals and means converge, resulting in operative landscape structures that serve multiple ends [5].

Infrastructures, by virtue of their scale, ubiquity and inability to be hidden, are an essential component of the urban landscape today [5]. They are a part of our everyday scenes. Hence, as landscape architects we should find ways to appropriate these infrastructures as landscape. This will help us to bring out the potential of these typologies to be transformed into public spaces through the understanding of the dynamic between structure and process [6]. Landscape infrastructures that facilitate different nodes of transportation can be categorized as transport landscape infrastructures. This category includes vehicular, rail, air, and port systems. For the framework of this thesis, we are interested in post-operation life of these landscapes.

2.3. Categorization of Industrial Landscapes

Towards a Landscape Typology of Transportation Nodes

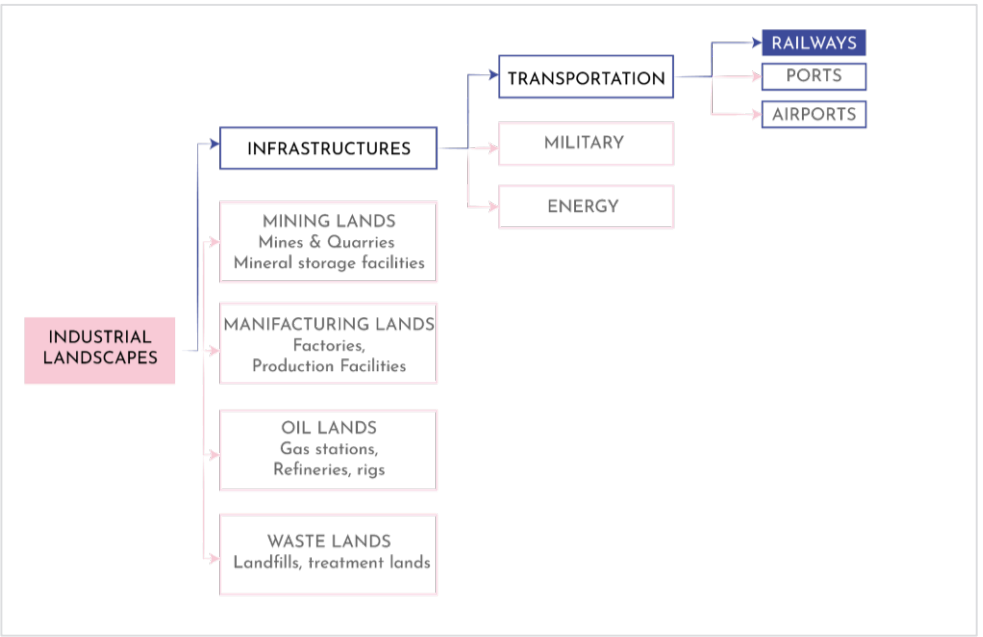


Figure 1. Categorization of industrial landscapes into typologies according to their function (Improved by author).

The concept of industrial areas is gaining more importance through the development of new technologies. They present a mix of typologies that consist of different characteristics such as landfills, gas stations, mining lands, quarries, or facilities of production etc. These areas have been categorized differently in different articles depending on the aim of each one. For instance, they can be categorized according to their former function, their level of contamination, their level of abandonment etc. EPA (U.S. Environmental Protection Agency) launched a classification in 2005 focusing on specific categories of brownfields such as mine-scarred lands, abandoned railway structures, underground storage tanks [7]. For this study, a categorization based on the function is presented. While some of the other categorizations have a different approach about the transportation group, here it is taken as a part of infrastructure landscapes and it consists of 3 different typologies such as railways, airports, and

ports. The aim of the study is to create a research area for the landscapes created by the activity of transportation under the infrastructure leg of the industrial landscapes. Landscapes of transportation represent the past and current movements of the society while shaping the future layout of the cities. This categorization is important because the transportation function is important in shaping cities since the related infrastructures are a part of the landscape today. In this article, we will be focusing on the railway typology and ultimately create a design statement for railway landscapes with the aim to inspire future work related to other typologies of the transportation category.

2.4. Railway Landscapes: Barrier or Connector?

In today's industrialized world, it is hard to imagine an urban landscape without the infrastructures which are built for the transportation activity. We may look at these structures as a disturbance and an intervention on natural land, but we can also look at them as a connector that links different parts of the urbanized world, a bridge between different worlds, the possibility to bring communities together since they provide mobility, hence access. Along with possibilities, the landscapes of transportation also provide us with the different layers of history. While airports changed the way we look at landscape with the invention of aerial views, ports have taught us that the edges are not the limits. And railways, a more urban-integrated type of transportation landscapes, provided us with the traces of movements throughout history. Not only with their layout, also with the beautiful architecture of the stations which were the gateways into cities and that is why they became important landmarks in the history of cities. They are a part of the architectural heritage of the 19th and early 20th centuries. Some of them are the most important buildings in the towns in which they were built. They represent the architecture and art of their time with their decoration, highlighting the importance of this mode of travel for the community [8].

One can see railways as barriers and maybe even consider them as a threat. From the landscape point of view, they act as a barrier since they create two sides and divide the natural land into two. However, they also have a major influence on social and economic development which helps society evolve. They provide opportunities and mobility by linking destinations as well as a panoramic experience along the way. This experience represents the dynamic interaction between human and environment because of the change in the scenery between the destinations. In conclusion, they are connectors as well as barriers. The urban pattern is highly affected by the railways, hence they are separators because of its effect on city layout. On the other side, they are the direct link between communities, towns, and landscapes. Once ecological compensation is created, these typologies become the connectors as well. Built environments and human influence do not always have a negative impact on nature. The key is in the relationship between humanity and environment; to create the balance. Instead of viewing them as something apart from our environment, we simply should find a way to co-exist together. Because in the process of urban dynamic development, the construction of these infrastructures is inevitable.

2.4. Reasons for Abandonment

The history of abandonment dates back to the worldwide economic depression between 1929 and 1939, famous as the Great Depression since "profit" is the main reason for abandonment. In the United States the rail service was already well developed during the 19th century and the railway network already exceeded 430.000 kilometers of lines at the beginning of the 20th century. Based on the outdated technologies back then, the existence of a railway system came too early, leading to an inability to withstand progressive erosion of market shares by the transport on road. After WWI, it worsened and 230.000 kilometers of lines were abandoned in the last century [9].

Europe as well was affected by the political changes and new transportation typologies. The railway use in Europe was hit by the low-cost airlines since suddenly travellers could fly to anywhere in Europe with very small prices [10]. In Italy's case, for instance, starting from 1839, with the opening of the line between Napoli-Portici, the railway network has been representing the development of industry. After WWI rail transport faced competition with mobility on rubber. It suffered also during the 2007-2011 with the national railway undertaking the crisis, losing within only one year, over a

quarter of its trades. Eventually, the case of abandonment relies mostly on rail traffic. The trend in passenger and freight demand served by the railway system translates into increases or decreases in the supply of services and therefore in the number of trains running on the network.

2.6. POTENTIAL OF RAILWAY LANDSCAPES

2.6.1. Statistics

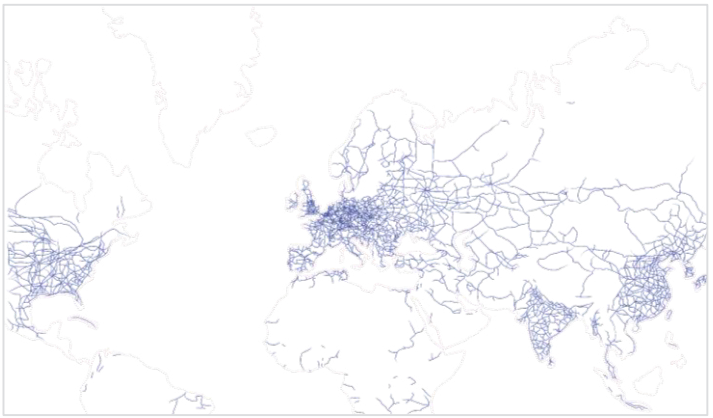


Figure 2. Railroad lines in the world (Improved by author).

About 2000 km of lines no longer active railways exist in Italy [11]. This number is 7600 km in Europe and 35,750 km in the US. With the organizations such as Rails to Trails, redevelopment of these derelict structures is initiated. The most common case is turning them into a part of slow mobility network with bicycle lanes and promoting sustainable mobility. This is a useful and cost-effective solution for abandoned areas, but in order for these locations to reach their full potential, a more comprehensive design should be developed.

The idea of reclaiming abandoned lines as greenways started in America with Rails to Trails Conservancy in mid-1960s and came to Europe during 1980s. Although there are not a certain total number of Europe's abandoned railways, we can make an assumption through the data provided by the programs of different countries in Europe. Spain with Programa Vías Verdes and France with Le Draisine E I Vélorail, Portugal with Ecopistas, England with the Sustrans Program (Sustainable Transport) and Belgium with RaVel (Réseau Autonome des Voies Lentes) can be examples of these programs which provide us with current statistics [12].

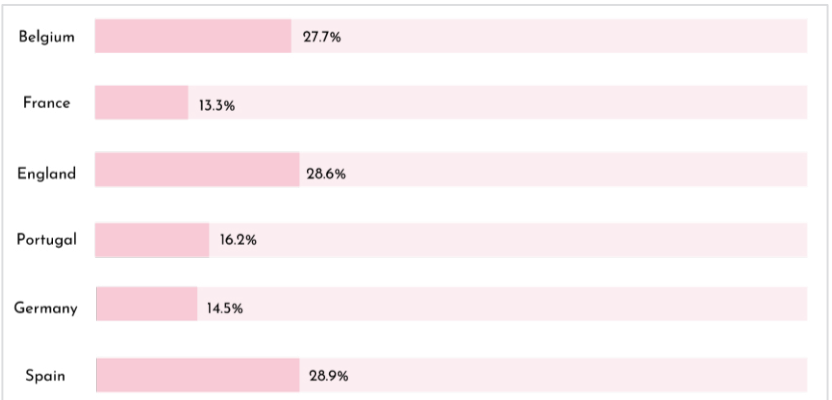


Figure 3. Europe's long way to reclaim the disused railways. Percentages of abandoned railways that are converted in green corridors (Improved by author).

Many countries are on their way to reclaim the abandoned railway landscapes. However, there is a lack of information regarding the assessment of how many kms of abandoned railway lines exist in these countries. The percentages of abandoned railways converted into green corridors in the countries that provide this information are illustrated in the figure above. To offer an indication; the number of total kms of old rails that have been converted into green trails is 400km in France, 733km in Portugal and 5020km in Germany. Considering the fact that about 2,8 billion cycle trips happening in Europe, the potential of these abandoned structures is immense [13, 14].

Many organizations are trying to raise funds and promote the reclamation of the abandoned railway lines. Also EU funded programs such as REVER MED project by the European Greenways Association are helping the progress [15, 16].

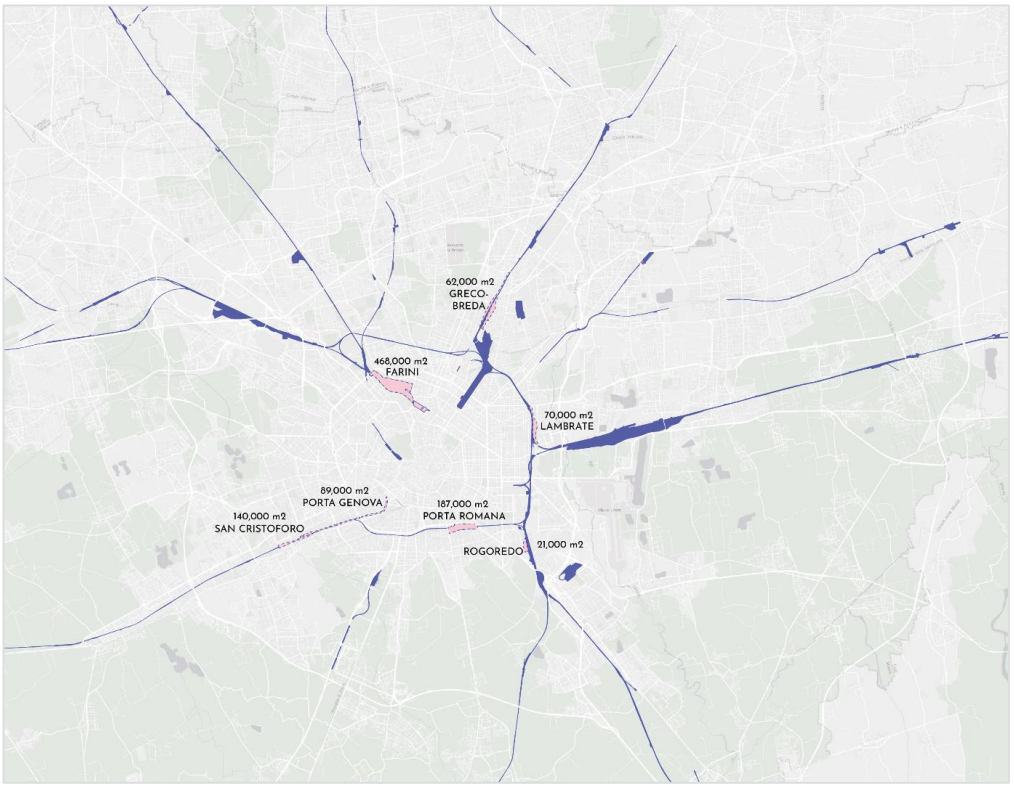


Figure 4. The 7 areas interested by the agreement (AdP) (Improved by author).

In Italy, the railway lines, passed by from about 6000km to over 10000 in 30 years since 1870. The network was then largely nationalized with the institution Ferrovie dello Stato (FS) in 1905 which expanded it in the thirties, to the threshold of 17,000 km [17]. Important programs such as "Scali Milano" or "Accordo di Programma" (AdP) initiated by FS, covering the city of Milan, proves the possibility of restoring abandoned railroad lines. The aim is to fund the city's railway network system by the transformation of underused railway areas [16]. International competitions are being organized to decentralize the rail yards which in total make 130 ha of urban soil [18].

2.6.2. Life Cycle of Railway Landscapes

Understanding the series of changes that railway infrastructures undergo, hence their life cycle, is important in order to assess the future phases of the related areas. Like everything else in our environment, they are born, and they grow, yet, they do not have to perish; they can be repurposed while still reflecting history. Because they are a part of the transportation network and an expression of the various technological-industrial eras [10].

As landscape architects we are dealing with dynamic changes in environment. These infrastructures are a part of today's landscape and they have different stages that are circular. They start their lives by operating, connecting different parts of the national or international territories. After the operation phase, because of different reasons mentioned in earlier chapters such as decrease in profit, political decisions, low demand etc. they come to the stage of closing. After that, the residuals stage arrives, where the leftovers can be visible. Until their potential is realized they stay in this phase. Following this, the transformation phase begins where the site is given a new purpose, leading to the beginning of a new cycle. This new purpose goes through the same stages until its service is no longer needed and it needs to be transformed and adapted to the new needs of the society again. All past lives, leaving their traces to be told in the next life.

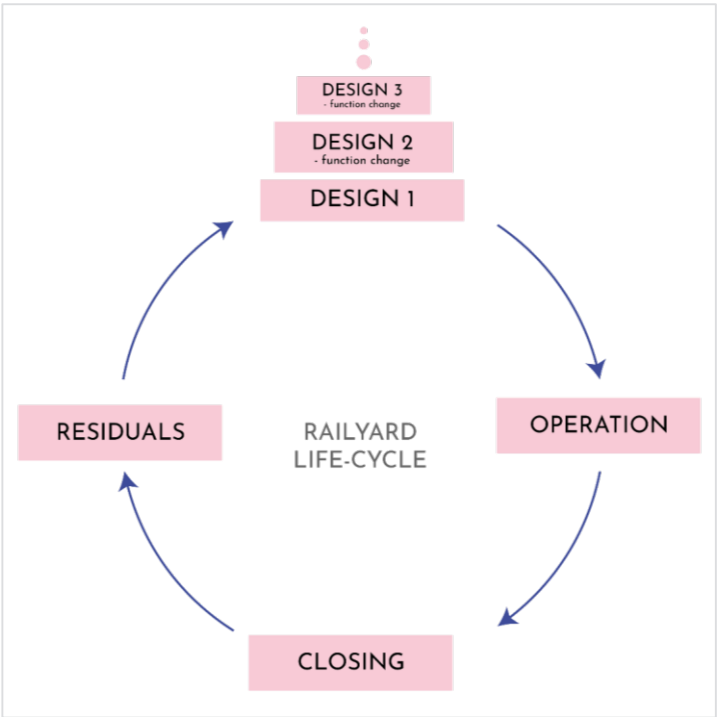


Figure 5. Life cycle of Railway Landscapes (Improved by author).

3. CASE STUDIES

The case studies are studied thoroughly in terms of location, historical development of the site, abandonment phase, design initiations, design approach, form and function (physical characteristics), botany, phases, site observations, daily operations and maintenance etc. However, because of the scope of the article, only a summary is presented.

3.1. High Line

Figure 6. The site in relation to the open space network of the city (Improved by author).

The 2.33 kilometers long linear park is built on an abandoned elevated railway on which during the mid-1800s, freight trains provided supplies to lower Manhattan [19]. After the mid-1900s, the growth of air-transport and inter-state trucking started to affect rail traffic [20].

The project owes its success to 'Friends of the High Line' (FHL) who organized campaigns with the help of photographer Joel Sternfeld whose photos brought international attention as well as to the competition for ideas for the transformation [20, 21].

Opened in 3 phases and connecting 3 neighbourhoods, the project tackles challenges such as the reclamation, adaptive re-use, and preservation. Each opening provided an input for the next phase and contributed to its success. The user engagement brought an incredible popularity which contributed to the cultural development of the area. The botany in this project was the key to all proposed senses. The wilderness in the design recalls the abandonment years as seen in the photos of Joel Sternfeld.

This project is iconic in terms of community engagement, the scale, and the attention it brought to the potential of the transformation of abandoned railway landscapes. However, the budget makes it one of the most expensive parks in the world with an annual operating budget averaging around $3 million a year [22]. Nevertheless, it is beneficial for the neighbourhoods it connects since the project has resulted in around $2 billion in new developments [23].

3.2. Promenade Plantée

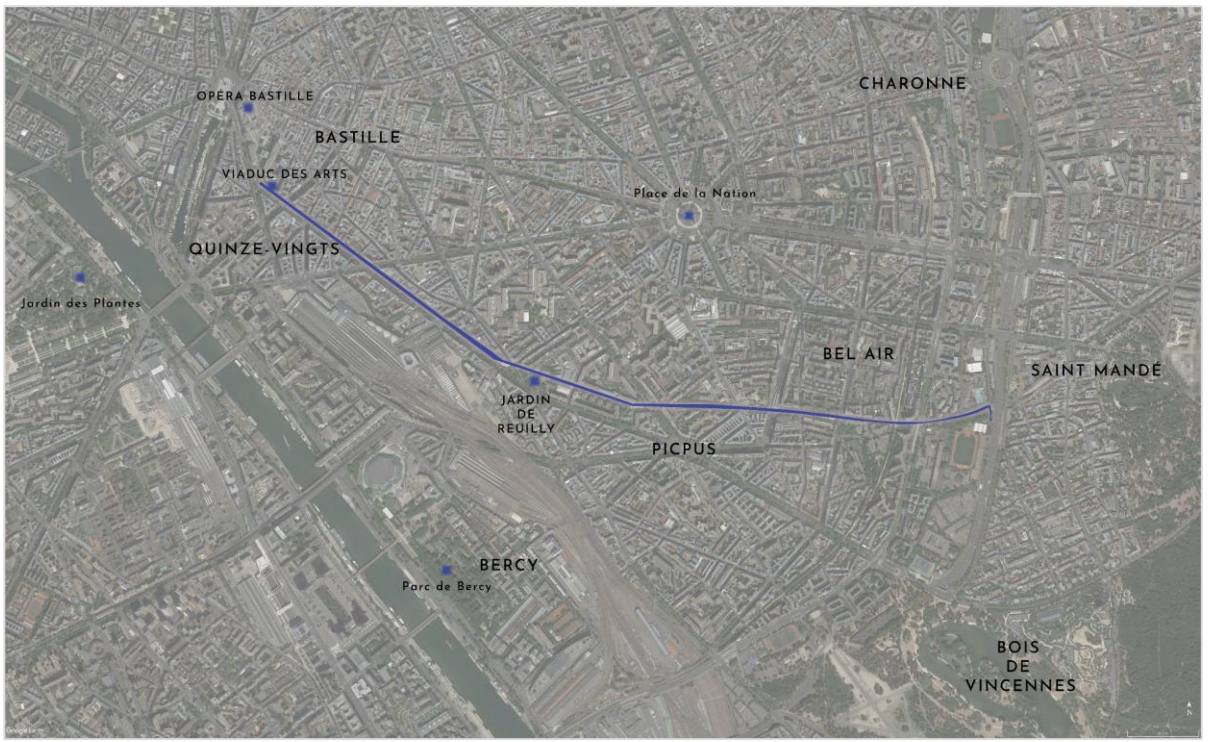


Figure 7. The site in relation to the open space network of the city (Improved by author).

Promenade Plantée or Coulée Verte René-Dumont is a 4.7 km long linear park built on an old, elevated railway, being one of the first examples that inspired many others such as the High Line. The Vincennes railway was opened in 1859 [24]. The abandonment was caused by the introduction of bigger trains and new technologies [25]. Meanwhile, under the viaduct, small businesses found places and the route was invaded by wild weeds and piled with garbage calling for an intervention [26]. Because of the historic significance of the line and the city's severe need for more green space, the concept of converting it to a public park received widespread support from governmental, charitable, and commercial sectors.

The design approach was centered around "place-making"; through architectonic imagination, ecological awareness, and social sensitivity. Its success is tied to an ongoing presence of people with act of motion and connection [25, 27]. It establishes a linear condition in varying height that connects the Place de la Bastille to the city's outskirts [25, 28]. Under the elevated portion, Viaduc des Arts exemplifies the characteristics of the 12th Arrondissement, with traditional artisan stores while playing an important role in East Paris' economic reconfiguration with its high-end artisanal stores; raising property values [25].

Promenade Plantée means "walk with trees" however locals generally refer to the site as "La coulée vert" which is translated as "green flow". Hence, botany and movement are combined in the design. The designers took reference from horticulture itself as the whole concept is based on the French landscape practice of préverdissement [25]. Jardin de Reuilly, which was formerly the railway maintenance yard, is the most popular garden along the Promenade.

The official name Coulée Verte René-Dumont includes René-Dumont, one of the first ecologists to suggest in the early 1970s that we need to be careful with our planet, showing there was an intention to promote it as a place for ecology, as a tribute.

3.3. Parque Lineal Ferrocarril De Cuernavaca

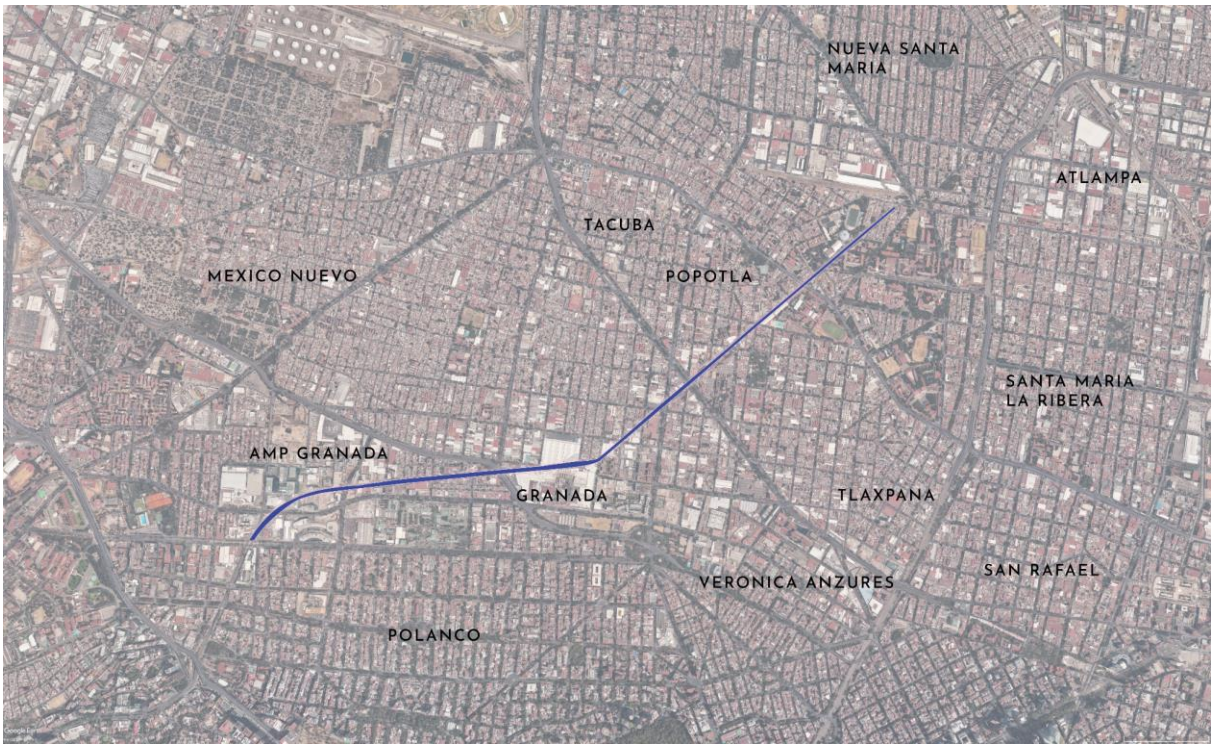


Figure 8. Location of the corridor(Improved by author).

Built in 1898, Cuernavaca Railway connected Mexico City to the Acapulco port until the use was declined due to the Mexican Revolution. In 2016, the municipality launched an international competition for the site. The design team of Gaeta-Springall Arquitectos became the finalist. Currently, a part of the railway is operating with 3 trains per day [29]. Despite a lack of security and services, public users found habitat there. The city has been dealing with drought and water crisis caused by low rainfall [30]. As a response, the design team proposed an urban forest as a part of the city's open space network using water as a didactic element during the design phase. The 4.5-kilometer-long urban forest, which is of similar size with Promenade Plantée, unites 22 neighbours, serving over 50,000 people.

The active participation of locals and stakeholders added to the success of the project. Its success lies behind the link established between different districts in response to metropolitan size demands, and the process design as the team designed future phases and actions for long term and medium-term scenarios. Rain gardens were created to celebrate the water and a continuous red line along the corridor created a connection between features as well as a celebration on the rail lines [31].

3.4 Scalo Porta Romana

Figure 9. Location of the railyard (Improved by author).

Porta Romana is a part of the Scali Milano program, mentioned earlier. The municipality launched an international competition for the site, including public consultation [32]. The project aligns with the municipality's strategy plans and the vision of "Green Rays of Milan". 68% of the surface is open spaces including an urban park with 3500 trees that contributes to the municipality's ForestaMi project, aiming to plant 3 million trees by 2030 [33]. The proposal reflects the site's industrial past while reviving it with contemporary initiatives centered on the principles of sustainability, inclusivity, biodiversity, resiliency, connectivity and wellbeing. It pays homage to its rich past while providing shared living and working environments for a diverse group of residents, students, office workers, athletes, and visitors. Remediation of the old industrial site is created with intention to spread to the adjacent districts, each of which shapes the characteristics of the locations it reaches [34].

The project uses strategies such as "meanwhile uses" to engage users during the construction phases which is key to properly meeting the demands of the users, allowing for a test run before the construction is completed. It has a central park demonstrating Lombardy's nature, eco-zones, connections, elevated forest, designated and a homogeneous building complex that will host offices, residents, student housing, and temporarily the Olympic Village, ecozones including wetlands and thematic islands [35]. The process design is important since this part will become the focal point of another major urban and real estate change after the Olympics [36].

3.5 Atlanta Beltline

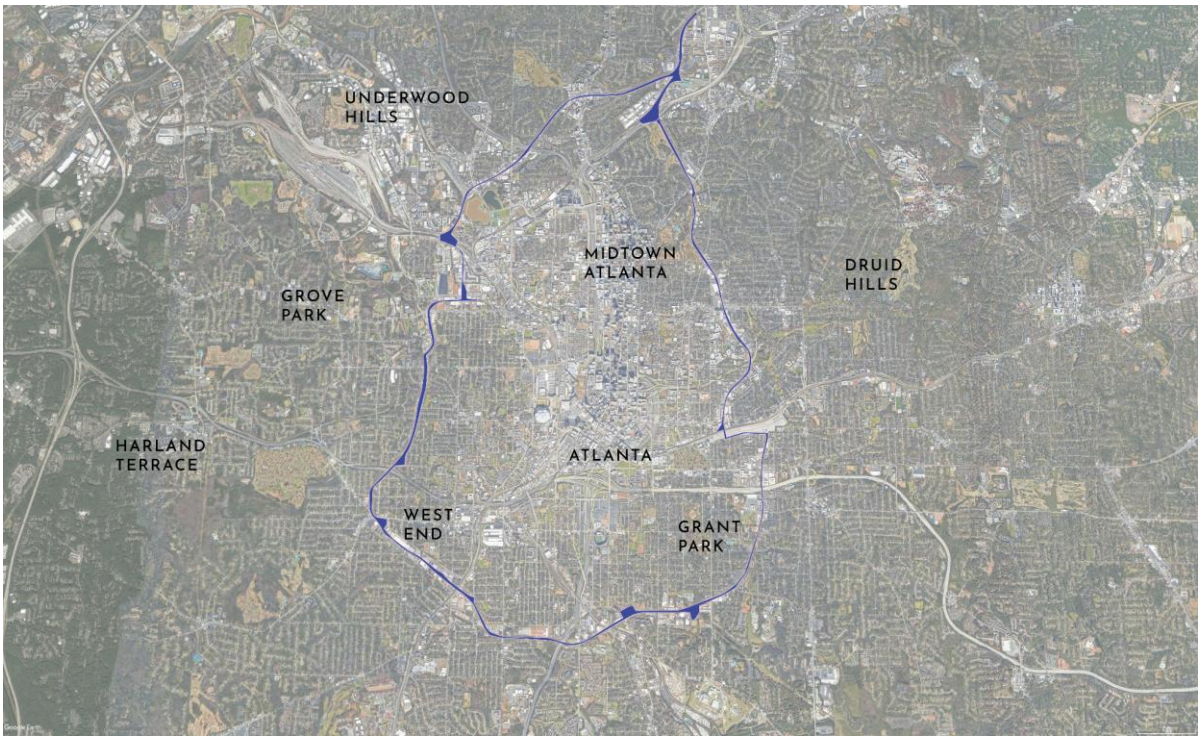


Figure 10. Location of the belt (Improved by author).

Located in an historical area with several railway corridors, the transformation took place on a 35 km long railway loop and the total trails are 53 km. It is a hybrid project that has bith disused rails and active rails. It was created with the establishment of the NGO “Atlanta BeltLine Partnership” in 2005. The project continued to grow step by step. For example, the quarry on the west side was purchased by the City of Atlanta and turned into reservoir park. Then, an advisory board was formed to give priority to affordable housing. The Partnership continues to work nonstop to develop the project to this day, finding federal and private funding. The last major funding was provided by the Metropolitan Atlanta Rapid Transit Authority (MARTA) with $570 million [37].

The BeltLine connects 45 neighbourhoods in which the poorest and the richest exist. Hence, it has the ability to transform the city considerably more profoundly than similar initiatives [38]. Around 2 million people visit the site which shows the need for alternative ways to circulate in the city. Despite the objectives as affordable housing, many people have been disappointed by the rise in housing costs, raising concerns about inequality. Following the demonstrations, the team claimed that they will try their best to keep their commitments [39, 40].

3.6 The 606 – Bloomindale Trail

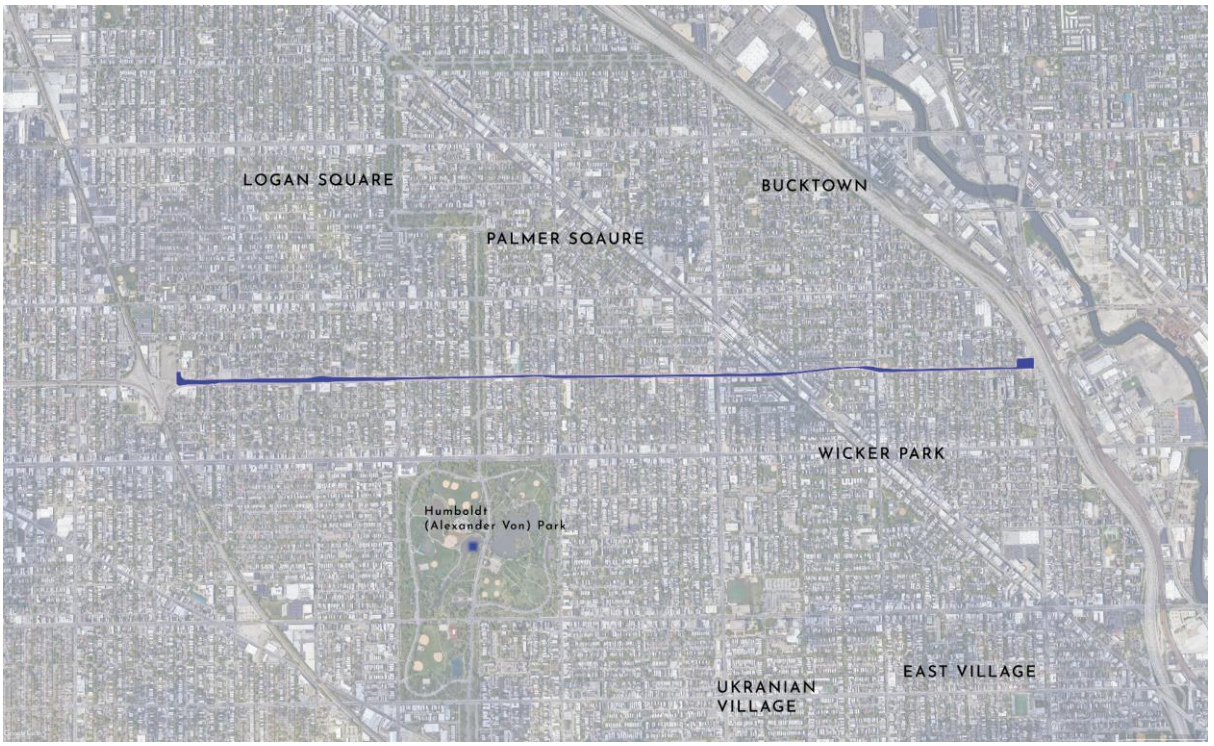


Figure 11. Location of the corridor (Improved by author).

The Bloomingdale one of the last remaining passenger railroads in the US to follow the instructions to elevate all rail tracks by 1899 for safety reasons. The rail line was operating until the 1980s giving service to a small manufacturing sector in furniture, bicycle, confection and instrument-making business. As a result of the lower demand, activity diminished, resulting in a lack of usage of the corridors by trains.
The neighbours became organized in 2004 and created the Trust for Public Land, working alongside the City of Chicago, the Chicago Park District, and the Bloomingdale Trail Friends. While there was an incredible effort to reuse the existing structures, an iconic new bridge was built for Milwaukee Avenue [41]. It connects diverse communities along its 4.3 km route.

The project's budget was $95 million in total, and its finance relied heavily on the cycling infrastructure. Successfully, it received $50 million in financing from the US Department of Transportation because it qualifies as an alternate transportation route, covering a significant portion of total budget. Although private donations are helping to fund most of the park, it is one of the Chicago Park District's most expensive capital projects in recent years [42].

3.7 Les Chemin De Carriéres

Figure 12. Location of the corridor (Improved by author).

The 11-kilometer-long Rosheim-St. Nabor railway started operating in 1902 to provide service to the sub-Vosges hills' quarries and to convey people between five communes. When the quarry company bankrupted in 2003, the freight service ended. An opencall was announced in 2016 for the design. The idea of reconversing the rail tracks with cultural pavilions, along the pathway distinguishes from others with its designed structural elements [43].

The project has a strong ability to tell the story of the past. It has 4 chapters on the 4 train stops, each demonstrating different characteristics of the surrounding landscape through framing different views with steelwork as well as creating openings in the site. It is a complete artwork of story-telling with 3 stories; the water, the land and the story of travel. The project includes river enlargement, and the renovation of the former train station. Finally in the last stop, we see the quarries reconquested by nature. Chemin de Carières means "Quarry Path" which demonstrates the importance of the final destination [44].

The project showcases a beautiful mixture of human-made world and nature with structural interventions. Architectural elements successfully demonstrate the idea to reverse the trend of urbanization and design rural areas attractively through the emphasize on their inherent qualities.

3.8 Lines of Life Singapore Park

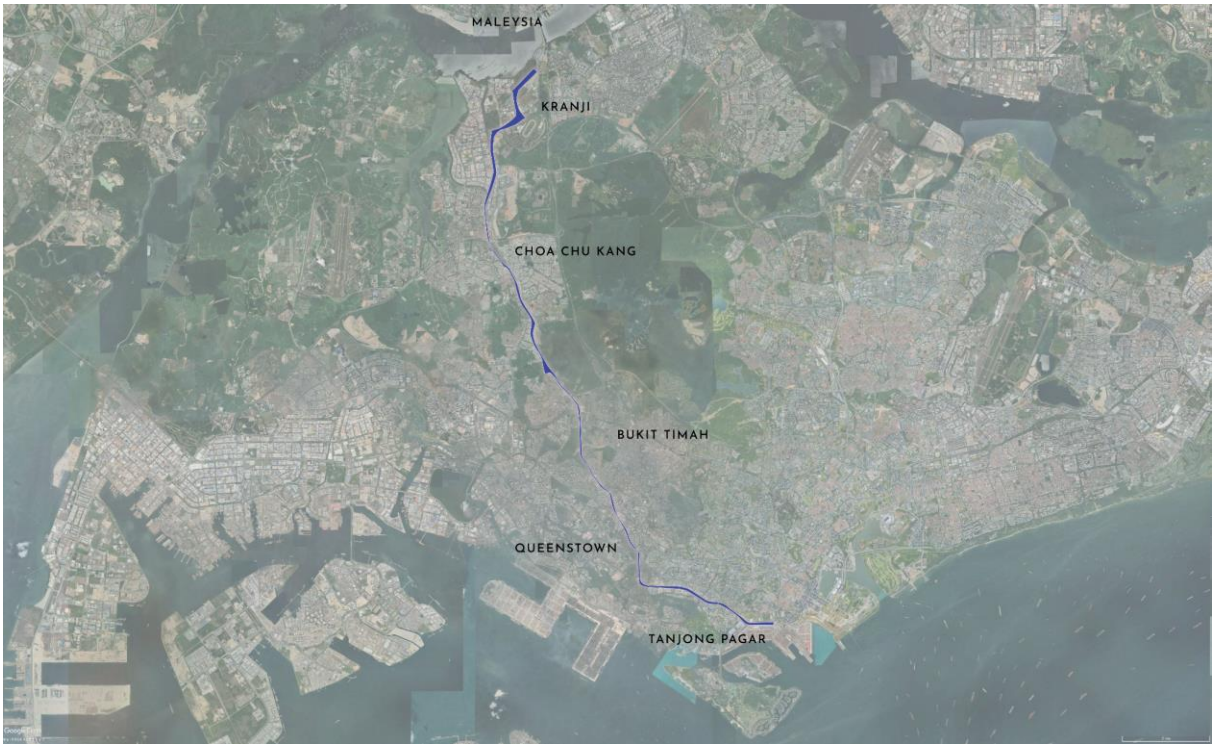


Figure 13. Location of the corridor (Improved by author).

The 24km railway line started operating in 1903 to connect Singapore to Malaysia. It traverses through Singapore's natural environments, making it known as the "Green Corridor." The railway was abandoned in 2011 due to new modes of transport and openings of other rail lines.
The government had a vision to turn the corridor into Singapore's version of High Line with the entire linear public space being used to link and regenerate the surrounding districts while also providing valuable green space. A competition was announced which included 3 parts; the masterplan and design of the railway corridor, the affordable housing project in Choa Chu Kang, and the renovation of Tanjong Pagar train station [45]. The selected proposal incorporates green space, walking paths, and cycling paths, as well as the development of the surrounding area over the next few years, ensuring that the entire old train line is well integrated into the surrounding environment.

The design includes green spaces along the canal, providing social places where locals can rest and interact with the water along the flood plains. Residential towers are connected through elevated decks over the forest textures. The ultimate goal is to establish a "seamless connectivity" that allows users to feel the emotional, functional, and experiential advantages of the area's rich past and ecosystem. It emphasizes the community-centered experience via the construction of new affordable housing [46].

3.9 Parco Lineare

Figure 14. Location of the corridor (Improved by author).

Built between the 1920s and 1930s on the historical railroad that was connecting Dittaino-Piazza Armerina to the UNESCO heritage town of Caltagirone and provided service until 1971. A section of the railway is part of Salvatorello, an 8-km-long greenway which was the first example of such an intervention [47]. The site was abandoned because of the frequent landslides and the disruption from the inclusion of short stretches within cultivated fields [48].

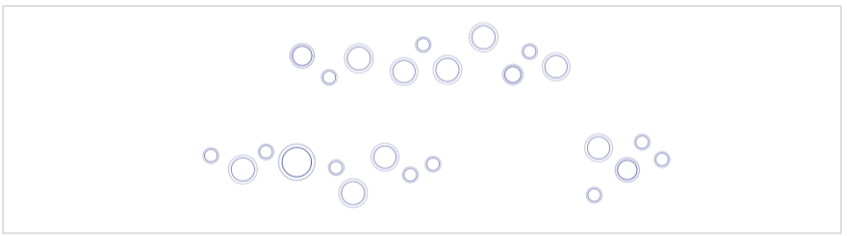
Project is one the first examples in Sicily to initiate the reuse of old railway sites with the establishment of recreational and cultural activities and characterized by the challenging orography, agricultural and historical landscapes, and environmental recovery. The design idea was to transform the “equipped nature trail” into a “light infrastructure” as a linear park that is formed by different widths along the corridor. The rail tracks are not visible, however, a dominant-coloured paving on the former railway line draws a cycle path that characterises the project which is referred as “linear cycle park” in some sources [49]. The park is currently in a condition of neglect and vandalism, probably due to maintenance and the lack of daily use of the park which might be a problem for the budget needed for future phases [50].

4. POST-INDUSTRIAL RAILWAY LANDSCAPES DESIGN STATEMENT

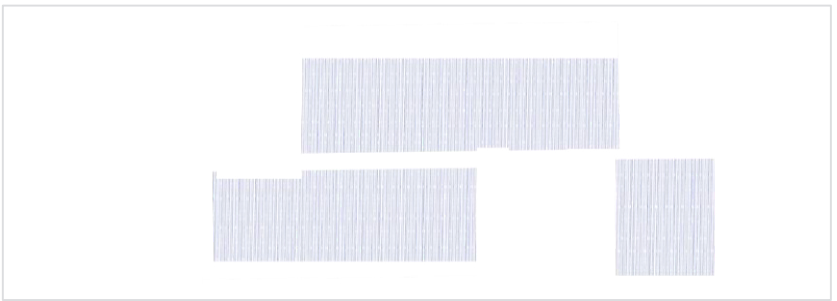
4.1 Railway Landscape Features

Railway landscapes consist of 3 elements which are lines, points and areas.

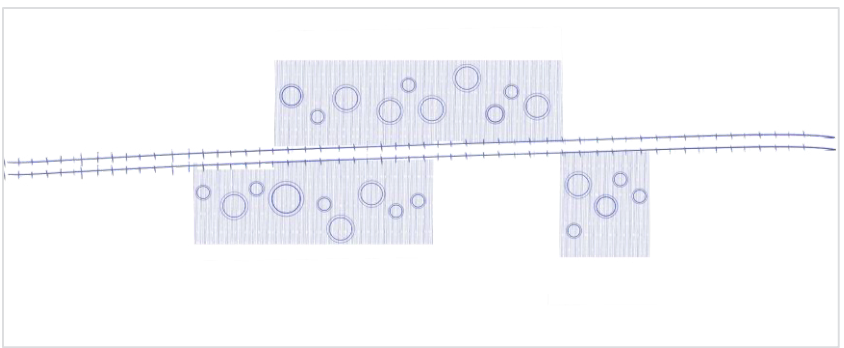
Lines: Rail tracks can be represented as lines.



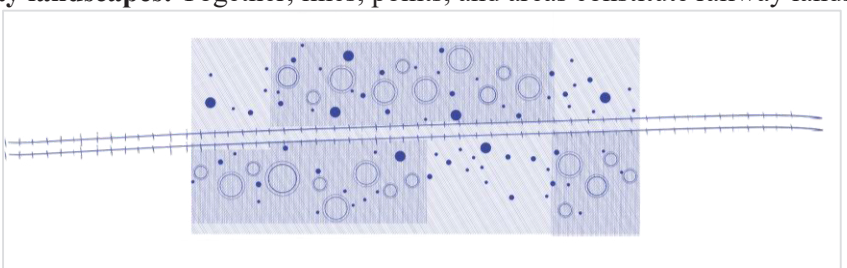
Points: Stations or other vertical elements can be represented as points.



Areas: Railyards and related multiple points can be represented as surfaces.



Railway landscapes: Together; lines, points, and areas constitute railway landscapes.



Transformation of railway landscapes: New nodes are developed by users and designers in the process of transformation.

4.2 Design Principles

1. Community Involvement

Designers and officials should create a platform to hear the community before initiating a regeneration of an abandoned railway site. The project cannot properly answer the needs without community involvement. Non-profit organizations put up tremendous effort in these areas, both in launching initiatives and maintaining them, in terms of budgeting and future growth. They provide the media to communicate with locals and their needs as seen in most of the case studies. It is nearly difficult to fail once the community, stakeholders, and project designers work together to alter the place in the best possible way. There is a sense of belonging provided to locals through their involvement in the process which helps engage users, detecting the requirements with a diverse variety of opinions from individuals near to the project as well as connecting diverse communities. We see the success of community involvement in many cases such as the High Line which was an amazing collaboration between authorities, community, and the non-profit organizations.

Competitions for design approach

Competitions are an indirect way to reach community opinion because the entry teams provide research on the area before presenting their design in which we can see surveys with local residents. This is a good strategy towards an adequate proposal for the site and its users.

2. Natural Process As A Design Form – Ecological Compensation

Reclamation

The first thing that needs to be dealt with is the residuals of the previous industrial activity as in all brownfield transformation projects. We have seen in the case studies that the post-industrial site has already been reclaimed by nature, with wild vegetation growing on the train tracks, generating spectacular images that drew the attention. In some ways, this scenario was a wake-up call. This does not, however, imply that we may invite users to the area immediately. Before taking any action, a reclamation project should be completed to remove the toxic substances from the soil.
Several techniques are being used currently for the decontamination of the polluted soil such as phytoremediation which is a part of bioremediation techniques.

We see an exceptional planting design in the High Line case. Pier Oudolf teaches us the dynamism of landscape through his design with its perfectly examined daily, seasonal and yearly changes. In Parque Lineal Ferrocarril de Cuernavaca, the natural process as an input provides the solution to the water crisis through the design of an urban forest.

Natural process as a design form

Landscape design is a dynamic field of study that changes through time and space. Hence as landscape architects, we design the process rather than the state of the place. Considering the changes, we should be able to propose a process design that considers all the phases. The elements that show these changes are obviously the vegetation which changes the scale, texture, colour and even the function of the space through time. We may notice these results as a result of ecological succession. Hence, the selection of vegetation plays an important role.

3. Heritage And History

Post-industrial sites present both intangible and tangible heritage in different forms. Railway lines, for example, reflect previous traces, societal mobility, and the link between two destinations, whilst stations represent the spots where people welcome their loved ones across distances. The linearity depicts the panoramic view of the scenery that the traveller enjoys as they go across yards. Thousands of memories are formed along these linear structures. More importantly, these sites encompass the industrial development through new modes of transportation as well as the evolution of society through

new technologies. Hence, it is crucial to be able to tell the story of the past through the design when regenerating a railway landscape.

Railway tracks

Railway tracks are the most distinguishing features of the railway landscape from other post-industrial landscape typologies. Their linear form is the demonstration of the past traces. It is important to re-use these valuable heritage infrastructures, which are occasionally demolished due to municipal decisions. We see in the case of High Line and Parque Lineal Ferrocarril de Cuernavaca that the tracks inspired the form of the design. High Line highlights them by forming a pattern out of their arrangement that shapes the sitting elements, whereas Parque Lineal Ferrocarril employs paint to extend the lines throughout the project and emphasize them.

Architectural elements

Architectural elements are the most visible heritage structures thanks to their vertical form and being at eye level. The stations, in particular, with their historical decorations and structures, depict the architectural era of the time and provide re-using opportunities for the transformation to help meet the site's contemporary demands. We see the renovation of the railway station in the case of Lines of Life Singapore. Although in most other cases the stations are demolished, other structural elements such as viaducts are kept waiting to provide habitat to new usage as in Promenade Plantée. In Scalo Porta Romana, the Squadra Rialzo building, the maintenance building of the former railway is proposed to be restored to its original configuration since it is the most representative element in the area from an architectural view.

The elevation of the rail tracks is also present in most popular case studies. These are arguably the structures that shape the cityscape the most. The elevation is exploited in the design of the High Line and the 606 The Bloomingdale by making the most of the views it offers. Although they don't present a high architectural background as in Viaduc des Arts in Promenade Plantée, they make the projects appealing.

Railyards

Rail yards represent a large cover of urban soil used for the maintenance and support systems of the railway operations. They may or may not contain rail tracks. The buildings on these railyards largely lack architectural design hence they are of little historical significance. However, the railyards continue living in different forms and they might be the areas with the most potential because of the large scale. We see a good example of the commemoration of history in Promenade Plantèe. In this project, the railway's former maintenance yard is now hosting the Jardin de Reuilly which is one of the landmark destinations along the site. In other cases, there is not a significant example of an area representing a historical function, however, the mobility action is being represented along the trails.

4. Adaptability - Ability To Answer The Changing Needs

Adaptability is very important for the transformation of former railway landscapes because when the function of a place changes, the existing elements provide material for the re-use strategies to adjust the current needs of the site. This way, the old materials continue living in other forms to accommodate new users while saving budget on new material production. Adaptability makes the features of the site more resistant to change. In certain ways, the adaptable design preserves the features and helps in their survival while the environment changes and evolves.

All the case studies have adaptive design approaches while some have more flexibility than others. The High Line continues to grow and improve to adapt to the contemporary requirements. The Promenade Plantée promises future expansions and highlights its concept of "anticipating the city". The event venues that can accommodate variety of activities in the 606 Bloomingdale Trail, and also in Atlanta

BeltLine, the interim use in Scalo Porta Romana and the 24/7 use along with short- and long-term strategies of Parque Lineal Ferrocarril de Cuernavaca to answer metropolitan demands are just a few of the highlights we can learn from the case studies. All in all, they all propose a process design which offers different scenarios to answer the changing demands of the users through time.

5. Sustainability

All landscape architectural projects must be sustainable, not only environmentally, but also socially and economically. Because the environment continues to change and evolve, and the landscapes we construct will do the same. We must ensure that it achieves so without imposing excessive requirements.

Ecological sustainability

Ecological sustainability lies in the relationship between humans and nature. When designing a former railway landscape, we should use existing species to create the flora, prioritize endemic species, and mimic nature to assist environment deliver ecosystem services. This includes the amount of space allocated to plants as well as a thorough examination of the soil to determine the effects of previous railway activities. Shrubs and herbs should be used in combination with wildflowers to create a low-maintenance arrangement. To achieve the best ecological sustainability, species should be chosen based on their climate and water/soil requirements. Aside from the planting design, a balance of hardscape and softscape materials should be employed to create permeable surfaces that make use of the environment.

Social sustainability

Social sustainability means creating liveable environments to achieve the greater goal of creating healthy, equal, and just cities. This type of sustainability is the least discussed, yet it is just as crucial as the others. Affordable housing, educational development, mental health support, safe and secure places for current and future generations are just a few of the acts that ensure social sustainability.

Economical sustainability

Economical sustainability works together with ecological and social sustainability. The actions mentioned earlier such as picking low-maintenance plants, are also aligned with economic sustainability because the cost will be reduced by doing so. However, economic sustainability entails much more. It entails assisting the socioeconomic development of the communities with whom the site is associated as well as ensuring long-term economic progress. It covers energy efficiency, re-use methods, increasing the use of renewable energy sources, minimizing waste, affordability, assisting in the stabilization of costs, and finally producing self-sufficient, minimum-waste landscapes.

6. Integration of Users

The transformation of a space into a place is determined by its users. They are the essential component of place-making practices. Hence, engaging users is a crucial part of the process design for the transformation project. The new function provides attractiveness for the place, however, since the abandonment phase of the site creates an unsafe habitat that lacks security, the target group might need to be convinced beforehand. To do so, we should take advantage of the construction process by mapping out areas to be developed in phases in order to communicate with different target groups.

Phases

Construction of a landscape architecture project requires years to be completed. This is a considerable amount of time to be wasted. Hence, a timeline of construction should be developed, mapping out areas to build in early, middle, and late stages and the opening to public should be in multiple phases.

Each phase contributes to the success of the next because user's interactions with project features provide the best outputs for the following phases. It will serve as a test run to assess what works and what does not in the design, allowing users to provide direct input. It is, in a sense, including users in the decision-making process, which will help increase their connection to the site.

Meanwhile uses

Meanwhile uses is also another strategy to take advantage of the construction process. It is a way to activate the site before the construction is completed. This strategy proposes pop-up areas such as cafes, playgrounds, event areas to use the sites' unconstructed parts temporarily to engage with users. It benefits both the local community and the project's budget since they can include small businesses. It targets everyday visitors, individuals passing by, and people looking for night-time activities. Additionally, the visitors can follow the evolvement of the project, experiencing the growth of vegetation and being imposed to the image of the site in early stages.

7. Perception – Experience of the User

The transformation of a former railway site includes negligence. These places are often neglected and forgotten, and are in poor condition throughout their abandoned stages, waiting to be discovered and used by the community. Hence, transforming them gives the community a new perspective on the site. In some cases, the community has realized the value of these places and has claimed them, urging towns and authorities to take action. And in some cases, the site's value is realized by the municipality. In any case, the design of transformation altered how these sites were seen. Perception is created by highlighting the historical layers, the past traces and its relation with the community. In addition, renovating the harmed features provides the storytelling that was not obvious to the visitor before the transformation. Using the existing structures is a strategy to elevate the visitor's experience of their own city, creating new meeting places, activity areas, framing views in a way that the locals have not experienced before. These sites should reflect the co-existence that was discussed in the chapter "Barrier or Connector", how we live together and the combination of human-made and natural world.

All the case studies provide new views to the visitors and change their perception of both the city and the site. Visitors interact with industrial residuals in a way that they have not been able to interact before. While some of them have a bigger effect than others maybe because of the elevation they provide, others find ways to impress visitors with other characteristics. High Line, Promenade Plantée, Scalo Porta Romana, the 606 Bloomingdale Trail create different perceptions through a combination of elevation and ground level views while others recommend a range of activities, some of which are unique to the neighbourhood and others that are adaptable enough to meet changing demands.

8. Mobility, Movement and Flow

We cannot talk about railway landscapes without talking about mobility, since they were once the major transportation providers in history. Even the linear form of them represents the movement. Symbolizing this in the site as well as re-using this functionality to adapt to new conditions. Railways were designed to connect places and they should continue to do so. While some projects employ this as a design aspect, others, such as Rails to Trails initiatives, use it as the entire idea. Making former railway landscapes a mode of transportation as a part of the "slow mobility network" appeals government funding since it aligns with municipal vision plans' sustainable transportation aims while also poetically enabling the sites retain their historical purpose as connectors.
The city's other transportation networks are normally connected to the railway stations; however, after the transformation of the abandoned sites, new access points along the corridors should be established, as well as linking these access points to various stops of other modes of transportation.
Finally, the site should be connected to other open spaces in the city through mobility links in order to establish a network of open spaces. This will activate the site by creating connections towards the city's other amenities.

The selected case studies have different designs to create a cycling route that can be a part of the slow mobility network of the city that we can learn from. For instance, the 606 Bloomingdale Trail works with the government to increase mobility. The slow mobility strategies are more dominant in this project compared to the other 10 projects.

The increased access points help the mobility by connecting the site to different modes of transportation. High Line and Promenade Plantée are exceptionally accessible which adds to their success.

Atlanta BeltLine connects 45 neighbourhoods which did not have a particular relationship before the project. Hence, we can say that the transformation of the abandoned railway landscapes into public places improves the mobility between neighbouring communities as the corridor does not only link the two ends but also the neighbourhoods it passes through.

5. CONCLUSION

Abandoned railway landscapes are special because generally they are very integrated to the urban fabric and they are characteristic in terms of their linear form and the way they allow us to see the exact traces of the past movements through the rail tracks. In this way, they differ from other typologies such as airports and ports and the number of disused railways is too high to ignore. The thesis demonstrates the enormous potential of these areas to be part of the citys' open space network.

The outcomes of this research are the categorization of industrial landscapes in a function-based perspective and a design statement of abandoned railways created from the analysis of process designs in best practices which were presented in the case studies. The accumulated knowledge of research and practice examination provided the base for the design statement.

Our work as researchers is based on the combination of design practices and theory. Hence, technical details are not included in this study. Additionally, since landscape architecture is a dynamic discipline that evolves across time and space; rather than suggesting particular actions, principles are presented in the design statement which covers a variety of examples and highlights from chosen case studies to be interpreted as design approaches and be adapted to any abandoned railway site. In order to answer to a wide range of target groups such as researchers, designers, planners and authorities, the design statement has an extensive form of principles.

The examination of best practices yielded 8 principles that should be followed in order to create the greatest potential regeneration. These are community involvement, natural process as a design form, history and heritage, adaptive design, sustainability and management, perception of users, integration of users and the mobility both as historical function and as the accessibility of today. The thesis' findings can inspire landscape architects, academics, and educators, as well as help interested parties extend their perspectives by providing the cumulative knowledge on the issue.

The research findings show that finance is the criticality of the whole transformation process. Some suggestions are presented in the design statement in order to find the budget such as community involvement together with stakeholders and integrating the site with the slow mobility network of the city for which the ministry of transport might propose funding; however even if the budget is found for current construction, daily operations and maintenance require continuous funding. The sustainability principle recommends various measures that can be performed in order to create a low-maintenance landscape, however considering the scale of the projects such as High Line or the 606 Blooming Trail, which are known for their high costs, we cannot really talk about small-budget projects. Hence, further research on budget and financing stability is urged, as it will aid authorities in understanding the needed politics and metrics.

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