Politecnico di Torino

Dipartimento
di Architettura e Design

Preliminary urban design proposal for "Parco Giovanni Paolo II" site in Milan

- A detail subject of Milan Navigli Canal Challenge

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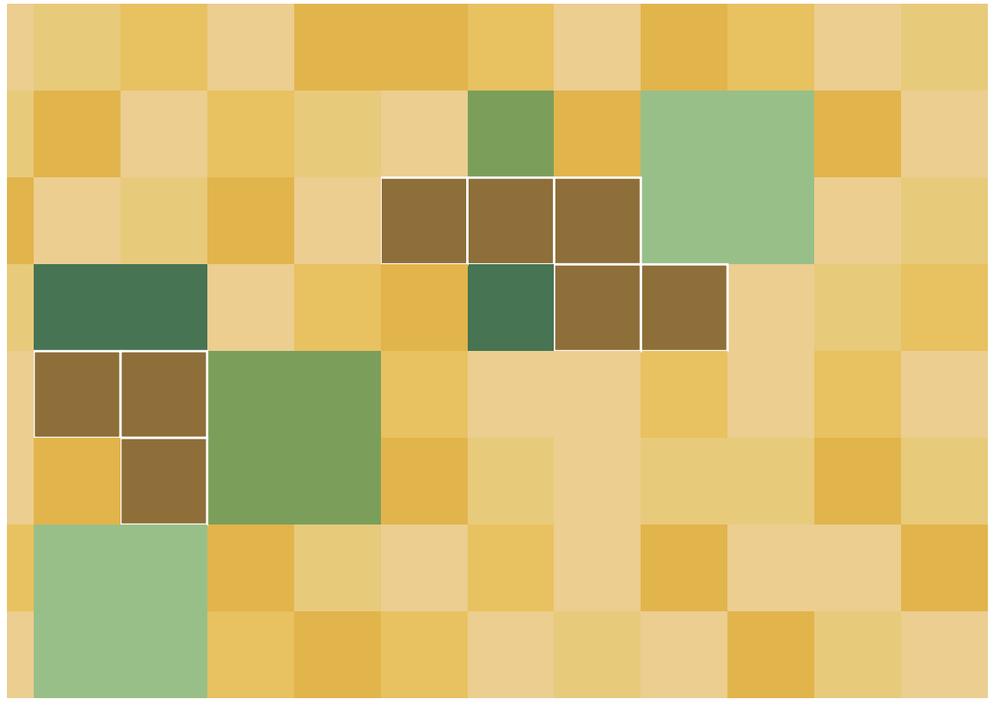

ABSTRACT

This thesis discusses the feasibility of opening the eight km Navigli Canal in Milan and transforms the traffic pattern and the surrounding green spaces and public spaces, aims to help Milan citizen to strengthen their identification of the canal, meanwhile improve the quality of the urban territory of Milan.

By searching the government's principle to understand the views and requests of the people of Milan on the canal, researching the current state of the site, and conducting a survey, the research design proposal analyzed the economic viability and citizen acceptance of opening the canal, and through a specific site design for *Parco Giovanni Paolo II*, we emphasized the mobility bicycle and pedestrians system and the reduction of flooding risks, including the discharge of excess rainwater into the Navigli Canal, through the creation of an educational rain garden using the sponge city concept to enhance the connection of the public spaces of the site.

The design informs the revitalization of the canal and the planning of riverside transportation and civic participation in the design of the park from the urban perspective of Milan and *Parco Giovanni Paolo II*, contributing to the development of a more sustainable and resilient city.

Keywords: Bicycle system, Urban planning, Urban design, Sponge city, Navigli Canal.

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INTRODUCTION

INTRODUCTION

The Naviglio Grande in Milan is a captivating navigable canal situated in Lombardy, northern Italy. Spanning across a length of 49.9 kilometers, it originates from the Ticino River, approximately 23 kilometers south of Sesto Calende, close to the village of Castellana. Its final destination is the Darsena di Porta Ticinese in Milan.

With an overall elevation difference of 34 meters, the canal showcases a varied width throughout its course. From Tornavento to Abbiategrasso, its width fluctuates between 22 and 50 meters, while from Abbiategrasso to Milan, it narrows further to 15 meters, eventually reducing to 12 meters in its terminal section.

The flow rate at Turbigo measures 64 m^3/second during the summer months, decreasing to 35 m^3/second in winter. As the canal enters the Darsena, the flow rate further reduces to 12 m^3/second. This reduction can be attributed to the 116 irrigation inlets that supply water to an expansive area of approximately 50,000 hectares, as well as the 9 m^3/second directed towards the Bereguardo Canal.

Boasting a remarkable history of 843 years, the Naviglio Grande stands as one of the most distinct and captivating features of Milan, adding to the city's unique charm.

To enhance the identity of the people of Milan and to improve the quality of the city's urban territory, this thesis discusses the revitalization of the Milan River and the transformation of the public space of the surrounding parcels of Milan, respectively, and proposes specific solutions for the entire canal and Parco Giovanni Paolo II through a study of the Milan government's policies and references to economic, traffic and similar cases.

01

THE NAVIGLI OF MILAN

1.1 WHY NAVIGLIO CANAL IS SO IMPORTANT FOR MILAN?

The Navigli canals, which date back to 1177, hold significant prestige for the residents of Milan. These canals, among the oldest in Europe, have played a crucial role in facilitating the movement of goods between Milan, Italy, and Switzerland. Originally constructed during a time when water transport was vital for urban mobility, the Navigli have undergone expansions over the years, solidifying their importance as connecting waterways.

However, with the decline in freight transportation during the 19th and 20th centuries, the Navigli underwent a transformation. In 1929, they were covered to make way for the expansion of public steam and electric rail systems, leaving only the Naviglio Grande, Naviglio Pavese, and Naviglio Martesana in the southern and northern parts of the city as open canals (Mariotti, 2021).

In present times, the Navigli canals serve as one of the few remaining connections between the people of Milan and their water heritage. The term “Navigli” has become synonymous with Milan’s vibrant nightlife, encompassing an array of cafes, bars, and weekend antique fairs that line the canal banks. It has become a popular gathering place for young people, where they can relax, stroll, and enjoy the atmosphere. Although the canals are not as economically significant as they once were, and much of the canal network has been closed off, the Navigli Canal area continues to hold its charm.

Most of the remnants of Milan’s canal system can be found in the Navigli and Martesana canals in the northern part of the city. As automobiles and trains became the dominant modes of transportation in the mid-twentieth century, the canals were largely relegated underground. Nevertheless, the canals still exist, concealed beneath modern roads and buildings, serving as a reminder of Milan’s rich history.

Logit model

Variables	Model Ⅰ	Model Ⅱ
Know-Navigli Project	-0.4841	
Survey 19	-0.5147	
Bid 1		-0.0135
Over 65	-1.4783	-1.4399
Car	-0.8478	-0.8269
USE	1.5399	1.5608
Existence	2.0199	1.9599
Bquest	1.6178	1.5987
Cons	0.50006	0.7643
Obs.	583	583
Prob.	0.0000	0.0000
Log likelihood	-191.5118	-191.2392
Pseudo-R2	0.3997	0.4006

Table 1. (Mariotti, 2021)

To summarize, the Navigli canal system is significant to Milan on economic, cultural, and historical levels, and its restoration will help revitalize the city, increasing its livability as well as vitality.

A new poll was conducted in 2018, the first phase in spring 2018 and the second phase in spring 2019, to capture the preferences of the residents over time, and the results showed that the support for the project decreased after the local event.The percentage of supporters declined after the local campaign, with only 65% support in 2019 compared to 84% in 2018. According to the economic scientific report by Ilaria Mariotti who made the cost analysis of opening Navigli, from the figure we can see thatThe logit model (Table 1, Model I) was used to simulate the data, and the results show that respondents who use cars and are over 65 years old are less likely to support this project.

The results show that respondents who use cars and are over 65 years old are less likely to support the project, and those who participated in the second round of the 2019 survey are less satisfied with the project. On the other hand, all respondents recognized the value of this item, as the use, existence and legacy values were positive and statistically significant.

Seniors may feel that their potential benefits are limited, as it will take time to complete the Navigli project, and some may consider visiting other areas. However, Model 1 shows that all respondents value this items themselves (existence value), for the benefit of future generations (legacy value), and their use. Therefore, opening the canal is a theoretically more reasonable choice for the people.

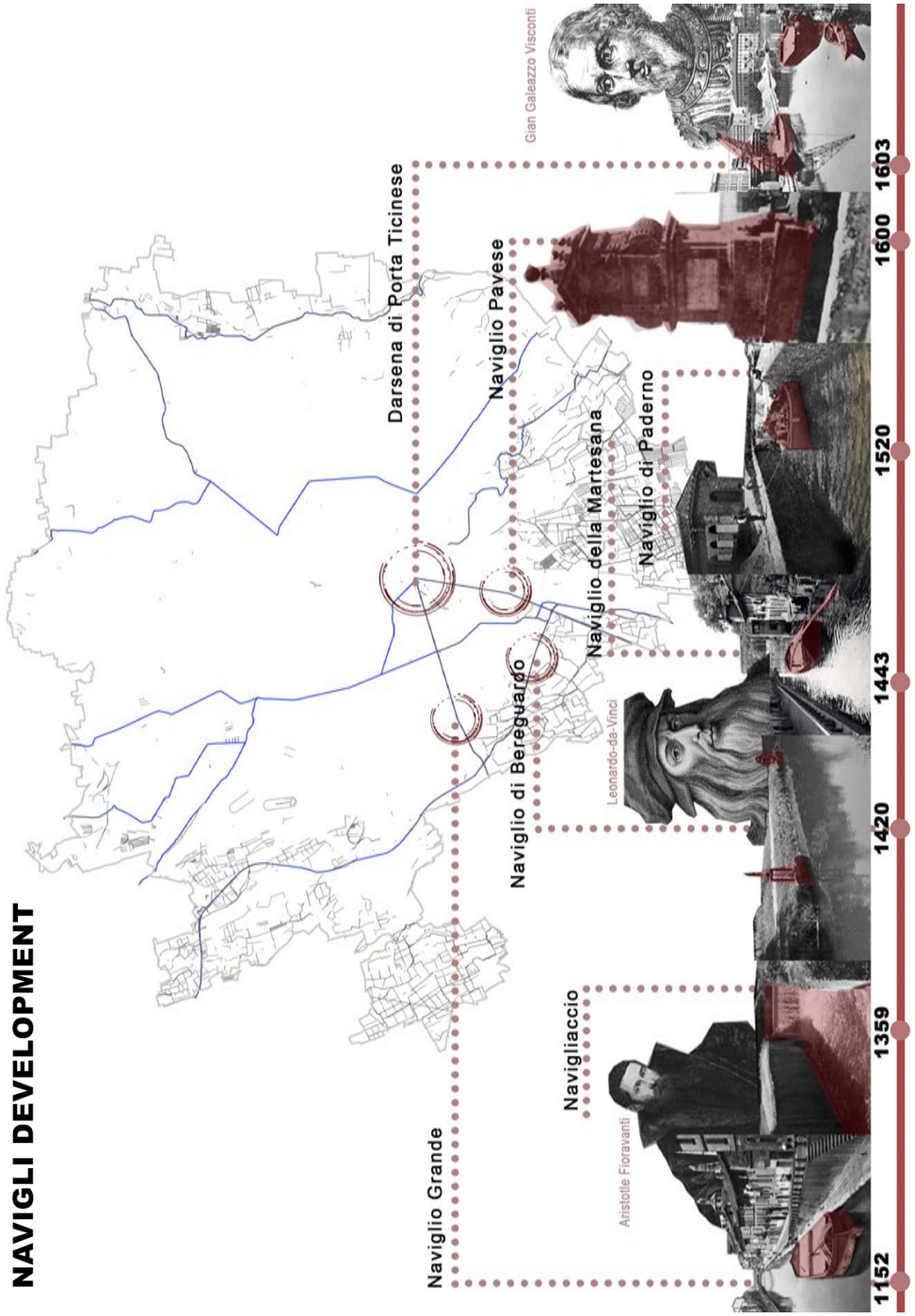
1.2 NAVIGLI CANAL HISTORY

In 1179, the residents of Milan made the decision to undertake the excavation of a long canal to divert water from the Ticino River and bring it into the city. The construction of the canal, initially known as Ticinello but later referred to as Naviglio Grande, was completed in 1257. Initially, its primary purpose was defensive, but it later expanded to serve as a vital water supply and transportation infrastructure.

During the 15th century, significant advancements were made in canal construction. Between 1439 and 1475, approximately 90 kilometers of canals were built in the Milan area, making it unique among other cities with 25 navigable basins.

The development of the canal system continued to progress. In 1482, the renowned Leonardo da Vinci arrived in Milan, and he devised a system that allowed for navigation between Lake Como and Milan. Between 1506 and 1513, Leonardo extensively studied the basin of the S. Marco Canal. His designs included connecting the Naviglio della Martesana to the inner ring of the canal through the locks of San Marco and Incoronata. This crucial connection enabled water travel across the city, linking the Ada and Ticino rivers. Consequently, the role of the Port of Milan shifted from a mere transit point to a major hub within the extensive Milanese canal system. The Navigli canals became the backbone of Milan's transportation network, playing a crucial role in communication and trade.

Only after the merging of the two canals and the reconstruction of the basin did Milan's internal navigation system reach its final form. This configuration remained virtually unchanged for over four centuries until it was eventually covered.



Map.1 Navigli Canal System development timeline
Map.1 Prepared by the author

In 1805, Napoleon Bonaparte oversaw the completion of the construction of Naviglio Pavese, a canal extending 33 kilometers from Milan to the city of Pavia. This canal provided an ideal connection to various destinations, including the sea via the Naviglio di Pavia and the Po River, Lake Maggiore via the Naviglio Grande and Ticino River, and Lake Como via the Naviglio della Martesana and the Adda River.

However, in the latter half of the 19th century, the river transport system faced a decline due to its slow speed of travel (3 kilometers per hour) and the growing competition from railway and tram lines that replaced the inner and outer waterways of the city.

During the 19th century, the Naviglio della Martesana continued to serve as a transport route, accommodating regular passenger services and significant commercial traffic. Barges transported various goods such as grain, fruit, dairy products, wood, sand, and gravel to Milan. However, the advent of automobiles led to a decline in canal transportation. Moreover, the canals suffered from heavy pollution due to industrial waste discharge. With waning interest from the public and a vision of a car-centric city, the government invested 23 million lire in the process of covering the canal. The covering of the canal took place between 1929 and 1930, during the fascist period. The municipal administration spent over 27 million lire (equivalent to 23 million euros today) on this project.

Unfortunately, over the centuries, this initiative resulted in the gradual disappearance of the urban landscape, along with the cultural, economic, and historical heritage it embodied. Even the significance of the works designed and built by the innovative genius Leonardo da Vinci was insufficient to halt this destructive trend.

1.3 WHY REPAIR THE NAVIGLI?

The Navigli, having played a vital role in the lives of Milanese inhabitants for over eight centuries, were unfortunately covered between 1929 and the 1960s, resulting in their loss from Via Melchiorre Gioia to the Darsena. However, there is now a promising project underway that looks towards the future and aims to revitalize the city by reopening the Navigli, creating a vast public space.

This restoration effort, widely supported by the people of Milan, is not only technically and financially feasible but also compatible with plans for urban traffic reorganization. By reopening the Navigli, the project seeks to restore the history and identity of Milan as a city intertwined with its waterways.

Restoring the history and identity of the water city of Milan

Apart from outlining the specific interventions of the project, it is essential to prioritize the recovery and appreciation of the historical and cultural roots that shape Lombard's identity. Consequently, the project aims to initiate a process of reappropriating the history of Milan as a water city.

Recognizing and understanding the city's history is crucial as it enables a conscious and informed transformation. The reopening of the Navigli serves as a foundational step towards any future interventions, both within the heart of the city and in broader contexts. By re-establishing the connection with the waterways, the project creates a platform for conscious and thoughtful interventions that align with the city's heritage.

Recovering and sharing the history of the water city of Milan is not only an act of preservation but also a means of actively shaping its future. This understanding of the city's historical significance provides the necessary foundation for future development that respects and builds upon its unique identity.

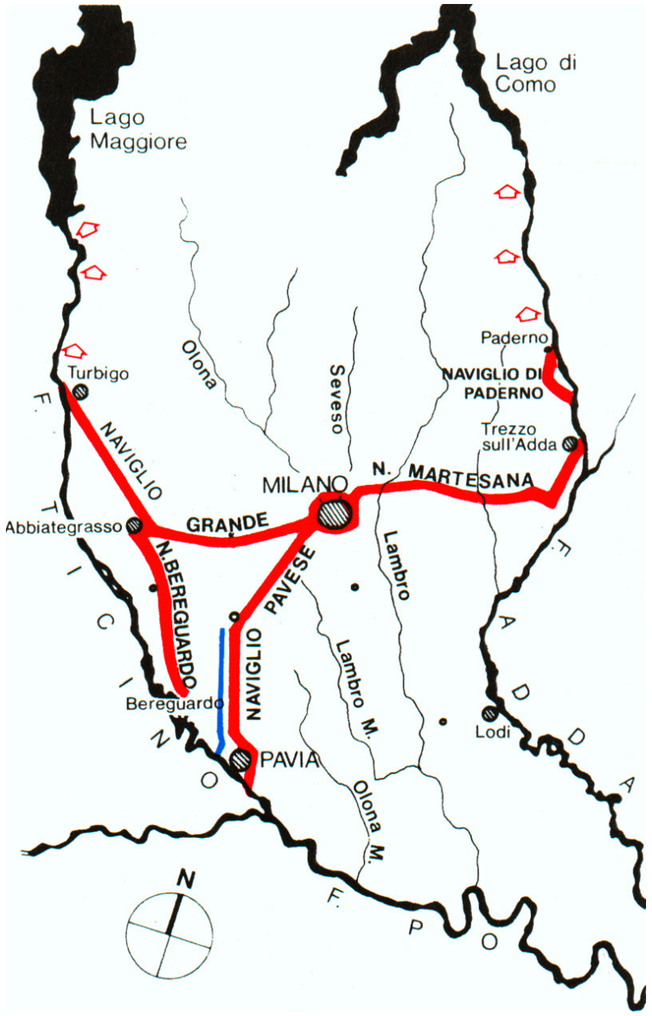


Fig.1 Navigli Canal System
https://it.wikipedia.org/wiki/Naviglio_Grande

The Rediscovering of the Lombard Civilization of Water

Water has been a unifying element in the economic transformations and work activities that have shaped the territory, leading to the formation of a Lombard Civilization of Water. While this civilization may have been somewhat forgotten in contemporary times, it holds immense potential for rediscovery and rejuvenation.

This civilization boasts a rich history that has found expression in various art forms such as paintings, photographs, poems, and songs. Moreover, its legacy is evident in the customs and traditions that have been passed down through generations, from the city's inception to the present day and even beyond the twentieth century.

The project not only aims to reopen the Navigli but also serves as an ideal opportunity to reactivate and reclaim the memory of this water-based civilization. It involves active research and exploration into the roots of Lombard's cultural identity, with the aim of sharing it more widely with the community. By embracing and celebrating this cultural heritage, the project fosters a sense of belonging and connection to the city's historical legacy, creating a platform for collective appreciation and understanding.

1.3.1 Municipality policy for Naviglio

In the Current Municipal strategy for Milan 2030 the Navigli are considered as a " urban system " and in the link of the Municipal Urban Strategi " Paino delle Regole " we read that "The areas subject to the constraints pursuant to law 1497/39 of the Navigli Grande, Pavese and Martesana areas are identified as landscape units, including areas defined by the layout of the open-air canals, by the towpaths redeveloped into cycle paths, by the fabrics that preserve artefacts and sites belonging to the history and culture linked to the functionality of artificial waterways.Belonging to the single large system of canals that carried the waters from the Adda (Martesana) and from the Ticino (Grande), these areas now present different conditions of testimonial integrity. Along the way, the Martesana has been conditioned by strong urbanization which has left some fragmentary signs of the original area and of the transformations appropriate to the use of water. The set of Navigli Grande, Pavese and the basin of the Darsena, preserves its historical and cultural imprint in a more continuous way in the permanence of places and buildings of a civil and religious nature. The decision to define the Navigli landscape unit also has the purpose of defining the valorisation actions of the ancient Milanese canal network by reducing the settlement and infrastructural interference on the still existing landscape, enhancing the available resources such as the cycle paths on the towpaths extend from the Milan area to the Lombardy area, connecting the areas accessible to public use of the Navigli to the system of urban and regional parks." (Source : Comune di Milano, Piano delle Regole, " Il sistema Navigli ", DP All1 Contenuti Paesaggistici del Piano della Rete Ecologica Comunale e Sistema del Verde e degli spazi aperti del Piano, L'ambito di prevalenza del Paesaggio urban 4.2 ,e Unita riconosciute di Paesaggio urbano.)

Document available at link
https://www.pgt.comune.milano.it/dpall1-contenuti-paesaggistici-del-piano-rete-ecologica-comunale-e-sistema-del-verde-urbano-e-degli-spazi-aperti/contenuti-paesaggistici-del-piano/4-lambito-di-prevalenza-del-paesaggio-urbano/42-le-unita-riconosciute-del-paesaggio-urbano/il-sistema

Numerous plans, initiatives, and studies carried out over the years have proven that the reopening of Navigli is of great importance not only for the citizens but also strategically for the municipality.

The reopening of the canal makes Milan even more attractive internationally and will enliven and strengthen the local tourism, leisure, and cultural economy.

The government's project to reopen the canal includes a detailed and comprehensive construction plan covering all aspects of the realization of Navigli and the improvement of the surrounding area. Even in difficult economic times, the total cost of reopening Navigli is sustainable. In addition, the project can be financed from private sources through project financing and private subscription or donation.
The General Directorate of Public Works has in the past made the reconstruction of Navigli a regional priority. Studies and studies have been carried out in the area since the 1980s, with some initiatives launched at the turn of the new century. (e.g., participation in EU programs TERRA, and V.E.V. projects).

The project "Riscopriamo I Navigli" (Let's rediscover the canals) was very successful thanks to the grants allocated for the reconstruction of sites of historical, artistic, and architectural interest and the marketing campaign to promote tourism in certain parts of the Naviglio Grande. The collaboration between the Government of Milan and the Politecnico di Milano (with the participation of the Regional Directorate General, Bocconi University, Milan State University, and the University of Pavia) later led to the development of the Navigli Lombardi Master Plan, to establish the urgent need for restoration of the Navigli system. intervene. In addition to this, they are committed to protecting the most important and most at-risk areas by imposing environmental restrictions (for example, the Naviglio Martesana's landscape protection in 2006).

PTRA (I Piani Territoriali Regionali d'Area) Navigli Lombardi is a project of 51 municipalities that represents a further development of the municipality and the region's interest in this issue. It was approved by the district in 2010, D.C.R.no.72, and oversaw its implementation in 2014, against the backdrop of the Expo.

The overall aim, as stated on the municipality's website, is "to strengthen and preserve Navigli as an integral part of Lombardy's historical, territorial, and cultural identity". The plan provides a unified vision of the Navigli systems yet respects the uniqueness of each system. At the heart of PTRA is the relationship between Navigli and the surrounding area for sustainable development.

The policies defined in the plan are as follows:

1. Enhanced use of historical/architectural and natural/ environmental heritage.
2 Protect the complex from degradation, poor conservation, and inappropriate surrounding area use.
3. Coordinate interventions and planning tools to create opportunities for sustainable development and improve quality of life.

The reopening of Navigli will contribute to the fight against climate change and reduce hydraulic risks, improving the quality of life for citizens and the attractiveness of the city. In the first phase of the project, the east and west hydraulic systems will be connected again to South Milan, allowing a large flow of clean water into the Vettabbia system, which is currently lacking. Due to the additional flow into the marina, there will be less backwater causing algae blooms in the summer.

From a traffic point of view, the reopening will require a necessary re-planning of the traffic areas on some of the affected sections (e.g., via F. Sforza, via Molino delle Armi), but it will also allow the reconstruction of more surrounding areas such as Melchiorre Gioia The region also benefits from the joint implementation of other urban regeneration and sustainable transport measures. The water resource can then be used for energy purposes, as energy, as an outlet for heat pumps, and possibly the installation of microturbines.

However, the reopening of these five sections of Navigli is only an initial intervention, part of a larger urban renewal project. The project starts with a new awareness of the environment, landscape, and quality of life for urban architectural and environmental enhancement of the city.

1.3.2 Naviglio's Current status

An informal referendum was held in 2011 and the project to revitalise the Navigli received almost 95% of the votes. The project facilitated the reactivation of a waterway system of approximately 8 km, linking the north and south of the city and bordering the Central Business District (CBD) of Milan to the east.

Reopening the Milanese canals means recovering the historic route of the late nineteenth century, thus creating a continuous system consisting of a canal and a cycle path that bring new urban quality in a homogeneous way from periphery to periphery passing through the center.

Milan is a cosmopolitan city that is undergoing major changes, not only in economic and construction, but also in environment and beauty. For this reason Navigli has to be fixed.

The reopening of the canal makes Milan more attractive internationally and it will enliven and strengthen the local tourism, leisure and cultural economy.

The government's project to reopen the canal includes a detailed and comprehensive construction plan that covers every aspect of the realization of the Navigli and the improvement of the surrounding area.

The large number of studies, plans, initiatives and research that have followed over the years testify to how the reopening of the Navigli is not only significant for the citizens, but also of great strategic importance for the municipality.

The General Directorate for Public Works has in the past included the redevelopment of the Navigli among the regional priority projects. Research and studies have been carried out by the region since the 1980s and some initiatives took off at the turn of the new century. (e.g. participation in the EU programme TERRA and the V.E.V. project).

The 'Riscopriamo i Navigli' project has been very successful, thanks to the allocation of grants for the redevelopment of sites of historical, artistic and architectural value and marketing operations to promote certain parts of the Naviglio Grande for tourism.

A collaboration between the Region and the Politecnico di Milano (with the participation of: Regional Directorates General, Bocconi University, State University of Milan and Pavia) later led to the creation of the Master Plan of the Navigli Lombardi, to establish which interventions were most urgently needed in order to recover the Navigli system.
The Region has also committed itself to the protection of the most significant and at-risk areas through the imposition of environmental restrictions (e.g. landscape protection of the Naviglio Martesana in 2006)

The PTRA Navigli Lombardi, project that comprises 51 municipalities, represented a further development of the Municipality's and the Region's interest in the issue. It was approved by the Region with D.C.R. no. 72 in 2010 and its implementation was monitored in 2014, in view of EXPO.

The overall objective, as stated on the municipality's website, is to 'enhance and preserve the Navigli as an element of Lombardy's historical, territorial and cultural identity.
The plan offers a unitary vision of the Navigli system that nevertheless respects the uniqueness of each one. Central to the PTRA is the relationship between the Navigli and the surrounding area, with a view to sustainable development.

The strategies defined in the plan are as follows:

1.enhance the use of the historical/architectural and natural/environmental heritage;

2.safeguard the complex from degradation, poor protection and improper use of the surrounding area;

3.coordinate interventions and planning tools to create opportunities for sustainable development and improve the quality of life.

The reopening of the Navigli will help in the fight against climate change and reduce hydraulic risks, increase the quality of life of its citizens and the attractiveness of the city.

In a first phase of the project, the two hydraulic systems East and West will be connected again with South Milan, allowing a significant inflow of clean water into the Vettabbia system, which is currently lacking.

Thanks to the additional inflow into the Dock, backwater that causes algae proliferation in summer periods will be reduced.

From a traffic point of view, the reopening will entail a necessary re-planning of the traffic areas of some of the affected stretches, (e.g. via F. Sforza, via Molino delle Armi), but it will also allow for a redevelopment of more peripheral areas, such as Melchiorre Gioia, also thanks to the joint implementation of other urban redevelopment and sustainable mobility measures.

It will then be possible to exploit the water resources for energy purposes, as a source, as an outlet for heat pumps and possibly with the installation of micro-turbines.

The reopening of these five stretches of the Navigli is however an initial intervention, part of a larger urban transformation project. This project starts from a new environmental, landscape and quality of life awareness to arrive at an urban-architectural and environmental enhancement of the city.

Back in 2019, the City of Milan drew up a long-term project to promote development based on environmental and social sustainability, innovation and digitisation.

This project includes:

1.planting 3 million trees by 2030
2.bridging economic gaps between the city's different communities
3.investing in critical/strategic infrastructure and mobile services

The pandemic has created a greater sense of urgency to realise these changes and provided an opportunity to reimagine the Milan of the future.

1.4 OPINIONS ON CITIZENS

The elimination of Navigli is a great loss for the urban landscape: "The city street has a double dimension and function: it is not only a place for rational travel but must also be seen as a place for irrational emotions and human wandering. In this sense, Navigli is undoubtedly a route of transportation and transportation, but also a mode suitable for meditation and imaginative travel." (Marco Comolli «La cancelazione dei Navigli – Declino di un'affabilità urbana» Theoria, 1994.)

The reopening of Navigli means above all cherishing traditions; revealing a cultural heritage of great value to citizens to ensure that the memory of this heritage is not completely lost. It's not just about culture and tradition. The reopening of Navigli will bring several citizen benefits and improve the quality of the city.

The vibrancy and liveability of some areas will be improved. Commercial and service activities are likely to open, also thanks to new tourist interest, bringing economic benefits to these areas. The reopening of Navigli will surely bring new attractive areas such as the Navigli neighborhood. It will be a great place to party, relax, eat, shop, unwind, and enjoy the beauty of the day. The simultaneous reopening of the Navigli Canal will also increase water availability for irrigation and energy purposes. Helping combat climate change and reducing hydraulic risk will also provide important and valuable benefits to citizens.

For Milan's citizens, the Navigli Canal reopening is of great significance. The association "Riapriare I Navigli" has launched a questionnaire "Why reopen Navigli?" to the citizens of Milan. The citizens gave this answer: (Riaprire I Navigli, 2017)

Because Milan was and must be a **city of water** again
Because we're going back to the water, a space now occupied by road traffic
Because it's unfair that fascism wants to close them
Because Europe's big cities live on the water
Because then it is possible to sail from - Lombardy Lake to the Adriatic Sea
Because tourism develops in Milan
Because we restore the great works of **Milanese culture**
Because new activities can be developed around
Because you can **walk** along the Navigli in the city center
Because then Milan will have its Canal *Saint-Martin*
Because you can canoe from Ada to Ticino
Because the world will remember Milan for this great work
Because Milan will be more **attractive**
Because many **pedestrian areas** can be organized around it
Because it helps **reduce pollution**
Because public transport services can be organized through water
Back to Milan for **Leonardo's work**
Because Navigli **reconnects** Milan to the rest of Lombardy
Because a **new urban landscape** will be born
Because water is a **symbol of happiness**

Because large-scale **water infrastructure** can be created
Because Naviglio can produce **hydroelectric power**
Because in this way Milan will become the **top city** in Europe again
Because Naviglio will connect Milan's green gardens
Thanks to Navigli, you can open new restaurants and bars along the route
Because water purifies the air
Because water is good for health and refreshes the mind
Because of Navigli, we will have **new landscapes** and **new proposals**
Because of Navigli, the car will no longer go through the current circle
Because they'll change the face of the historic city's roads
Because they will return to the city's huge and wonderful **public spaces**
Because it makes Milan a Milan.
Because it is beautiful and charming.
Because what comes from what, you can think of other waterways as well.
Because you can travel from the lake to the sea and rediscover a different way to travel.
Because it can be used to haul tons of cargo and take thousands of trucks off the road.
Because not everything has to have an immediate financial return.
Because we are fascinated by art that has nothing to do with the laws of the market (except art dealers...)
Why not be **fascinated by artworks** like canals, locks, towing roads, and more?

So, “Why not dream?”.

REOPENING NAVIGLI

An association-driven project

The project's main objective is to reopen the Navigli in Milan, reestablishing the historical connection between the Naviglio della Martesana from Cassina de' Pom, where it is currently buried, to the Melchiorre Gioia area, and continuing up to the Darsena di Porta Ticinese.

To achieve this, the project includes the construction of a new 8-kilometer canal along the Melchiorre Gioia and the "inner pit," predominantly following the old riverbed. This will ensure the restoration of hydraulic continuity within the canal network and the Lombardy River.

The association "Reopen I Navigli" is responsible for overseeing the project. They have initiated studies to establish initial guidelines for its construction, encompassing aspects such as strategic planning, future urban development, and city usage. These studies also encompass the potential economic transformation, financial viability, and funding options for the project, as well as cost estimations, implementation timelines, and management procedures.

A significant milestone for the project was a positive referendum held on June 12-13, 2011. During this referendum, 489,727 citizens voted in favor of the reopening of the Navigli system, representing 49.09% of the Milanese population and 94.32% of voters. This demonstrated strong public support for the project and its implementation.

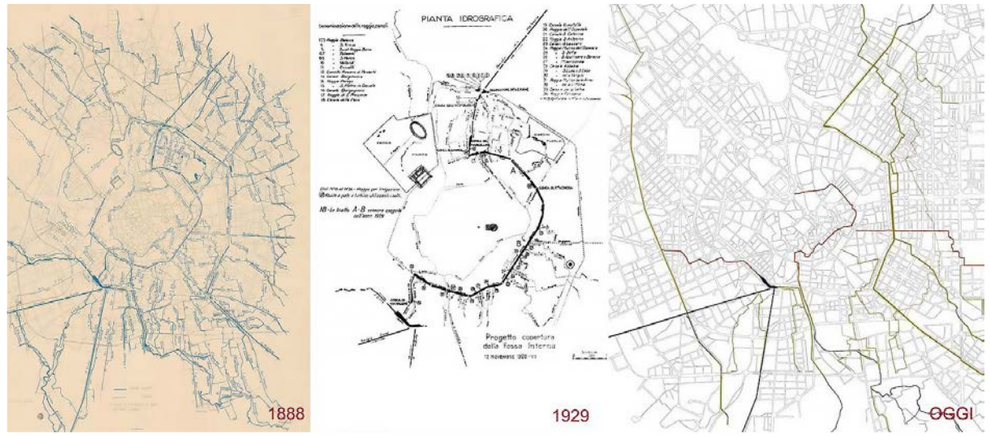


Fig.2 Reopen Navigli Milan
https: //www.offtopiclab.org/tag/progetto-navigli

1.5 DISCUSSING THE FEASIBILITY OF REVITALISING NAVIGLIO

A 15-minute city & The M4 metro line

1.5.1 15-minute living circles

During the COVID-19 pandemic, Lombardy, including the Municipality of Milan, was among the first regions in Europe to experience the significant impact of the virus. In response to the health emergency and the subsequent lockdown measures in 2020, the Municipality of Milan recognized an opportunity to reevaluate and redesign urban spaces and rhythms. They introduced a new project called the "15 Minute City" that aimed to strategically reorganize the city's time and space with several key objectives.

One of the main goals of the project was to redefine the use of streets and public spaces, prioritizing pedestrian and bicycle paths. By doing so, the project aimed to create a safer and more accessible urban environment. Additionally, the project aimed to rediscover and promote neighborhood dimensions, encouraging residents to engage with their immediate surroundings and experience the city in a different way. This approach also aimed to alleviate concerns of congestion and facilitate residents' access to essential services within a 15-minute radius of their homes.

The project envisioned reclaiming streets for public use, permanently allocating more space for pedestrians and bicycles. It also emphasized the importance of green infrastructure such as green roofs and transparent sidewalks. These measures were intended to enhance the quality of urban spaces and contribute to a more sustainable and livable city.

Document available at:
This topic of 15 min city has been deeply studied in international scientific debate with the concept were introduced by Carlos Moreno

Furthermore, the implementation of the 15-minute living circle concept allowed for a practical assessment of the economic benefits within each area. By considering various geographical indicators such as proximity to transportation, healthcare facilities, educational institutions, green spaces, sports facilities, museums, and more, the study revealed that the Porta Vigentina-Porta Lodovica area ranked highest in terms of accessibility and service availability within a 15-minute walking distance. Interestingly, the study also indicated that the neighborhoods with higher rankings were typically situated between the city center and the suburbs along the middle urban ring.

By embracing the principles of the 15 Minute City and implementing these strategies, Milan aimed to create a more inclusive, sustainable, and vibrant urban environment that better serves the needs of its residents.

To effectively implement the proposal for the 15 Minute City, particularly in the case of Milan, several steps need to be taken to simplify territorial planning and initiate a comprehensive rethinking of the allocation of public and private collective functions. Abandoned buildings and spaces should be repurposed to accommodate cultural activities, new forms of entrepreneurship, and to enhance public health services. The goal is not to create isolated and disconnected communities but rather to restore the dignity of diverse communities that contribute to the fabric of the city.

The key is to establish a unified urban area comprising different districts, interconnected by a sustainable transportation network. This network should prioritize pedestrian and bicycle infrastructure, along with efficient public transportation systems, to ensure accessibility and reduce reliance on private vehicles. Additionally, the urban area should incorporate ample public and collective green spaces, providing opportunities for recreation, relaxation, and social interaction.

By creating a polycentric and safe system of resilient urban communities, Milan can foster a sense of cohesion while accommodating the unique characteristics and needs of each district. This approach will help promote a balanced distribution of resources, services, and opportunities, ensuring that all residents can enjoy a high quality of life regardless of their location within the city.

It is important to engage in collaborative planning processes involving stakeholders from various sectors, including government authorities, urban planners, community organizations, and residents. This participatory approach will help ensure that the implementation of the proposal aligns with the specific needs and aspirations of the Milanese population, fostering a sense of ownership and collective responsibility for the city's future.

By reimagining the urban landscape and fostering resilient, connected, and inclusive communities, Milan can create a sustainable and thriving environment that enhances the well-being and quality of life of all its residents.

1.5.2 The new metro line in Milan

The report by the World Health Organisation on road safety highlights the grave dangers posed by road traffic, leading to numerous accidents each year. It particularly affects young people aged 5-29 and significantly involves cyclists in Europe (WHO, 2018).

In Milan, an average of 21 individuals died in car accidents annually between 2001 and 2019. Recognizing the significance of these issues, the European "To be a victim" program was launched with the aim of achieving a cultural change by 2050, eradicating any tolerance for road deaths, and promoting synergies between safety and sustainability measures. For instance, reducing car usage in cities and creating safer environments for pedestrians and cyclists not only reduces gas emissions and improves air quality but also alleviates congestion while promoting a more active and healthier population (European Commission, 2019).

The construction site of the new Milan metro line (M4) marks the starting point for bolstering urban resilience, fostering active mobility, and alleviating traffic congestion through the revitalization of bicycle-pedestrian zones and public spaces. The new metro stations act as nodes within a "territorial network," intertwining flows, identities, infrastructure, and ecological corridors. Milan's newly established blue-green network, through urban planning and the spatial-temporal design of public transportation and ecological networks, comprises a series of pathways and public spaces that facilitate the movement of pedestrians and cyclists across the city center while connecting surrounding parks. This integration of traffic and green-blue-green lines presents an opportunity to create safer and more resilient public spaces and promote sustainable mobility.

In Milan, the Green and Blue Mainline project serves a dual purpose. Firstly, it offers a practical and feasible tool for ongoing urban planning and transportation projects (master planning). The Milan experience has made the project accessible to the general public, aiming to inspire behavioral changes in accessing the city for residential, work, and leisure travel, ultimately reducing traffic, air pollution, and noise. Additionally, the project emphasizes the transformative power of public spaces as connectors between functional areas. The redesign of public spaces can shift the overall attitude towards mobility by highlighting the benefits of walking and cycling, as well as increasing access to the surrounding natural environment and cultural heritage.

However, the primary limitation of the research project is the absence of participatory processes. Although the Municipality of Milan has organized joint design studios to transform some metro stations, the Green and Blue Arteries projects did not involve the residents.

1.5.3 Benefits of canal restoration

In the first half of the 20th century, Milan earned the nickname "Little Venice" due to its extensive canal network. These canals facilitated the transportation of goods between commercial centers and enabled the importation of heavy construction materials and food into the city center during the 19th and 20th centuries. However, with the advent of trains and automobiles, which gradually replaced ships, the revenue generated from the canals decreased. Consequently, in 1929, the city made the decision to cover the canals to make way for an expanded bus and trolley system. Today, only two main canals in the southern part of the city, namely Naviglio Grande and Naviglio Pavese, remain open. These canals serve as one of the last authentic connections between Milan and its waterways. Surrounded by restaurants and cafes frequented by tourists and locals alike, they have become vibrant meeting places and popular spots for leisurely walks with friends.

Using the hedonic price method (HPM: Rosen, 1974) and the projected construction cost of € 351 million derived from the regional input-output table (I-0; Richardson, 1972), we estimate a collective gain of approximately € 825 million. This gain is reflected in the increase in housing and business prices resulting from the improved quality of the city. Additionally, there is an estimated increase of € 168 million in revenue. These collective benefits, associated with the urban transformation, are roughly double the estimated construction costs, proving the project's viability from a social perspective. In other words, the social benefits outweigh the social costs. However, it is important to note that this does not necessarily guarantee financial gains from the project. The public sector will need to identify the financial resources required to subsidize the project, which may be obtained through a one-time tax on the increased property value.

1.5.4 Citizen Participation

When land use planning and management decisions are based on inadequate information, ecosystem services can be underestimated and therefore threatened. In most cases, scenarios developed for real projects are not used for actual projects on the ground, so there is always a gap from drawing to project.

Research has shown that citizen participation in urban ecosystem management is essential. (Hunter,2011) For example, when urban open spaces such as community gardens and the benefits they provide are threatened, people actively organise to protect them [9-11]. An example of this can be seen in Parco nord in Milan, which was created to improve the citizen’s quality of life of the problematic area and to restructure the urban ecology by creating a green lung plan. The local associations and citizens showed great support for the initiative.

In 2016, a public workshop was held in which citizens were randomly selected to participate in a collaborative effort between officials and citizens to identify the specific functions of the park and the locations where the functions would be implemented, including where people would be free to add desired functions and where they would like them to be implemented. The interviews focused on the following: "Where do you find or use cultural services in the area? Please indicate on the map the park locations where you see (find or use) cultural benefits" . Maps and questionnaires were created individually by participants, but group discussions were also facilitated by one or more experts supervising the exercise and assisting people with the mapping process. This interaction can help locate on the map and potentially produce more reliable spatial data (Wolf,2015)

The process involved planners, designers, environmental education offices, rangers, technical cartographers and local residents, making the project more integrated and collaborative, unlike traditional planners planning and design and government structures making decisions and implementing them. During the discussions the questionnaire was specifically differentiated by age, gender, job, distance from home to the park and time of each visit.

In the final results, it was concluded that the highest scoring cultural benefits were those related to education and ecological knowledge, health (physical and mental), heritage values, aesthetics and cultural heritage, and the lowest scoring benefits related to community and social relations.

Meanwhile, in another case, I found a bottom-up comparison of two derelict plots of land near the Milan Canal that were transformed by citizens. One represents the Verdi Group and the second, the Urbano Laboratory, today the Verdi Group has realised part of its project, a community garden. On the other hand, after it made plans to invest in abandoned spaces for 2010-11, Urbano Labs slowly disappeared, without giving its project a final shape.

The Wildi Civic Network, which aims to reuse the wasteland that often turns into an unofficial dump in the area. In addition to direct management by the founder members, the residents of the local community were encouraged to participate in the activities on their own initiative, and in addition to this residents were mobilised to use their abilities to carry out a feasibility study for the installation of a public transport barge system on the canal. In parallel with the transformation of the plots, the Verdi Group strengthened its links with other networks involved in active citizenship activities, with the aim of strengthening the links by emphasising the social resources already available locally and enhancing community involvement to strengthen the ties of the area.

Urbano Lab was created by the architecture studio and prefers to work with local businesses and property developers. Of the network's proposals, the furthest away from social behaviourism is throughout the implementation of the project. Gradually Urbano Lab lost his initial followers and by the end withdrew from the project. As the project progressed, it also lost the support of many of its initial followers and gradually withdrew from the 'bottom-up' urban regeneration.

‘*Laboratorio Urbano* is born under the initiative of an entrepreneur [...] and we were inspired by the UK model of the Business Improvement Districts [...] but then we realised that here the situation is very complex. After the initial spontaneous enthusiasm, we got frustrated by the difficulty to make understanding our project to other businesses [located, as are we, in the area].’[1]

[1]Round table ‘Rigenerazione urbana tra Naviglio grande e Naviglio pavese. Attori locali a confronto’ (Urban Regeneration between the Naviglio grande and the Naviglio pavese. A Debate among Local Actors), Milan, Italy, 3 November 2011.

As previously mentioned, city projects should not be exclusively carried out by government departments or architectural studios. Instead, there is a growing imperative to incorporate citizen involvement in the design process, allowing for a deeper understanding of their needs and aspirations. Citizens, as the ultimate users of public spaces, play a critical role in shaping the success of urban projects.

The design requirements of the northern park in Milan illustrate this point, as they reveal that the ecological and educational functions of the park are of paramount importance to the citizens of Milan. Consequently, it is crucial to prioritize the needs of local users in the park design process, seeking to strike a balance between design aesthetics and functional requirements.

Overall, involving citizens in the design process is essential for creating urban spaces that are functional, sustainable, and responsive to the needs of local communities. By prioritizing citizen participation, designers and policymakers can ensure that urban projects contribute to the well-being and prosperity of the communities they serve.

1.5.5 Conclusion notes

The reopening of the Milan Canal is of strategic importance, not only because it is one of the few connections Milanese have with the water system, but also as a reminder that the city's long history is deeply linked to the canals that line its streets and the surrounding lakes. It is one of the most shining areas of the city of Milan, and although many visitors are unaware of such great historical context and of the fact that such great works once existed in Milan, historical records and digital archives attest to the social and geographical significance of this infrastructure.

In a city whose history is interwoven with its canals, this paper examines the positive impact of the reopening of the canals on Milan's international status, on the social benefits obtained, on the quality of life of its inhabitants, and on environmental protection. Through the study of civic participation in other parks in Milan, we understand the expectations and needs of the users, aiming at an integrated and positive development of the city through a multifaceted approach.

The introduction of the M4 metro line and the redesign of the surrounding public spaces will help to improve accessibility and quality of life for the city's inhabitants, and to reduce traffic congestion and ecological pollution in the area. At the same time, the 15-minute living circle initiative and the introduction of the M4 metro line will help to create a resilient urban space in Milan, where the design of the new metro line takes into account the ecological as well as the traffic positive aspects, but without involving the citizens of Milan in the discussion.

Regarding the economic benefits of reopening the Milan Canal, several economists have concluded through economic modeling that the proposal is feasible. The economists noted that it could be successfully implemented through a combination of fundraising, developer participation and government support. While it has been determined that the collective benefits of renovating the canal outweigh the cost of construction, it should be noted that this finding relates specifically to the social impact of the initiative and not necessarily the tangible economic benefits.

In urban design, it is very important that citizens are involved in the project. As can be seen in the case study the design of public spaces in Milan with citizen participation has been positively developed, in contrast to projects done jointly by real estate and open houses and architectural studios that were abandoned. When designing urban public spaces, it is important to consider the citizen's perspective on urban design, as they are the real users of the land. Therefore, urban designers must prioritize citizen participation in public design to ensure that urban public spaces meet the needs and expectations of the communities they serve. By prioritizing the inclusion of citizen perspectives and feedback, urban design can benefit more citizens and programs are more likely to be implemented effectively in ways that benefit the community as a whole. Ultimately, the success of these projects depends on the degree to which the voices and needs of local residents are considered throughout the planning and implementation process.

After analyzing the above factors, we believe that the revitalization of Naviglio and its surrounding areas should prioritize the preservation of public space and low-cost bicycle traffic flow. The next step in moving forward with the design process will be to develop a questionnaire designed to assess the needs and perspectives of park users and adjacent canal stakeholders. This approach to the design process will promote active participation by users and ensure that their feedback is considered. Ultimately, this participatory approach will increase the likelihood that the revitalization project will be successfully implemented in a manner consistent with the needs and preferences of local residents.

1.6 THE COMPETITION

1.6.1 Main targets

In this competition, the organizers asked the participants to recreate Milan's "water city charm" through the transformation of the canal and the surrounding site. By conceptualizing the future of Milan and promoting a symbiotic relationship between the city and the Navigli Canal.[2] The organizers asked the participants to focus on environmentally friendly design, mobility and the relationship between water and urban space, and to respect the history of the surrounding sites, with the aim of enhancing Milan's international status and optimizing the quality of life of its inhabitants.

[2] MILAN NAVIGLI CANAL CHALLENGE: https://architecturecompetitions.com/naviglicanalchallenge/brief

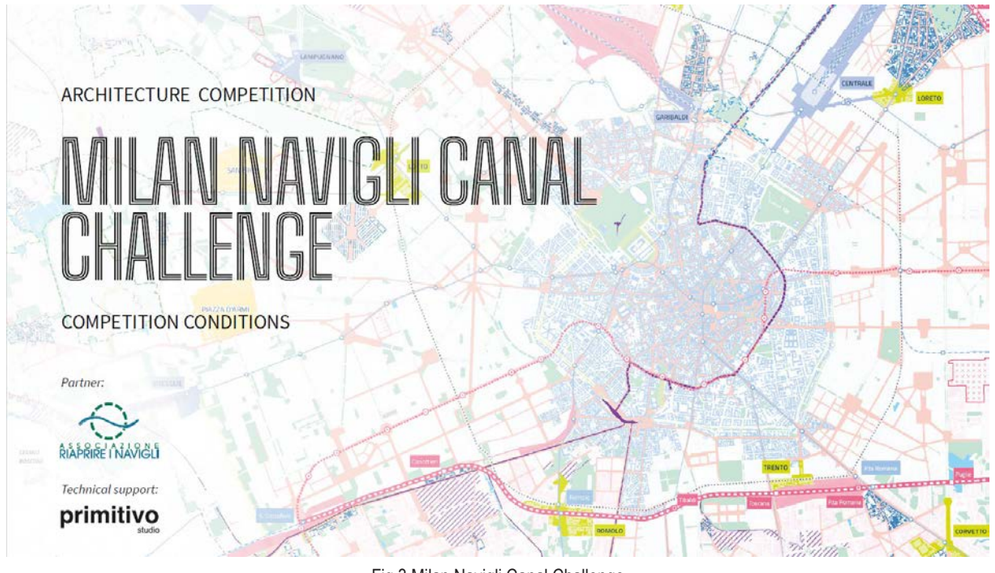


Fig.3 Milan Navigli Canal Challenge
https://architecturecompetitions.com/naviglicanalchallenge/

1.6.2 Main expected outcomes

For this competition, participants are asked to focus on two tasks.

Firstly, participants must create plans and a strategy for reopening the entire 8-km-long Navigli canal path. Submitted projects should define general architectural guidelines, possible functions throughout, and some key connections between new and existing spaces, as well as general branding of the canal area.

Secondly, participants must select one of the 8 defined smaller sections of the Navigli Canal path to reinvent. Each section has its own unique characteristics, key points of interest, and problems that participants are tasked with designing solutions for. The new proposals must not interfere with the linearity of the Naviglio Canal or currently existing private properties. Proposals can include both ground level and hypogeum structures.[3]

[3] MILAN NAVIGLI CANAL CHALLENGE: https://architecturecompetitions.com/naviglicanalchallenge/brief

02

THE LANDSCAPE VALUE OF NAVIGLI CANAL SYSTEM

2.1 STATUS OF THE NAVIGLI CANAL IN MILAN

Located in the city's southwest corner, the Navigli district remains one of the last true connections the Milanese have with water. The Grand Canal (Naviglio Grande) itself dates to 1177, making it one of the oldest navigable canals in Europe. Today, it’s packed with bars, cafes, restaurants, art galleries, and boutiques; it’s a lively meeting spot or a place for a gentle passeggiata stroll by the water.[4]

However, this small corner of the city has a much richer history. Although not widely known, the centre of Milan was once connected to waterways, not unlike those of Venice or Amsterdam.

Think of almost any major inland city and there will be a major river running alongside it. London has the Thames. The Seine in Paris. Berlin is built around the river Spree. Yet Milan, one of the wealthiest cities in Europe, has nothing. So, the city had to build one of its own. Between the 12th and 17th centuries, the government of Milan developed a network of Navigli (canals) to increase the wealth and influence of the inland city. By the end of the 15th century, Milan's canal system connected the city to the river Ticino (25 km to the west) and the River Adda (35 km to the east). At the heart of the network, Cerchia Interna (the inner ring) and a series of smaller channels weave the whole thing together.[5]

Most of the last traces of this network can be seen in Navigli, and the north of the city, at the Martesana canal. The rest fell victim to modernization during the mid-20th Century; as automobiles and trains replaced boats as the fastest modes of transport, The Inner Ring was buried under concrete. For the most part, the canals are still there, covered over by new roads and buildings. Some vestiges remain in the city centre, such as the Conca dell'Incoronata at the end of Via San Marco.

[4] Milan: Italy’s lost city of canals: https://www.bbc.com/travel/article/20210208-milan-italys-lost-city-of-canals#:~:text=Between

[5] Milan: Italy’s lost city of canals: https://www.bbc.com/travel/article/20210208-milan-italys-lost-city-of-canals#:~:text=Between

2.2 NAVIGLI CANAL REOPENING PROJECT

Reopening the Milanese Navigli means recovering the historic layout of the late nineteenth century, thus creating a continuous system consisting of a canal and a cycle path that homogeneously brings new urban quality from suburb to suburb passing from the centre.

The project aims to reopen the Navigli in Milan, restoring the ancient connection from the Cassina de' Pom to the Naviglio della Martesana, where today's Naviglio sinks into via Melchiorre Gioia up to the Darsena di Porta Ticinese. It envisages the construction of a new canal, along the Melchiorre Giola and the "fossa interna", 8 kilometers long, built mainly inside the old riverbed, to ensure the restoration of the network and the hydraulic continuity of the Lombard canal.

The "Riaprire i Navigli" association, which commissioned the project, has started studying the first guidelines for the construction of the work, including strategic definition, future urban planning and intended use, potential economic transformation, economic viability and financing of the work, and the cost, implementation times, implementation procedures and forms of management. The project was also presented on various occasions and meetings, resulting in an active referendum on reopening the Navigli system on 12-13 June 2011, to which 489,727 citizens answered "yes", corresponding to 49.09% of the Milanese, and 94.32% of voters. (Riaprire i Navigli, 2018)

These preliminary studies have shown that the project for the reopening of the "fossa interna" is feasible from an architectural and engineering point of view and is functional to the objective of the environmental redevelopment of the city, the reorganization of the transport system, and urban mobility, to return in Milan the traditional value of "city of water".

2.3 A LANDSCAPE,ENVIRONMENTAL AND URBAN PROJECT, AS WELL AS A HYDRAULIC PROJECT

The realization of this project, of great landscape and environmental value, capable of restoring the charm of the entire city, restoring the great system of Milanese and Lombard waterways, restoring the viability function of this system, the first is of tourism, from Lake Maggiore and Lake Como, from the Po to Venice and the Adriatic.

The reopening of the Navigli is a sign of a new urban, environmental, and economic strategy for Milan. This will be a rare opportunity to rebuild the city along the covered canal and in many adjacent areas, both above and below ground. An exceptional quality investment opportunity for the creation of new businesses and new functions.(Antonello Boatti, 2019)

The Navigli will be a source of new international attraction, which will help strengthen the economy of leisure and culture and will be an opportunity to enhance the existing architectural heritage. It is important to remember that this project does not promote an impossible linguistic and antiquarian “reconstruction” of the historic canal, but rather a “construction” of new landscapes and new development opportunities for the city based on its historic waterway structure.

At the basis of the project is a new vision of the city, projected into the future under the banner of new environmental concerns and a different concept of modernity. A non-ephemeral, non-nostalgic vision that does not propose an anachronistic project, but promotes a new way of experiencing the city, in which the Milanese recognize themselves: new developments, new opportunities, new qualities. In fact, no one wanted to rebuild the nineteenth-century Milan of the Navigli, but to "create a new landscape" for Milan and create new development opportunities for the city and Lombardy.

2.4 THE IMPACT OF THE CANAL LANDSCAPE ON THE CITY

The reopening of the Milanese Navigli is an ambitious challenge for a city that wants to change in the name of livability and sustainability and in particular for Milan which has based its history, over the centuries, on being a city of water and fits coherently into the objectives indicated in the most recent planning instruments on a regional scale, in turn, superordinated with respect to the planning choices on a municipal and provincial scale.

Among these, the Area Territorial Plan (PTRA1 Navigli Lombardi), a planning and implementation tool of the Regional Territorial Plan, has the task of correctly and coordinately orienting territorial transformations, promoting the protection and socio-economic growth of the territory of the coastal municipalities of the Navigli system. The Navigli Lombardi PTRA represents the first Area Plan drawn up in Lombardy according to Regional Law no. 12 of 2005, whose main objectives are aimed at enhancing and preserving the Navigli as an identity of Lombardy, and in particular:

• enhance the use of the historical/architectural and naturalistic/environmental heritage that characterizes the Navigli areas, governing the transformations of the territory through correct ways of using resources and limiting the damage caused by the strong urbanization and congestion of the areas present in some stretches.

• safeguard the complex of resources and cultural heritage from risk factors such as degradation, lack of protection, and improper use of the surrounding area.

• ensure the coordination of inter-municipal and inter-provincial interventions and planning tools to create opportunities for sustainable development and improve the quality of life.

To translate these guidelines into specific objectives and actions, which can be assessed through the SEA, two needs have been combined: (PTRA, 2005)

• the protection, or the safeguarding of the Navigli as a territorial system representative of the Lombard identity; first, by safeguarding the landscape values expressed by the close relationship between the historical/cultural evidence and the naturalistic/ environmental structure.

• sustainable development, capable of enhancing the territorial values and environmental resources present, so that economic benefits (tourism, renewable energy, sustainable agriculture) are combined with the maintenance and growth of the assets themselves over time.

But despite these objectives, the PTRA, like the PTR and the PTCP2, record a sudden fracture of the surface hydrographic network in Milan, with the silting of its waterways (Seveso, Olona, and Navigli). As described below, a similar interruption is noted for the corridors and the ecological network. On the contrary, a reopening of the canals could cure these abrupt interruptions, extending the possibility of enhancing the landscape within the built system, relaunching territorial values, and generating important economic and tourist benefits as required by the PTRA.

2.5 NAVIGLI PROJECT LANDSCAPE POTENTIAL

The tourist enhancement that can arise from a continuous system of canals and cycle paths from the Adda to the Ticino crossing Milan and the concrete possibility of being able to navigate from Lake Maggiore passing through Milan to Pavia, and from here through the Po to the Adriatic, they well symbolize the profound meaning of the project. The reopening of the Milanese canal system from the north-east of the city, where the Naviglio Martesana still runs outdoors towards the centre, with the re-proposition of the layout of the historic circle on its eastern side, up to the Darsena and then connecting to the Navigli Pavese and Grande, constitutes a large urban landscape project suggesting changing the city through natural resources such as water and green spaces and trees.

The project positively solves the question of the supply of the 'raw material', water, and the consequent hydraulic model of operation to guarantee navigability with tourist boats (with a transport capacity of up to 36 people) also in the centre of Milan and renews the traffic pattern in the city, favoring soft mobility. Numerous positive synergies can arise: from the extension and diffusion of the heat pump system, offering a new possibility of water delivery, to the production of energy with micro-turbines, to a greater water supply for agriculture, to the use of the excavations to overall improve the underground services system, to conclude with the tourist revitalization of the city.

The fantastic opportunity, offered by the reopening of the Navigli, is to build a continuous system consisting of a canal. Flanked by a cycle path, capable of distributing new urban quality homogeneously from suburb to suburb, through the centre, opens further perspectives such as that of restoring a sense of unitary belonging and common identity to a city that has profoundly changed in its social and ethnic composition.

Thus, a single lexicon of public space architecture and urban furniture can be extended from the more multi-ethnic and sometimes problematic districts of the northeast of Milan (Greco, Turro, Gorla) to the new central areas. Such as Porta Nuova, which could be enriched by the new visible presence of the Naviglio Martesana. This leads to the heart of the historic city (the Cerchia) and then returns through the Darsena and the Navigli to the two south and south-west suburbs of Chiesa Rossa, Gratosoglio, Rozzano, and Lorenteggio-Giambellino. We can go further,in the metropolitan city, towards other regeneration goals in the outermost suburbs of Milan.

Another essential component of the project is raising the presence of natural and environmental values in the city, thus helping to break the building spiral, consuming land and only then, in the best case, adding green spaces that are often domesticated and shared.

Water, which flows following the main orientation of the soil along rivers, canals, and irrigation ditches, constitutes the backbone of ecological networks: it is the main source of biodiversity and its entry into the city immediately constitutes an environmental improvement (not least the mitigating microclimate that arises with the evaporation processes close to waterways). Water that is as visible as possible so that control over it, the simplest and most democratic, can be exercised: seeing the transparency and purity of waterways is the best guarantee for their state of health.

Therefore, in contrast to the bad habit of imprisoning the waters under a blanket of concrete or asphalt, which has dramatically come to the fore with the recent floods caused by drained rivers or streams.

The source waters for the reopening system of the Milanese Navigli are taken from the Naviglio Martesana: they are among the purest and cleanest of those in Lombardy.

Precisely for this reason, within the fundamental themes addressed by the project, there is that of the separation of the Seveso course from that of the Martesana through a hydraulic disconnection project which is foreseen in via Melchiorre Gioia at the height of via Carissimi, where currently the 'one flows into the other.

Naturally, the hydraulic measure is unable to respond to the recurring problem of the flooding of the Seveso in the Niguarda district, which requires very different actions; however, the work certainly favors the hydraulic reorganization of the system and above all safeguards the purity of the Martesana waters.

The route of the reopened Navigli favors the enrichment of the green heritage and the expansion of the city's gardens through the creation of new rows of trees and shrubs partly on the banks and partly in the surrounding areas.

The Navigli reopening project adds over 7 km of river ecological corridor, making a decisive contribution to strengthening biodiversity even in the heart of the city. In this way, the critical issues posed in the Provincial Territorial Coordination Plan (PTCP) of Milan on the possibilities of penetration of ecological networks in the capital are overcome, among which the Navigli system stands out.

On the other hand, the northeastern periphery of the municipality is among the poorest in trees due to the chronic absence of a distinctive element of the city such as the large tree-lined avenues. In this sense, the most significant intervention is the one along via Melchiorre Gioia where planting three hundred trees alongside the reopened waterway constitute an effective penetration of an ecological corridor from the peri-urban areas towards the city centre. Furthermore, the rediscovery of the canal as a multifunctional and green infrastructure stimulates the development of theme parks throughout the peri-urban south-west between Naviglio Grande and Naviglio Pavese, to the point of considering a Navigli Park as a subsystem of the Parco Agricolo Sud.

The idea that Gilles Clément's Third Landscape has no scale and covers "the set of ecosystems capable of ensuring the maintenance of diversity" (Clement, 2005) fits very well with the characteristics and layout of the canals to be reopened which alternate banks and water banks with rows of trees, lawns, flower beds and gardens all connected by a continuous stream; therefore without closing the meshes of urbanization, establishing continuous communications between the "vacuoles and fragments of the third landscape", as Gilles Clément defines the parts of the ecosystem of the city that are not built, cemented or asphalted and therefore where nature can perform its cycle.
But still, in terms of the environment, the creation of this system within the city will reduce private vehicular traffic.

In fact, despite the already partially satisfactory results deriving from the establishment of Area C5, it is completely clear that the reopening of the Navigli along the eastern side of the Cerchia will result in the limitation of traffic and the permitted speeds, always safeguarding the rights of access of residents, the needs deriving from emergencies, loading/unloading of goods, and maintaining efficient conditions of public transport.

The Urban Plan for Sustainable Mobility of Milan (PUMS) in its version published on 20 February 2015 dedicates a scenario to the reopening of the Milanese Navigli and more precisely carries out an "assessment of the compatibility of the basic PUMS scenario with the project for the partial reopening of the canals".

The purpose of this assessment is aimed at verifying the compatibility of this project with the basic scenario of the Plan, with the aim also of identifying criticalities and constraints that will have to be addressed in greater detail in the context of the studies connected to the greater design definition of the 'intervention.

Among the impacts on the road network are the reduction of the carriageway useful for vehicular traffic in via Melchiorre Gioia (an artery of radial penetration into the city, which improperly carries traffic up to the edges of the historic centre) the creation of a one-lane road network one-way traffic (counter-clockwise) along the eastern sector of the Cerchia dei Navigli, the consolidation of a two-way cycle path, promiscuous or reserved, on one bank only or on both depending on the sections and the continuity of the routes pedestrian.

It is important to underline that compared to the reference scenario of the PUMS without the reopening of the Milanese canals, the negative impacts on vehicular traffic in the event of the reopening of the Navigli are in any case on average more than offset by the benefits expected through the implementation of the Plan.

2.6 THE THREE CATEGORIES OF PROJECT

The project can be illustrated, according to the meaning it assumes in the different places of the city, in three main categories. (Riaprire I Navigli, 2017)

The construction of a landscape project in parts of the city was built over time more as road axes than as real districts of Milan (via Melchiorre Gioia).

Via Melchiorre Gioia is a long artery that connects the extreme north-east of the city with the new Porta Nuova business centre close to the historic centre; with the burial of the Martesana canal in the 60s of the last centuries, it lost its identity without acquiring any new one.

The project was born where the Naviglio is swallowed up with an abrupt entrance under the road surface in Cassina de' Pomm, one of the outermost suburbs of the city. In the project, the Naviglio, reappearing at the centre of the roadway of via Melchiorre Gioia, generates new perspectives and transforms the arterial road into a multi-faceted place in which the traffic flow (two lanes in each direction) and a pedestrian heart coexist and cycle path along the rediscovered canal, overlooked by an array of services, commerce, and mixed activities (cultural, recreational, and social). Hundreds of multi-level trees transform the perspective that will be perceived walking along via Melchiorre Gioia like a new boulevard. Precisely the reopening of the Naviglio in via Melchiorre Gioia allows the hydraulic separation of the Seveso from the Martesana (in via Carissimi) with the creation of a new underground channel, exclusively for the Seveso, which will certainly contribute to the hydraulic reorganization in the city and the return of greater purity to Martesana water. Finally, the proposed entry of the Naviglio into the 'Library of trees' park is symbolic: it plastically represents the rapprochement of the centre and the periphery, the true strategic objective of the reopening of the Navigli with the creation of visual continuity between the historic parts and the newer ones and recently transformed.

This proposal in via Melchiorre Gioia, near Porta Nuova, is indicated as an alternative to a route of the Naviglio to be made underground and therefore following the straight line of via Melchiorre Gioia without digressions. In this case, as in two other occasions that will meet in the historic core of Milan, in the idea of the project the participatory process will play a decisive role in the choice of the hypothesis to be implemented.

The enhancement of the nucleus of ancient formation (the Internal Circle) with the revitalization of historical and monumental places and the urban landscape Very different but complementary characteristics, assumes the intervention of the reopening of the Navigli along the Circle, starting from the Naviglio di San Marco. We are in the heart of the city, in its Nucleus of Ancient Formation.

The urban qualities present are historically consolidated and an intervention such as the reopening of the Navigli is destined to increase their perception. The hinge between the first system, that of via Melchiorre Gioia, and that of the Internal Circle is precisely constituted by that stretch of the Naviglio di San Marco, in which the water of the Martesana no longer flows, which leads from the Bastions of the Spanish walls to the Inner Circle.

The recovery of the Conca dell'Incoronata is one of the most emblematic interventions that the project to reopen the Navigli can offer the city.

The goal is to bring the architectural artifact of the historic Conca and its portals to life as much as possible to make it once again a functioning testimony of the more complex Navigli system in Milan.

When fully operational, the system will operate continuously from via Melchiorre Gioia to via Castelfidardo and from here along via San Marco to via Moscova and further on to via Montebello, where the historic headquarters of «Il Corriere della Sera» still exists today.

South of via Montebello, the reopening and reconfiguration of the small lake of San Marco can give back to Milan one of the historical perspectives, the loss of which the city suffered the most with the closure of the Navigli.

Having re-established the continuity of the route along via Fatebenefratelli, the project then confronts piazza Cavour with a place full of potential, such as the Indro Montanelli public gardens, the arches of Porta Nuova on the remains of the medieval walls, the Royal Villa in via Palestro and the Palazzo Dugnani in via Manin, but devoid of any urban value inside.

As previously mentioned, the project introduces two different hypotheses, a more philological one that proposes a route for the reopened Navigli more in line with the original site and a more innovative one that launches the idea of forming a body of water to be used for parking of the boats to allow, through the disembarkation of passengers, the revitalization of the tourist attraction of the surrounding historic complex.

The monumental and historical-artistic enhancement of the city takes on its most important meanings along the route of the eastern circle of the Navigli.

An exceptional opportunity is offered by via Senato with the urban redevelopment of the public space in front of the State Archive, highlighting the connection between the Naviglio and the gardens of Via Marina.

It is also necessary to dwell on an exceptional area determined by the Sormani Library complex - State University - Guastalla Gardens.

The rediscovered Naviglio, which can flow in a position very close to that of 1929, gives new urban values to the State University complex and places it in an attractive scenario of absolute quality. The subsequent intervention, foreseen in via Santa Sofia, with the creation of an important new row of trees, reconstructs a front on the right orographic bank, which alleviates the negative effect of the interventions built in the central period of the last century in the sign of a pure enhancement real estate and allows a comparison with the historical pre-existences that still overlook the orographic left side.

The stretch of via Molino della Armi constitutes another paradigm of the role that the Navigli can assume in urban contexts of great value, such as the one that opens from San Lorenzo to Sant'Eustorgio: here too, in this bombed area and miraculously real estate speculation with the formation of a park with great urban and landscape perspectives, the Naviglio gives back to the Milanese the possibility of appreciating places as they are built today by anchoring them to a clearly evident historical perception.

The reopened Naviglio starts to enter via Conca del Naviglio and from here, through via Ronzoni, to rejoin the Darsena.

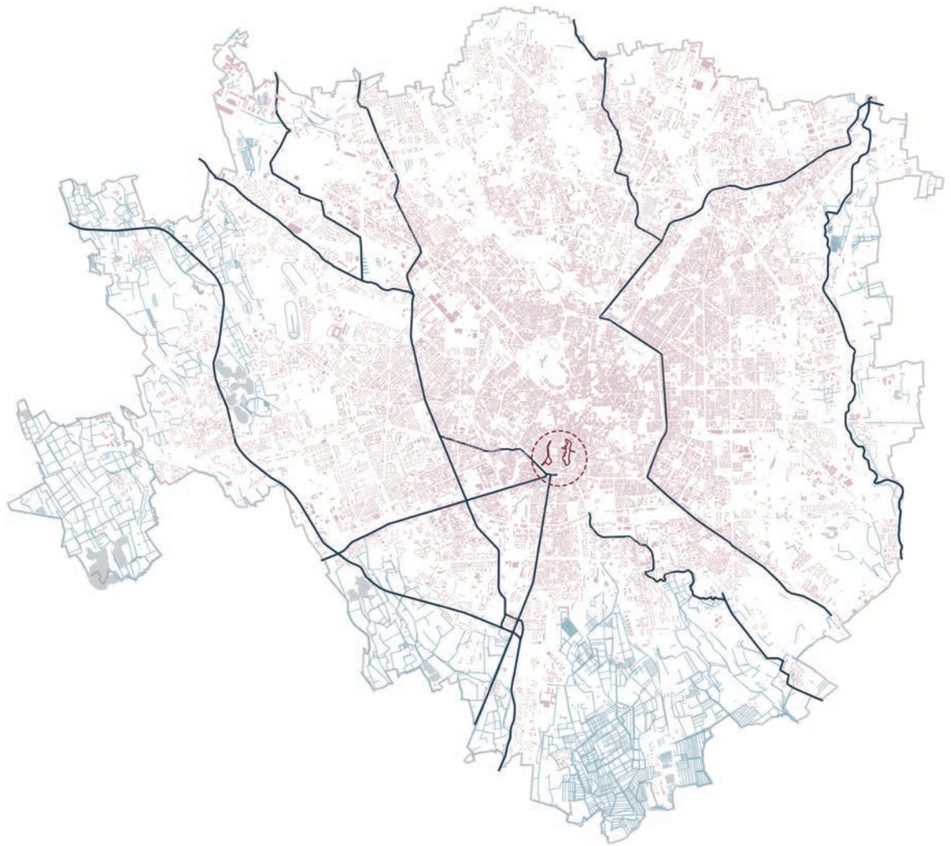
The entrance to the Conca di Viarenna takes place through an underground passage from via de Amicis up to the basin itself. The choice of a small underground channel with an alternating direction of travel, illuminated through wells of light or with the use of artificial lighting sets, allows to maintenance of the numerous and substantial trees present on the street.

Similarly, it is precisely the theme of greenery and the protection of existing trees that prompted the authors of the project to propose two different solutions for the last stretch from via Conca del Naviglio to the Darsena. The proposal is to entrust the choice between the two routes to the subsequent discussion in the city and therefore the participatory process leaves the phase of simple communication and becomes the driving force of the design choices. The first solution makes it possible to restore urban identity to the canal and the Conca, and the second favors the conservation of the trees born and raised in the land covering the Naviglio, preserving the memory of the Conca and introducing a new parallel canal.

The rediscovered Naviglio then reaches the Darsena already reactivated and restored for Expo 2015.

That common lexicon made up of water and the surrounding surface structures, exits through the Naviglio Grande and the Naviglio Pavese from the city limits, to enter the wider metropolitan area. A new element of cohesion is born between the central city and the many communities that live in the outermost municipalities and Milan regains its historic port.

Map.2 Site location in Milan



Map. 2 Prepared by the author

Map.3 Two parks location

Map.3 Prepared by the author

03

URBAN ANALYSIS

PARCO GIOVANNI PAOLO II

Parco Giovanni Paolo II, formerly known as "*Parco delle Basiliche*", is a park in the city of Milan. It is so-called because it connects the Basilica of San Lorenzo and the Basilica of San Ostrogio.

The large green corridor via Molino delle Armi runs through the Cerchia dei Navigli. It forms an "archaeological trail" between the apses of the two cathedrals. The park offers leisure and sports in the shade of maple, black pine, elm, and plane trees in the historic center of Milan.

It has an area of 40700 m² and passes through Molino delle Armi, Piazza della Vetra, Vetere, and Santa Croce.

The enhancement of the public green space behind the church of San Lorenzo began in 1925.

In the post-war period, driven by the new master plan of 1953, the area was given the function of an "archaeological pedestrian street", as it would connect the two cathedral naves.

In 1956, through the Orticola Association, two architects, Bagatti Valsecchi and Grandi, were given the task of designing it. They built the motorway in the Via Molino delle Armi.

One of the results of the project in 2000 was a greater emphasis on the relationship between the back nave of the cathedral and the surrounding green space.

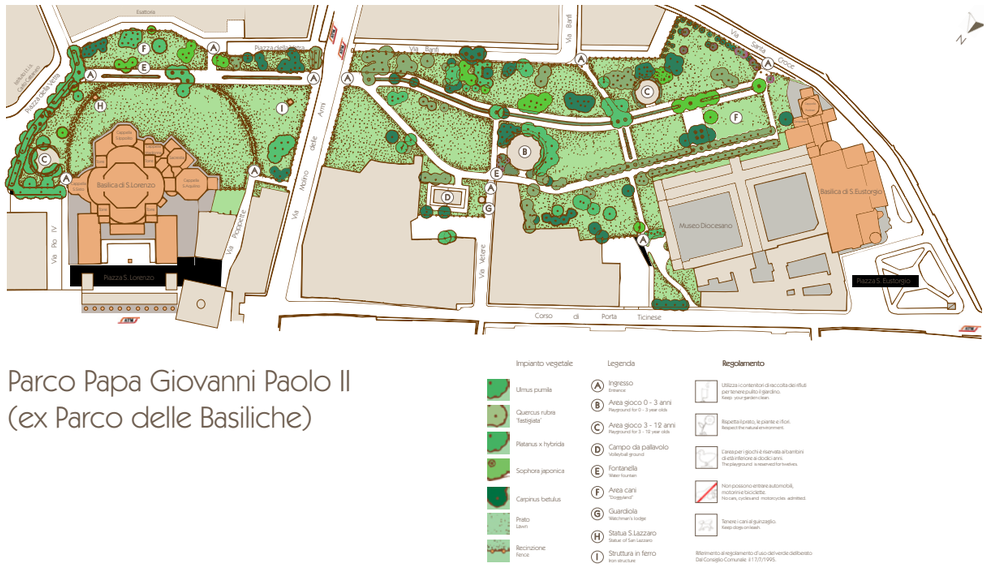


Fig.4 Parco Giovanni Paolo II plan
https://www.comune.milano.it/documents/20126/440502713/Parco+Papa+Giovanni+Paolo+II-mappa.pdf/4bcd0a01-9c62-2c29-9fae-b74046145e9d?t=1554799093891

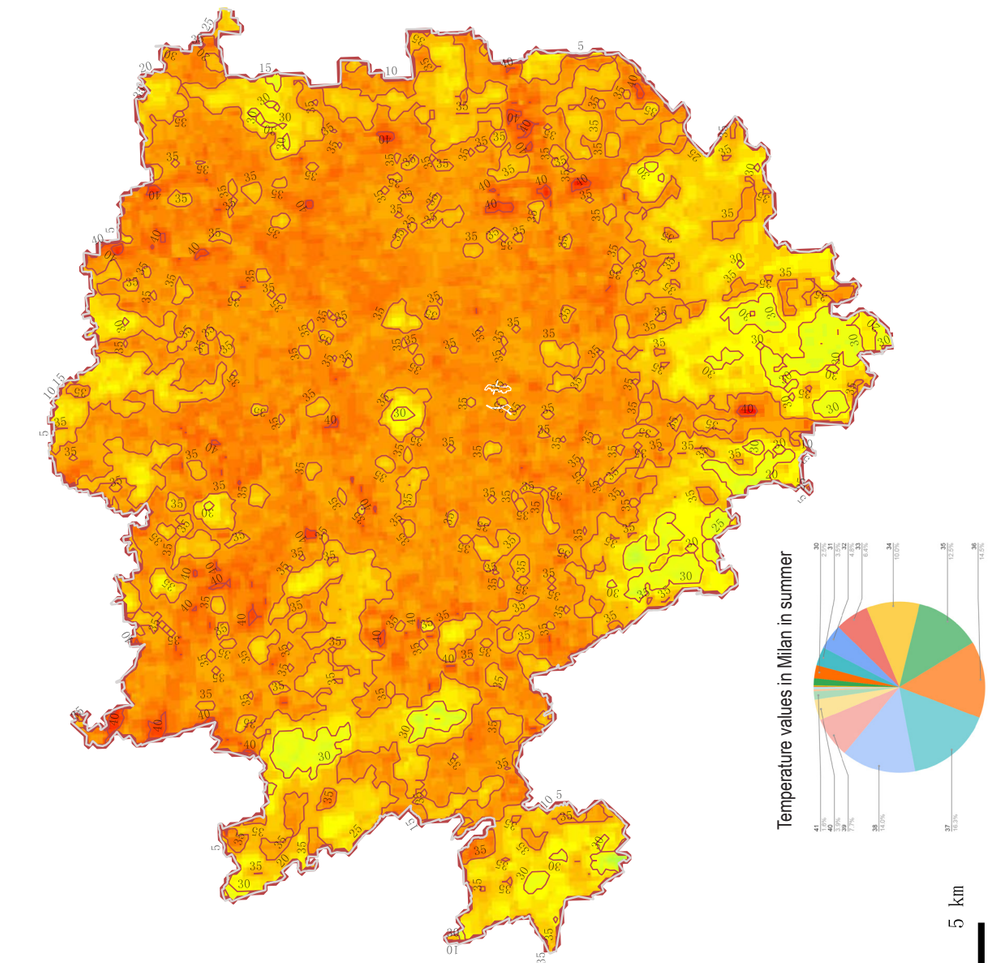
3.1 CLIMATE

Milan exhibits a mid-latitude, four-season humid subtropical climate (Cfa) according to the Köppen climate classification. The city experiences a climate similar to the inland plains of Northern Italy, characterized by hot and humid summers as well as cold and foggy winters.

In summer, Milan's temperatures range from a minimum of 27.9 to a maximum of 41 degrees Celsius, with an average temperature of 35.81 degrees Celsius. The accompanying pie chart illustrates that 98.4% of Milan's area experiences temperatures above 30 degrees Celsius.

In summary, due to its geographical location and urban development, Milan faces high temperatures and dryness issues during the summer months. Additionally, the city encounters significant air pollution problems during the winter season.

Map.4 Milan Summer Temperature Map



Map.4 Prepared by the author

Fig.5 Green space in the north part of the park
https://initalia.virgilio.it/parchi-piu-belli-milano-44037

Fig.6 Green space in the south part of the park
https://www.visititaly.it/info/992142-parco-papa-giovanni-paolo-ii-riccione.aspx

About the climate of the site: Parco Giovanni Paolo II

During the summer, the park experiences significantly high temperatures, with the maximum reaching 39 degrees Celsius and the minimum hovering around 34 degrees Celsius.

Comparatively, the temperature around the canal is relatively lower. Specifically, the temperature at the "*Parco Archeologico*" site falls within a moderate range, while the "*Parco Giovanni Paolo II*" site records the highest temperatures.

Further research indicates that the elevated temperature at "*Parco Giovanni Paolo II*" can be attributed to the presence of bare grass in its northern section and trees in its southern section. In contrast, "*Parco Archeologico*" is predominantly covered with trees.

The temperature around the canal remains the lowest due to the presence of water and the abundance of tall trees and shrubs in the vicinity.

Map.5 Site Temperature Map

Map.5 Prepared by the author

3.2 HYDROGEOGRAPHY

The Navigli Canal system in Milan spans a total length of 92.8 kilometers. The accompanying lake covers an area of 11,643.8 square meters, consisting of 302.2 square meters of artificial lakes and 99,492.6 square meters of wet streams. These canals and streams were historically utilized for transportation and irrigation purposes.

Additionally, the Navigli Canal is home to numerous historical sites dating back to the 4th century. Today, these sites have transformed into popular meeting places for both young people and tourists.

The Navigli Canal system played a vital role in connecting various regions. Its focal point was the city of Milan in Lombardy, Italy. This extensive network facilitated transportation and navigation, linking Lake Maggiore, Lake Como, and the lower Ticino region to Milan. It provided access to waterways that connected Switzerland, northwestern Europe (including the Canton of Grisons and northeastern Europe), and ultimately the Po River leading to the Adriatic Sea.

Fig.7 Naviglio Grande
https://viaggi.corriere.it/itinerari-e-luoghi/cards/i-navigli-di-milano-cosa-sono-e-cosa-vedere/

Water buffered area

Riparian buffers, which refer to areas of natural or artificially established vegetation located adjacent to bodies of water, play a crucial role in mitigating various environmental issues. They effectively reduce stormwater sewage runoff, excessive sedimentation, and erosion, while also contributing to groundwater recharge. Riparian buffer zones, particularly those consisting of vegetation, serve as essential barriers between aquatic and terrestrial ecosystems, providing protection to freshwater environments and wildlife habitats. These areas have proven to stabilize the microclimate of riparian zones, control soil erosion, retain sediment, nutrients, and pesticides from surface runoff, and offer an ecological corridor that supports biodiversity conservation.

When development sites are situated too close to shorelines and waterfronts, the water quality of nearby ponds, lakes, and rivers can be adversely affected. Therefore, it is crucial to maintain an adequate riparian buffer zone.

A well-designed riparian buffer should meet the following criteria:

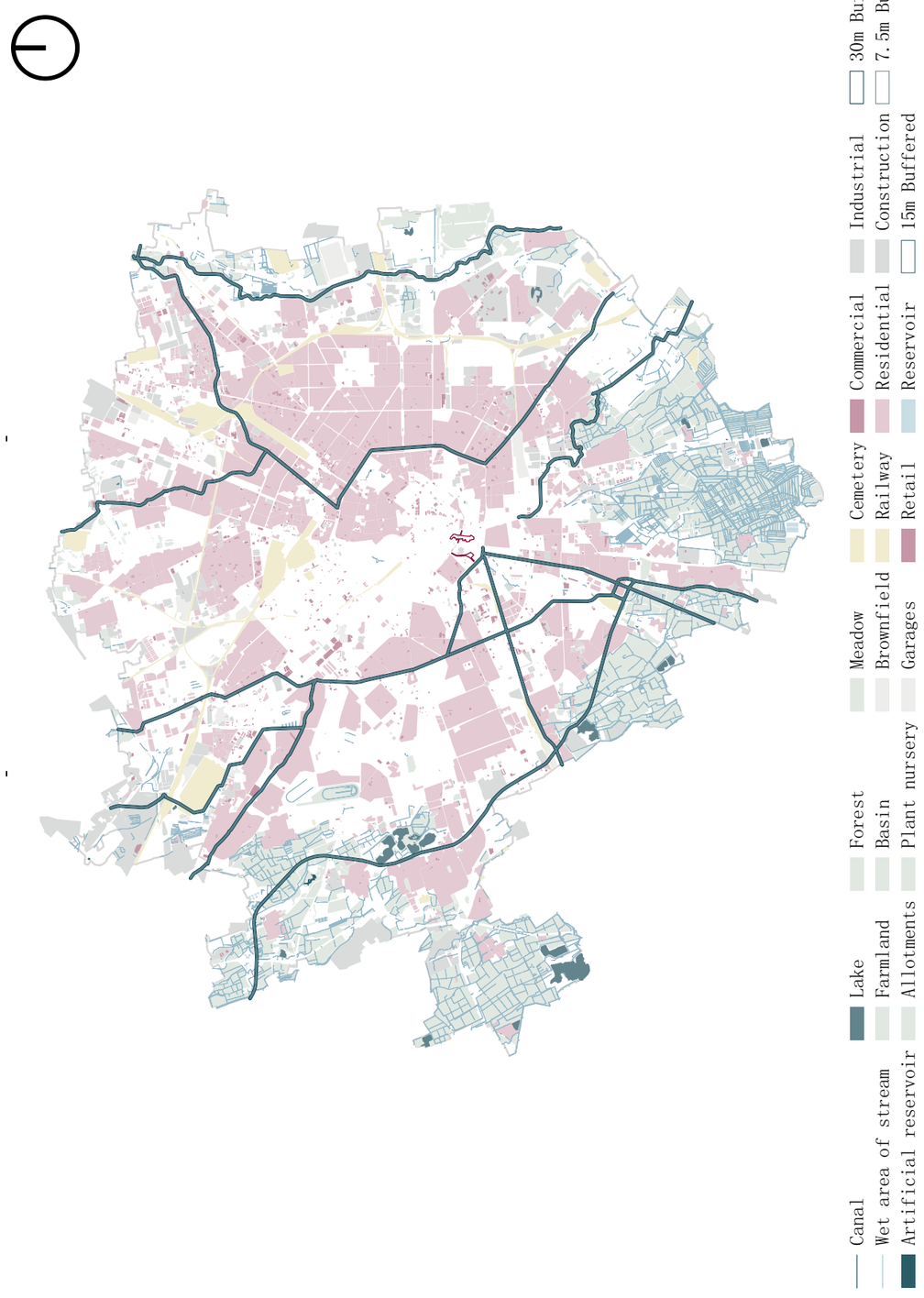
1. Width: The buffer should be at least 30 meters (100 feet) wide.

2. Extension into the water: It should extend at least 7.5 to 15 meters (25 to 50 feet) into the body of water.

3. Extension from the water's edge to land: The buffer should extend at least 15 to 30 meters (50 to 100 feet) from the edge of the water to the adjacent land.

4. Slope: The slope of the riparian buffer zone should be less than 5%, and the width of the buffer should increase with steeper slopes. In general, wider buffers provide better protection and benefits to the surrounding ecosystem.

Map.6 Milan Riparian Buffers Map



Map.6 Prepared by the author

The identification of the surrounding environment of water bodies was conducted using field surveys and QGIS macroscopic observations.

In April 2022, field surveys were carried out along the main Navigli canal and its tributaries. These surveys involved a thorough examination of land use and the overall surrounding environment.

The validation process considered the biodiversity present around the water bodies and the adequacy of the buffer zone. In urban areas, the buffer zone is often narrower due to the occupation of land by urban construction and agricultural activities. Additionally, the riverbank slope tends to be gentle, resulting in buffer zones that are often limited to 7.5 meters or even less, or in some cases, there may be no buffer zone at all. This can lead to issues such as height differences between the riparian buffer zone and the river channel, increased erosion, and a lower level of biodiversity in the vicinity of the water bodies.

The primary vegetation types found in these areas include typical northern tree species such as maple, black pine, elm, and sycamore, as well as various weed species.

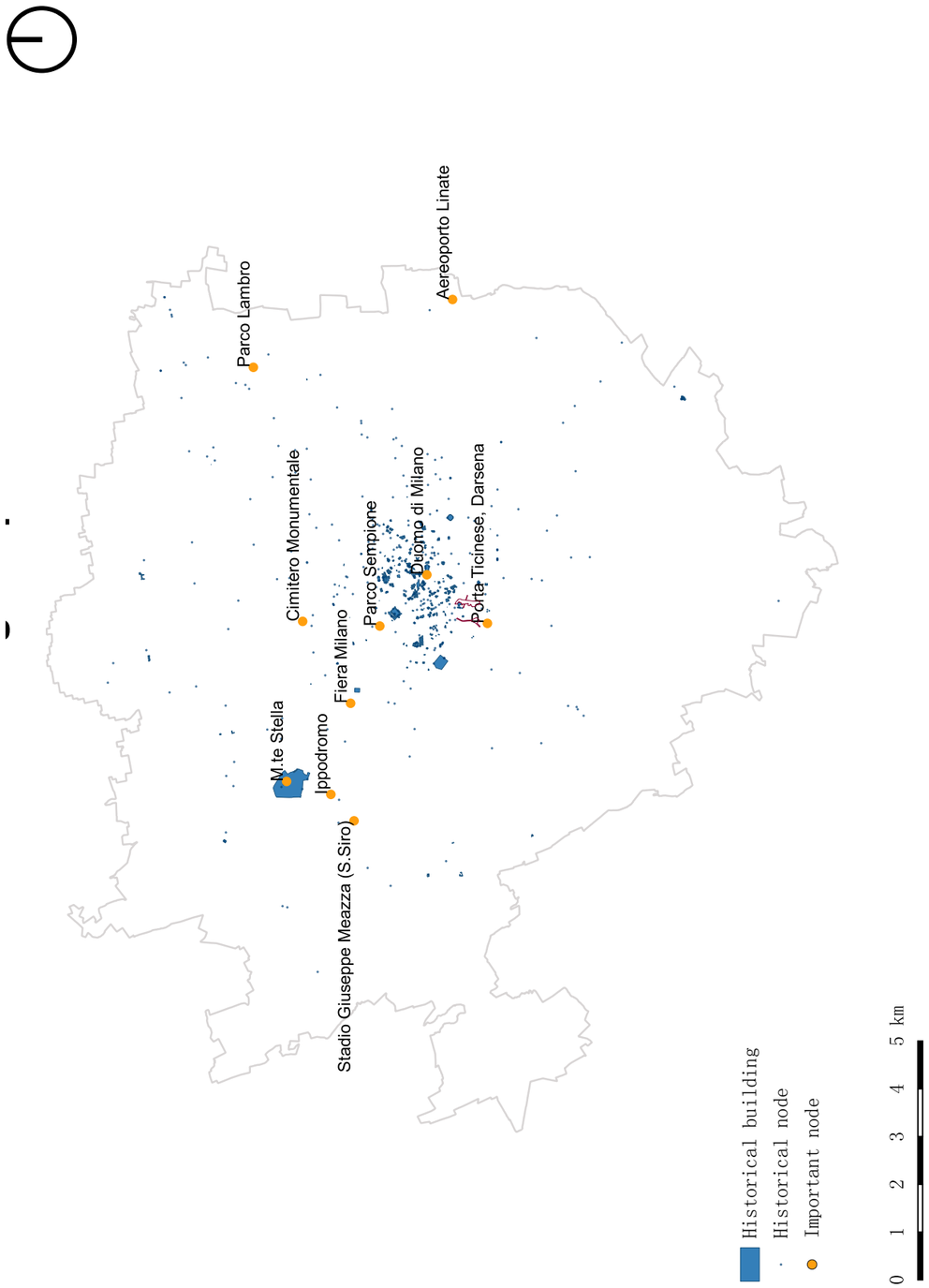
3.3 HERITAGE ARCHITECTURE

Milan is renowned as a modern city, yet it boasts a wealth of cultural and artistic heritage, including famous monuments.

The historic center of Milan, with the majestic Duomo di Milano at its heart, houses a significant portion of the city's artistic and architectural treasures. The city center showcases a diverse range of architectural styles, primarily from the seventeenth and eighteenth centuries when villas and palaces were constructed as the primary private residences. The architectural styles represented in the city center span from neo-gothic and baroque to eclectic, Liberalism, and postwar rationalism. Milan's civil architecture has evolved over time and includes numerous modern buildings that embody innovative concepts of urban design. Several streets and squares in Milan hold historical, architectural, social, or commercial significance, making them notable attractions in their own right.

One prominent attraction within the historic center is the "Parco Giovanni Paolo II." The park derives its name from the presence of two significant cathedrals located on opposite corners: the Basilica di San Lorenzo and the Basilica di Sant'Eustorgio. This park serves as a captivating focal point, combining natural beauty with the historical and religious importance of the surrounding basilicas.

Map.7 Milan Heritage Map



Map.7 Prepared by the author

HISTORIC MONUMENTS AROUND THE PARCO GIOVANNI PAOLO II

3.3.1 Basilica di San Lorenzo

The Basilica of San Lorenzo is a Catholic cathedral located in Milan. It is one of the oldest churches in the city and has undergone numerous reconstructions and modifications over time, while still largely preserving its original late Empire floor plan.

During the period between 390 and 410, the St. Lawrence's Column, situated opposite the church, was part of the building's antechamber, which was considered a significant monumental complex from the late Roman era of the Milanese Empire. The Duomo, as it is also known, is recognized as one of the earliest Christian cathedrals in Milan and the first centrally symmetrical building in Western Christianity.

Throughout its history, the basilica has faced considerable damage from fires. It was severely affected by two fires in 1071 and 1075, and its dome collapsed in 1103. Subsequently, the church was rebuilt in Romanesque style while retaining its original interior layout. Unfortunately, another fire in 1124 led to further destruction of parts of the building.

Despite the challenges and reconstructions, the Basilica of San Lorenzo stands as an architectural testament to Milan's early Christian heritage, blending elements of late Empire and Romanesque styles.

Fig.8 View of the facade of the Basilica with the monument to Costantino il Grand
http://www.hoteladelchi.it/basilica-di-san-lorenzo-milano/

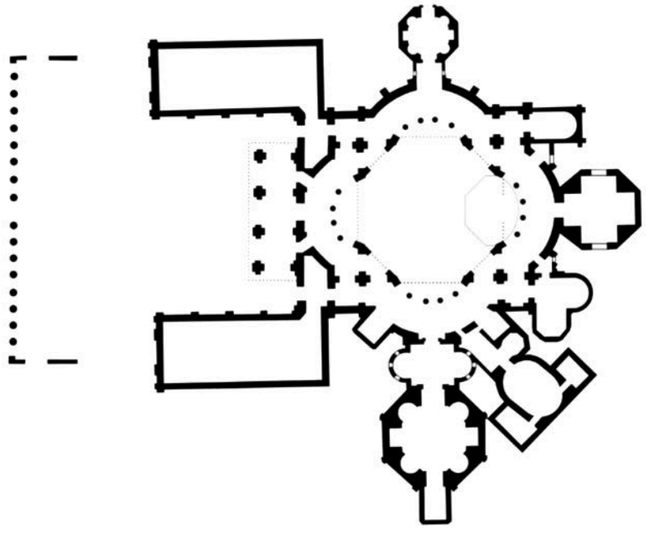


Fig.9 Original plan of the San Lorenzo complex
https://it.wikipedia.org/wiki/Basilica_di_San_Lorenzo_%28Milano%29

3.3.2 Basilica di Sant'Eustorgio

The Basilica of Sant'Eustorgio holds great significance in both the artistic and religious history of Milan, ranking among the city's most valuable and significant monuments.

The location of the current church site held strategic importance even during Roman times, as it stood along the road connecting Milan to Pavia. The origins of the basilica can be traced back to late antiquity and are traditionally attributed to Eustorgio I, who served as the bishop of Milan in the 4th century. Beneath the main nave's floor, remnants of a later Roman cemetery that had been Christianized have been discovered. However, the earliest documented evidence of the church dates back to the 13th century, with the oldest identifiable structures dating to the 11th century when the initial Romanesque buildings were erected.

A significant chapter in the history of Sant'Eustorgio began in 1234 when the monastery became the headquarters of the Inquisition. The basilica gained prominence as it became the resting place for the remains of St. Peter's Martyr, swiftly transforming it into one of the most revered pilgrimage sites and sacred buildings in Milan.

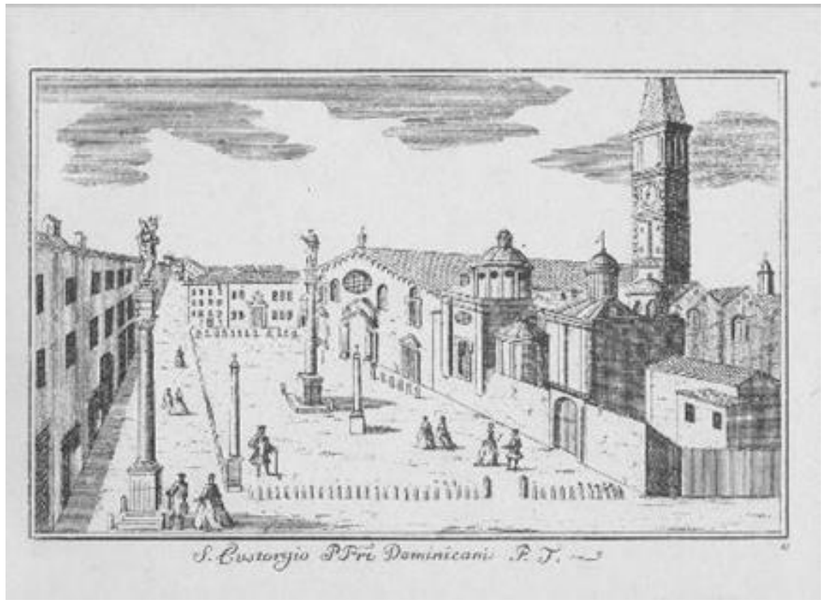


Fig.10 Marc'Antonio Dal Re, S. Eustorgio P. Dominican Fathers, Milan 1745
https://it.wikipedia.org/wiki/Basilica_di_Sant%27Eustorgio#/media/File:Dal_Re,_Marc'Antonio_(1697-1766)_-_Vedute_di_Milano_-_43_-_S._Eustorgio_P._Padri_Dominicani_-_ca._1745.jpg

Fig.11 Basilica of Sant'Eustorgio, late 1920s
https://www.beniculturalionline.it/location-1671_Basilica-di-Sant%27Eustorgio.php

3.3.3 Colonne di San Lorenzo

The remains you described are of a quadrangular-vaulted atrium, supported by columns, located in front of the oldest Roman cathedral on the way to Pavia. These columns stand at an impressive height of 8.50 meters and are adorned with Corinthian capitals, though the friezes on them are only partially related, giving them a rustic appearance. Among the columns, there is a larger intercolumn with a brick arch, which serves to emphasize the entrance.

An interesting historical touch is an inscription by Lucio Vero, dating back to AD 167, found at the left end of the colonnade. The inscription bears the full title of the emperor. Over the centuries, this space has suffered neglect, but it is currently occupied by a square where trams pass by. In the center of this square, there stands a statue of Constantine, a bronze replica preserved in the Lateran, which was placed there to commemorate the bicentennial of Augustus' birth.

This site carries immense historical and architectural significance, representing a glimpse into the ancient Roman era and its majestic structures that have stood the test of time despite the bustling modern surroundings.

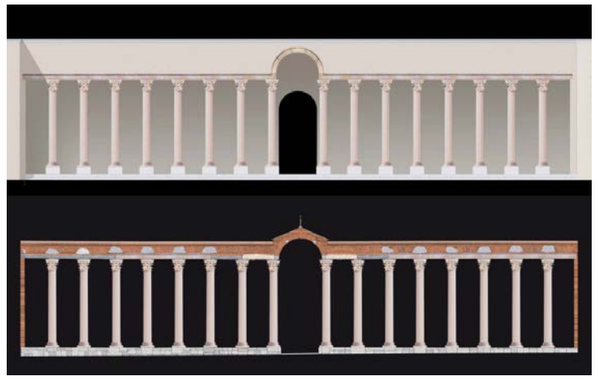
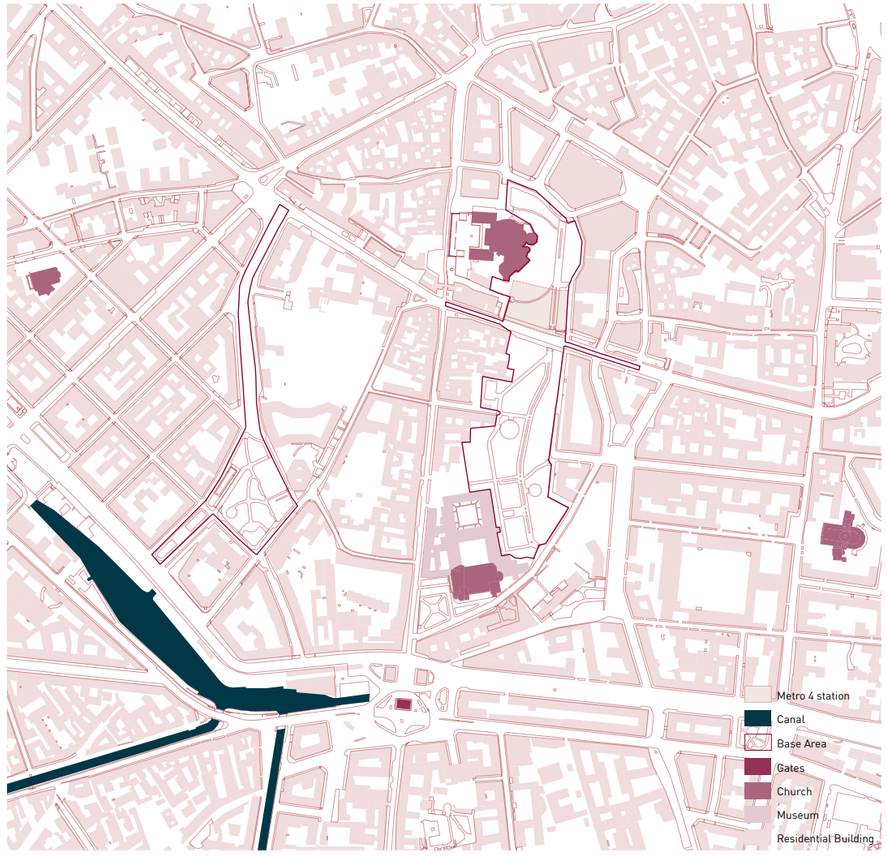


Fig.12 Colonnade Facade Model
https://blog.urbanfile.org/2017/09/15/xxxmilano-porta-ticinese-le-colonne-di-san-lorenzo-ieri/

Fig.13 Le Colonne viste dal sagrato della basilica di San Lorenzo
https://blog.urbanfile.org/2017/09/15/xxxmilano-porta-ticinese-le-colonne-di-san-lorenzo-ieri/

Fig.14 Colonne di San Lorenzo 1860
https://blog.urbanfile.org/2017/09/15/xxxmilano-porta-ticinese-le-colonne-di-san-lorenzo-ieri/

Map.8 Historical heritage around the site Map



Map.8 Prepared by the author

Map.9 Historic monuments around the Parco Giovanni Paolo II

Map.9 Prepared by the author

3.4 TRANSPORTATION

Milan, known as the fashion capital, boasts a comprehensive and user-friendly public transport system that caters to residents and visitors alike. The city's public transport network encompasses four metro lines, trams, and buses, offering convenient and affordable options for getting around.

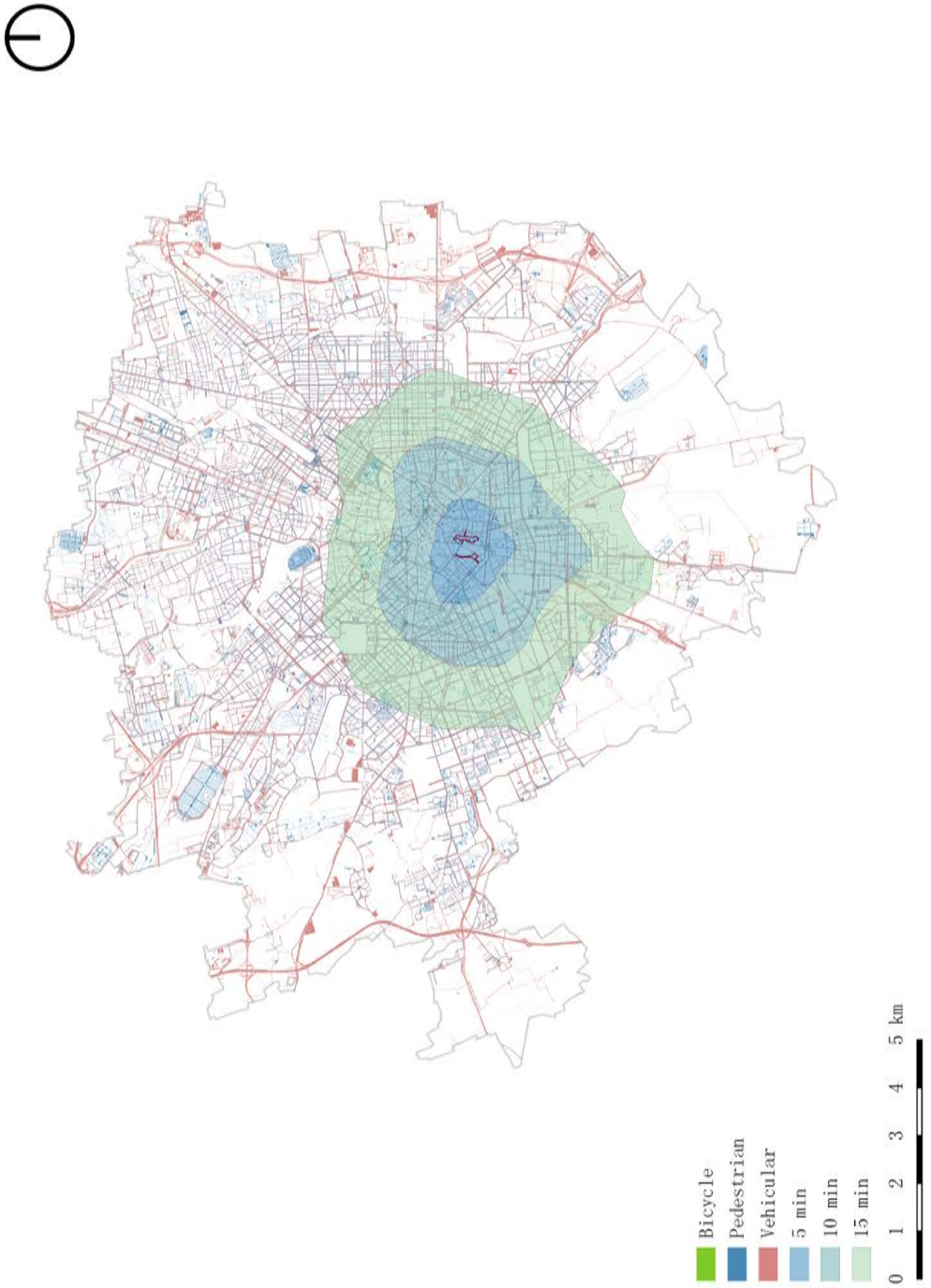
The bus lines in Milan provide coverage to all areas of the city, ensuring accessibility and connectivity throughout.

The metro system consists of four lines: the red line (M1), the green line (M2), the yellow line (M3), and the recently opened purple line (M5). The red line (M1) is the oldest subway line in Milan, serving as a gateway to the city's main attractions and railway stations. The green line (M2) and yellow line (M3) extend their reach to cover other significant areas of Milan. The purple line (M5), completed in 2015, connects Bicocca, Garibaldi, and the San Siro Stadium. Additionally, the blue line (M4) is scheduled to be operational in April 2023, linking Linate Airport to the city.

Milan takes pride in having the world's longest tram track and the largest tram fleet in Europe. Trams have become iconic symbols of the city and offer a more leisurely way to explore Milan's center compared to the faster-paced metro system. Riding the trams allows you to take in the sights and enjoy a city tour experience, especially when you're not pressed for time.

By utilizing Milan's public transport options, travelers can effortlessly navigate the city, visit top attractions, indulge in shopping sprees, and dine at some of the finest restaurants, all while saving time and effort in the process.

Map.10 Milan Bicycle feasibility Map



Map.10 Prepared by the author

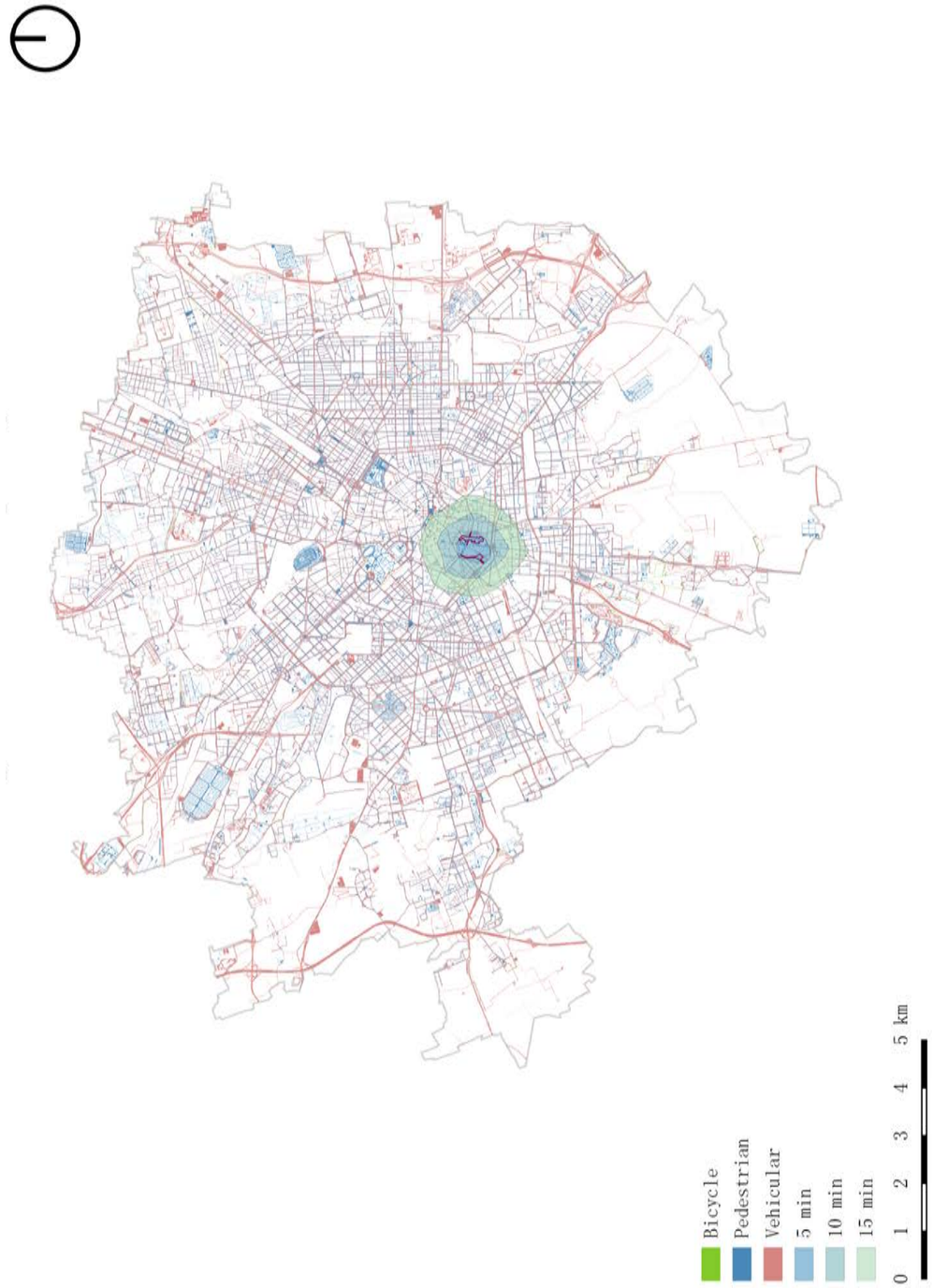
The 15-minute urban theory promotes the idea that all essential amenities and services should be easily accessible within a 15-minute walk, bike ride, or public transport journey. This approach aims to decentralize the local economy, creating self-sufficient neighborhoods that cater to residents' diverse needs. Each neighborhood is designed to include workplaces, commercial areas, recreational facilities, green spaces, and residences, providing a comprehensive range of urban functions.

By implementing the principles of the 15-minute city, urban planners strive to create a spatial layout that aligns with people's daily requirements, minimizing the need for long-distance travel and reducing reliance on private cars. The concept encourages the design of multifunctional spaces and diverse functions within close proximity, enabling individuals to meet their basic needs without having to travel far.

In the case of Milan, an analysis of the city's pedestrian and bicycle infrastructure reveals that a significant portion of the city center can be reached within a 15-minute bike ride. Furthermore, essential amenities such as supermarkets, pharmacies, green spaces, entertainment venues, hospitals, schools, offices, and more can be accessed on foot, facilitating convenient and sustainable transportation options for residents.

Adopting the 15-minute urban theory aligns with sustainable urban design principles, as it helps reduce car dependency, lower carbon emissions, and shorten commuting times. Additionally, this approach promotes the creation of more public spaces, enhancing the quality of urban life and fostering a sense of community.

Map.11 Milan Walking feasibility Map



Map.11 Prepared by the author

Site: Parco della Basiliche traffic analysis

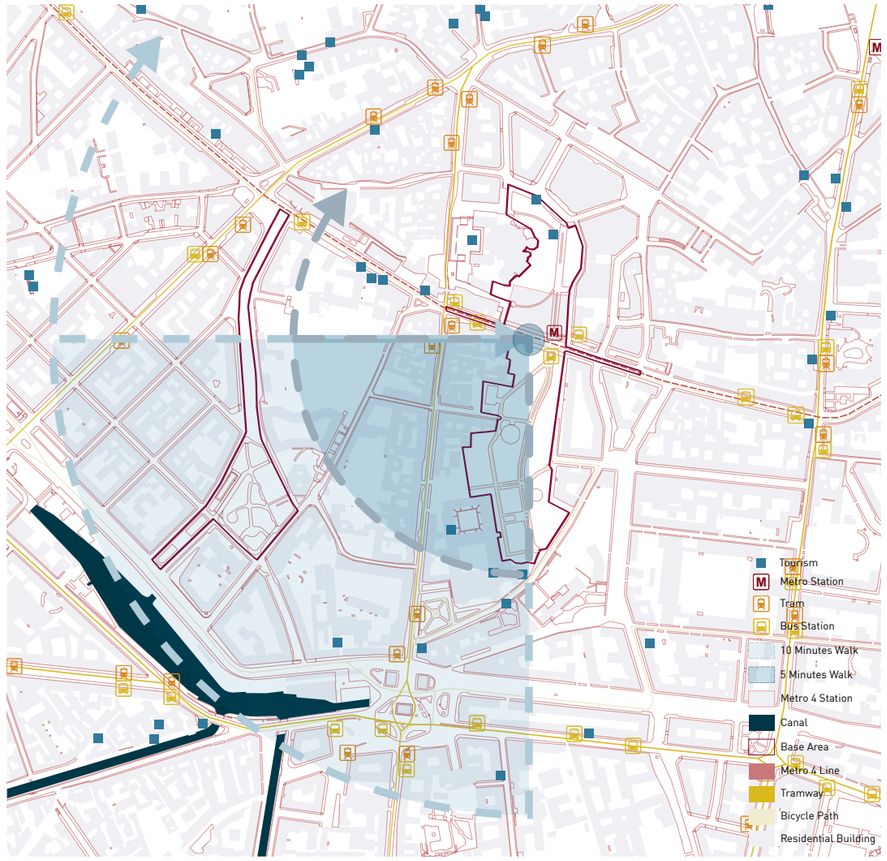
Improving the bike paths and sidewalks around the park is essential to enhance connectivity and accessibility for both pedestrians and cyclists. Currently, the area benefits from convenient public transportation options like trams, subways, and buses, which connect it with the Milan city center and the Navigli canal system. However, to encourage more sustainable and active transportation, the development of a well-designed network of bike paths is crucial.

By creating dedicated bike lanes and improving pedestrian walkways, the parking area can become more cyclist and pedestrian-friendly, promoting a healthier and more eco-friendly mode of transportation. The addition of bike paths would offer visitors and residents a more enjoyable riding experience and a safer way to navigate the area.

Moreover, enhancing the sidewalks and providing clear pathways will help pedestrians move around the park seamlessly, promoting a sense of safety and comfort for pedestrians. A well-connected system of sidewalks would also facilitate the movement between the north and south parks, encouraging people to explore the entire area without barriers.

Overall, investing in better bike paths and sidewalks in and around the park would not only improve the connectivity of the site but also contribute to a more sustainable and enjoyable urban environment for residents and visitors alike. It would support the goals of the 15-minute urban theory, making it easier for people to access various amenities, recreational facilities, and tourist attractions within a short distance from the park.

Map.12 Traffic analysis around the site Map



Map.12 Prepared by the author

3.5 VEGETATION

The parks of Milan, green lungs of the city.

The real green lung of the city of Milan is Parco Sempione. Large English garden, inside it includes paths, streams, bridges and small hills; the satisfied gaze enjoys the suggestive perspective game that connects the Castello Sforzesco to the Arco della Pace and it is not uncommon to see fitness groups, young people organizing a picnic or families out for a walk. Nature is life and Parco Sempione in Milan is a vital space to breathe in the heart of the city.

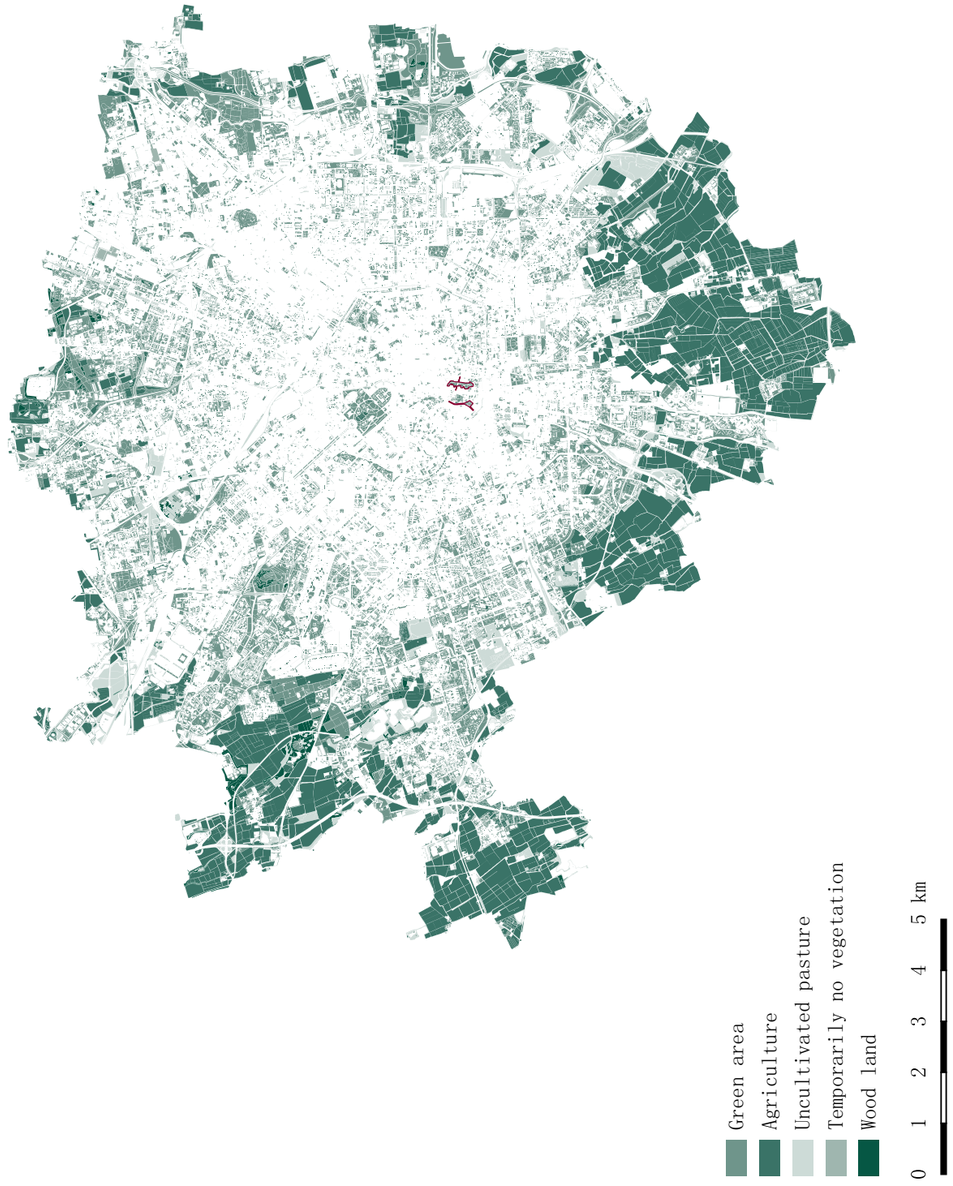
Another green space is the so-called Parco delle basiliche (Pope John Paul II Park), which connects the basilica of San Lorenzo and the basilica of Sant'Eustorgio in the Ticino area. Among the most beautiful areas of green Milan where you can spend time in complete relaxation are Parco Trotter, Parco delle quarte and Boscoincittà, with its farmhouses dating back to the fifteenth century.

There are many parks and nature reserves scattered throughout Lombardy. It's not just a question of natural itineraries of enormous botanical value, but also of archaeological parks that bear witness to Italy's immense environmental heritage.

The area of Milan is 181.8km^2, the green vegetation area is 72.41km^2, and the vegetation coverage rate is 39.82%.

The vegetation types are divided into, Green areas, agriculture, uncultivated pasture, temporarily no vegetation, and wood land. Green area is 30.5km^2, agriculture is 30.9km2, uncultivated pasture 7.73km^2, temporarily no vegetation 2.22km^2, woodland 1.06km^2.

Map.13 Milan Vegetation system Map



Map.13 Prepared by the author

NDVI

The Normalized Difference Vegetation Index (NDVI) is a widely used remote sensing index that provides information about the presence and health of vegetation. NDVI is calculated using the reflectance values of near-infrared (NIR) and red light from satellite imagery or other remote sensing platforms.

The formula for calculating NDVI is as follows:

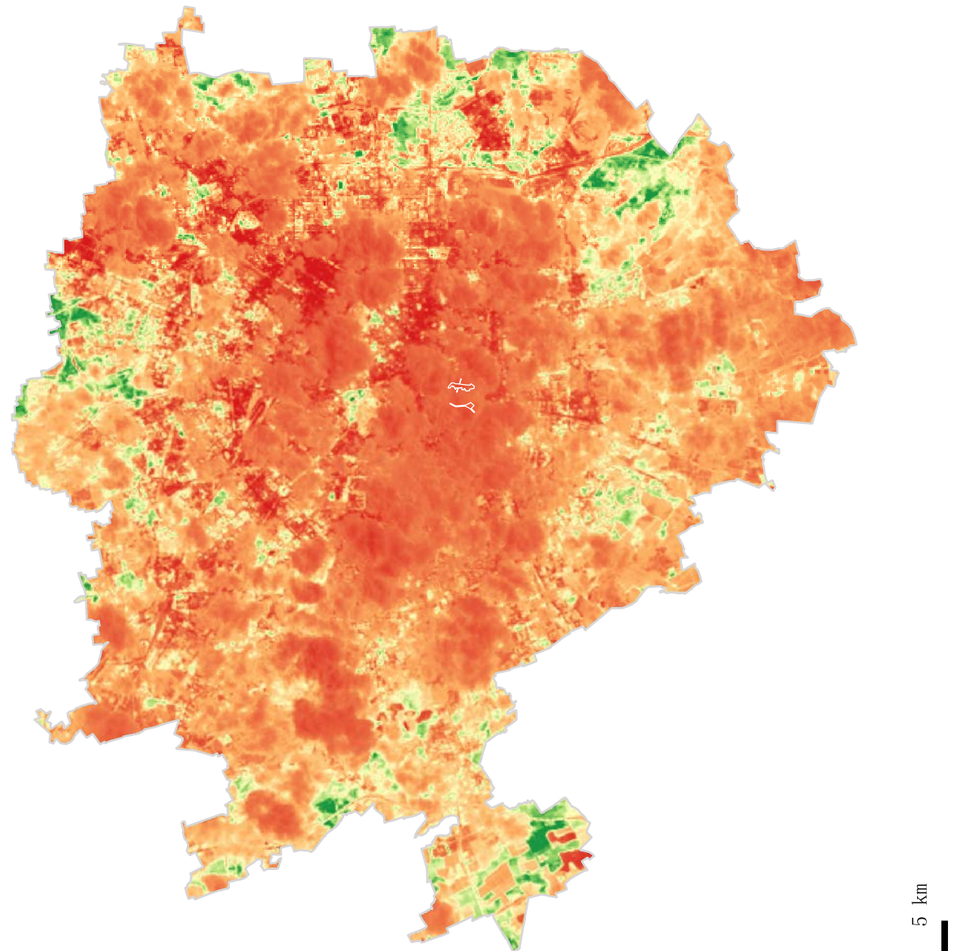
NDVI = (NIR - RED) / (NIR + RED)

In this formula, the numerator represents the difference between the reflectance of NIR and red light, while the denominator represents their sum. The result is a numerical value that ranges from -1 to 1.

Higher NDVI values indicate a greater density of live green vegetation, while lower values indicate less vegetation or non-vegetated areas. NDVI values close to 0 indicate areas with minimal or no vegetation, such as barren land or water bodies. Values close to 1 indicate dense and healthy vegetation.

NDVI is widely used in various applications, including agriculture, forestry, environmental monitoring, and land cover analysis. It provides valuable information about vegetation dynamics, vegetation health, and the distribution of vegetation across a landscape.

Map.14 Milan Normalized Difference Vegetation Index(NDVI)



Map.14 Prepared by the author

It's interesting to note that while Milan has a relatively high green coverage rate, the NDVI index values indicate a generally low density of vegetation. NDVI values ranging from 0.007 to 0.42 suggest that the vegetation cover in Milan is not dense and varies across the city.

A low NDVI value of 0.1, which you mentioned is common in urban areas, indicates that the land is relatively exposed and lacks dense vegetation. This could be due to various factors such as urban development, limited green spaces, and the prevalence of built-up areas. In urban environments, vegetation may be sparse or limited to parks, gardens, or specific green areas.

It's important to consider that the NDVI index not only reflects the presence and health of vegetation but also accounts for other surface characteristics. A low NDVI value can indicate bare soil, water bodies, or even snow and ice-covered surfaces. These non-vegetated areas contribute to the overall low NDVI values observed in the urban area of Milan.

To promote greener urban environments and increase NDVI values, initiatives such as planting more trees, creating additional green spaces, and implementing urban greening strategies can be beneficial. These efforts can help improve the aesthetic appeal of the city, enhance the urban microclimate, and provide environmental benefits such as reducing heat island effects and improving air quality.

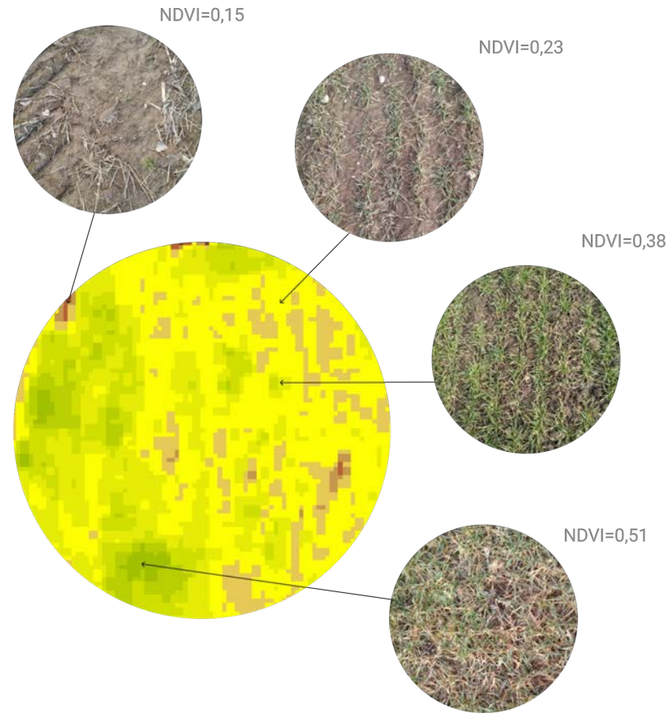


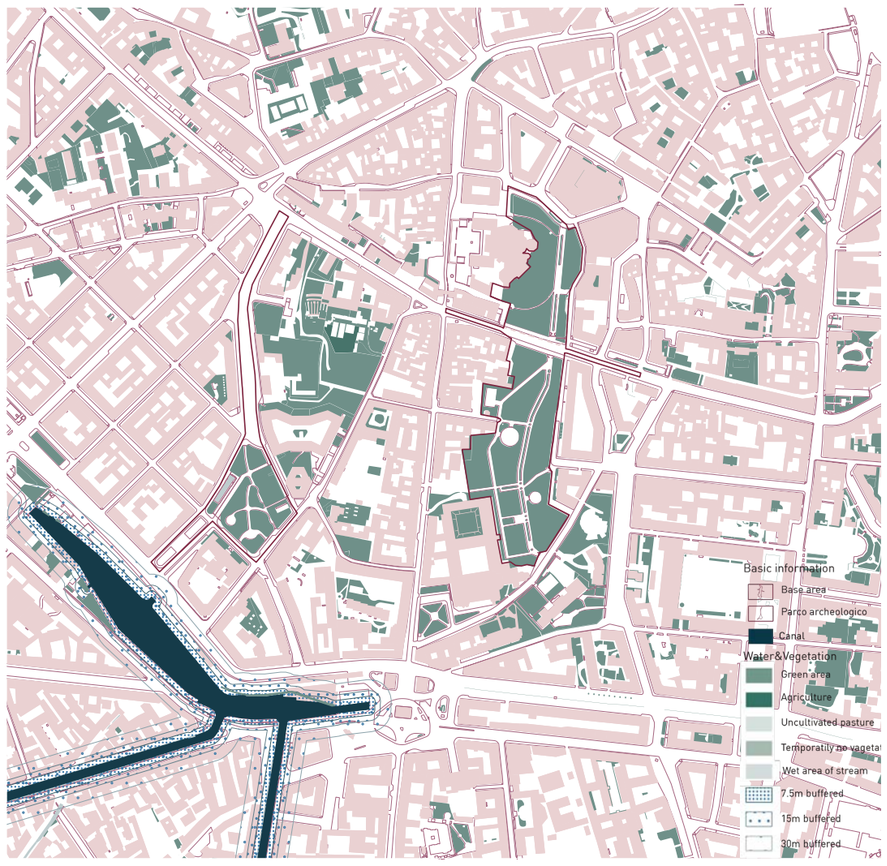
Fig.15 Schematic diagram of NDVI numerical value
https://blog.onesoil.ai/en/what-is-ndvi

3.5.1 Parco vegetation & water

The park's interior is dominated by grass and trees, with a small number of shrubs.

- Maple (Acer negundo, A.platanoides, A. saccharinum)
- Hornbeam (Carpinus betulus)
- Flowering cherry (Prunus cerasifera 'Pissardii')
- Beech (Fagus sylvatica)
- English oak (Quercus robur)
- Elm (Ulmus spp)
- Black pine (Pinus nigra)
- Cypress poplar (Populus nigra 'Italica')
- Plane tree (Platanus x acerifolia)
- Sophora (Sophora japonica)

Map.15 Parco Vegetation & Water Map



Map.15 Prepared by the author

With a range of 0.047 to 0.074, the NDVI values indicate a relatively low density of vegetation in the area, consistent with the overall low NDVI index observed in Milan.

It's interesting to note the presence of mulberry trees and Celtis Orientalis at the entrance via Molino delle Armi, as well as shrub species like wrinkled roses and autumn berries. These vegetation spots contribute to the green coverage in the area and provide some level of biodiversity and visual appeal.

As mentioned before, even though Milan has relatively high green coverage, the overall NDVI index remains low. The range of 0.1 NDVI values in the city center suggests that the vegetation in urban areas is limited, and the predominant green areas are concentrated in specific locations such as parks and designated green spaces.

To improve the NDVI values and overall green coverage in Milan, it could be beneficial to implement urban greening initiatives. This could include planting more trees and shrubs in urban areas, creating additional green spaces, and incorporating green infrastructure in the city's design. These efforts can help increase the density of vegetation, improve the urban microclimate, and enhance the environmental quality of the city.

Map.16 Parco Vegetation & NDVI
(normalized difference vegetation index)

Map.16 Prepared by the author

PART.2

04 URBAN PROJECT AIM
05 CASE STUDIES

04

URBAN PROJECT AIM

4.1 MAIN PROJECT AIM: RELATIONSHIPS WITH THE SURVEY ANALYSIS

On our site, qgis data analysis and field research found the following several problems and phenomena.

1. Because of modern traffic development and economic reasons, most of the canal is covered.

2. In terms of traffic, the motorized and non-motorized paths along the canal are mixed, which is not friendly and dangerous for pedestrians and bicyclists.

3. In terms of environment, we found that the summer temperatures in Milan are high, and the closer to the city center, the worse the state of the vegetation soil and the more exposed the vegetation cover is.

4. There are 7 important landmarks along the canal, namely Pinacoteca di Brera, Teatro alla Scala, Galleria Vittorio Emanuele II, Duomo di Milano, Basilica San Lorenzo Maggiore. Santa Maria delle Grazie, Castello Sforzesco, but their locations are more spread out and it takes at least 51 minutes to ride which is a long time for visitors to visit on foot.

Map.17 Navigli Render

Map.17 Prepared by the author

4.2 MAIN PRIORITIES

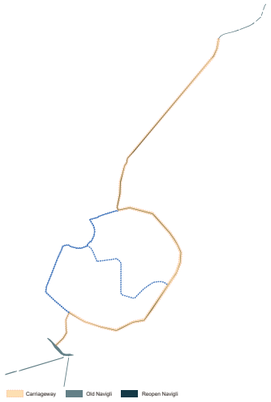
Based on the above phenomenon, we propose the following design solutions to meet the objectives and requirements of the organizers and the government to "restore the charm of the water city of Milan", to design for environmental protection, to improve the quality of life in the city and to consider the future urban development of Milan.

1. According to the government strategy and the feasibility analysis of reopening the Milan Canal in Chapter 1.5, we decided to gradually open the Naviglio closed canal in 2030, 2040, and 2050, and to increase the traffic by gradually reducing the car lanes to support only public transport lanes, adding regulated pedestrian and bicycle paths and increasing the subway. The aim is to achieve long-term urban development of mixed traffic (now) - fewer cars (2030~2040) - no cars (2070).

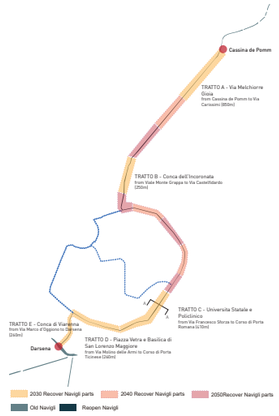
2. In terms of urban transport in Milan, we adopted the strategy of "Build up the link". Firstly, we decided to build up the bike path along the 8km Milan Canal, taking into account the surrounding city landmarks, elementary school, airports, train, and coach stations, and the starting and finishing stations of the new metro line 4, meanwhile not only to build up the north-south link but also to build up the east-west bike path according to the width of the road and the important green landmarks Castello Sforzesco and Duomo di Milano to the west, to create an east-west bicycle path, from "build up the link" to close the loop and strengthen the connection inside of the city.

Recover area

before

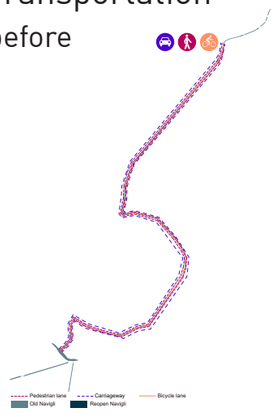


after

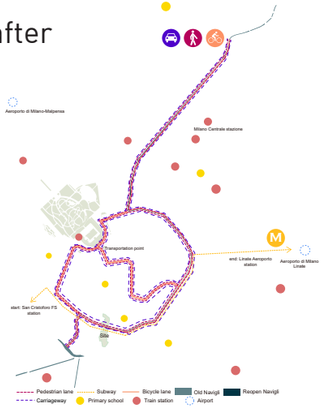


Transportation

before



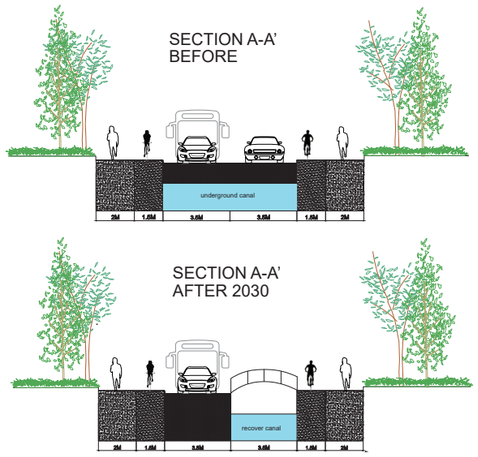
after

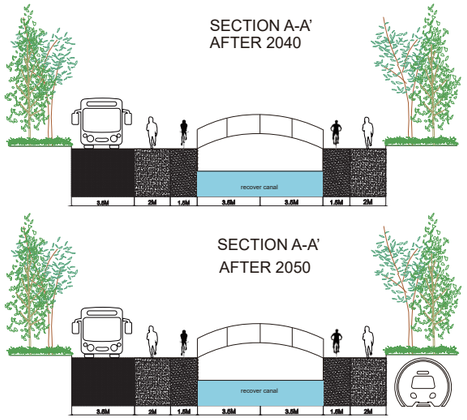


Map.18 Navigli strategy

Map.18 Prepared by the author

Recover area & Transportation





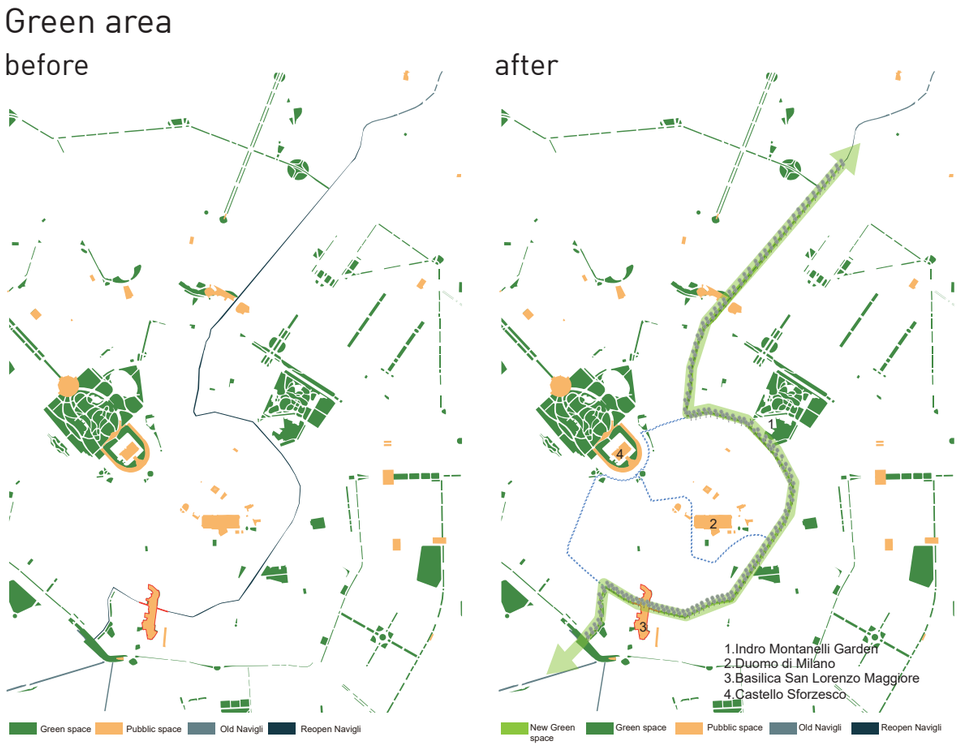
Map.19 Navigli strategy analysis diagram

Map.19 Prepared by the author

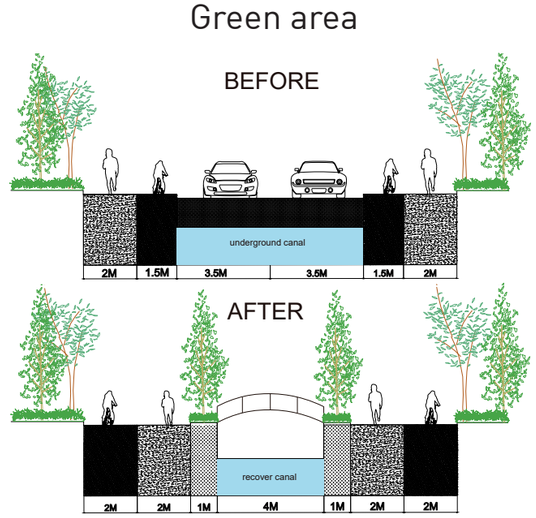
3. Milan is located in the low-lying Bataan plain in northern Italy, surrounded by mountains. It has a typical Mediterranean climate, with hot and sunny summers and cool, humid winters. At the same time, Milan also has serious environmental pollution problems.

On January 19, it was the third most polluted city in the world, after Dhaka, Bangladesh, and Delhi, India. Today, it has fallen to 33rd place but is still the only Italian city on the list. To alleviate the problem of the urban heat island effect generated by the summer heat and to mitigate air pollution, it was decided to create a boulevard along 8 km of the canal at the same time to achieve shade for cyclists and pedestrians, and to provide a diversity of activities around the river according to the surrounding infrastructure.

The aim is to gradually reduce the number of vehicles and enhance the vitality along the river.



Map.20 Navigli strategy
Map.20 Prepared by the author



Map.21 Navigli strategy analysis diagram
Map.21 Prepared by the author

4. Creating efficient and convenient links between important landmarks in Milan is a great way to enhance the visitor experience and reduce travel time. By ensuring that each landmark can be reached within a maximum of 10 minutes and a minimum of 3 minutes by bike, the overall travel time is significantly reduced compared to walking or other modes of transportation.

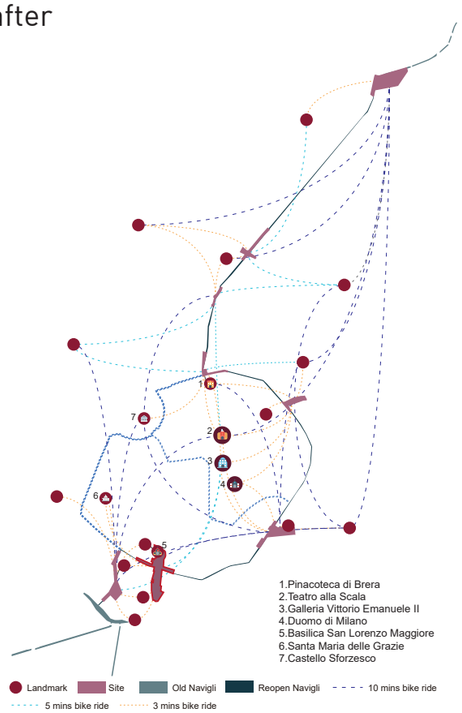
In addition to the time savings, this approach also leads to a reduction in carbon emissions. The initial ride time resulted in carbon emissions of 267.75g. However, with the implementation of the new links, the total carbon emission reduction is calculated to be 241.41g. This reduction in carbon emissions is significant and contributes to a more sustainable and environmentally friendly approach to exploring the city.

By promoting cycling as a means of transportation and optimizing the connectivity between landmarks, not only are visitors able to explore Milan more efficiently, but they also contribute to reducing their carbon footprint. This aligns with sustainable urban mobility goals and promotes a greener and healthier city environment.

Landmark connection

before

after



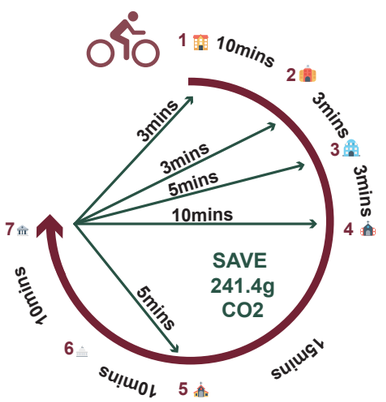
Map.22 Navigli strategy

Map.22 Prepared by the author

Landmark connection

Before: only single loop

After: build up west to east bicycle net



Map.23 Navigli strategy analysis diagram

Map.23 Prepared by the author

4.3 EXPECTED OUTCOME FOR LOCAL COMMUNITIES

By setting design goals, people are able to collectively identify, prioritize and plan solutions to their problems, and can meet the expectations as well as the aspirations of users, ultimately achieving sustainability. The ultimate goal of improving the quality of life in the city of Milan is achieved through successful organization. The following is a breakdown of the expected results on the ground:

Through the transformation of the overall traffic of the city of Milan and the green parks, such as a complete bicycle system and a green network along the canals. These changes enhance the efficiency of urban life, ensure the connectivity of the city, and make the life of citizens safer and more efficient.

By redesigning the eight green spaces along the canal, a large number of public spaces have been transformed to enhance connectivity, make the entire urban system more stable and efficient, provide good urban greenery, give citizens more good urban public spaces, and strengthen the community structure.

The project will not only stimulate economic growth, but also create jobs for local residents. By reshaping the canal, it will stimulate the development of the local tourism service industry, not only the commerce around the canal, but also the real estate economy around the canal, which is a very important indicator of economic growth and attracts more international investors.

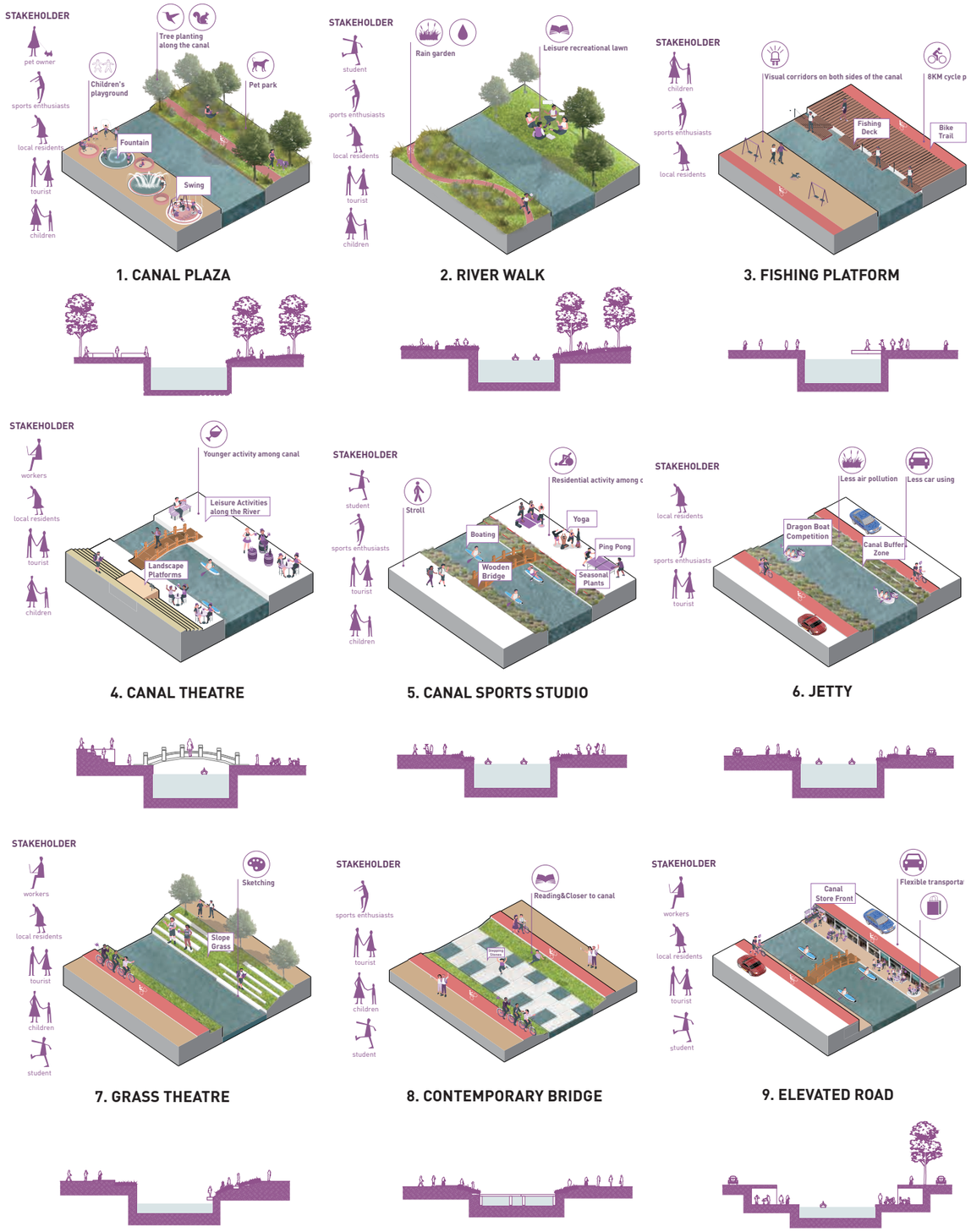
Milan's canals have a long history, and by opening them up and reinventing them, it will help visitors to reconnect with Milan - not only as a fashion capital, an economic capital, but also as a very beautiful city of water. For the locals of Milan, it helps to strengthen their sense of identity.

By reshaping the canals and enhancing the lighting and security facilities around them, it will help to reduce crime rates and create an image of Milan as a safe and secure cosmopolitan city, as well as creating a good living atmosphere for local residents.

Navigli Master Plan

Map.24 Prepared by the author

Map.25 Navigli Diagram



Map.25 Prepared by the author

05

CASE STUDIES

5.1 THE REASON OF THE CHOICE

The Naviglio Canal Project is an important urban regeneration program located in Milan, Italy. It aims to restore and enhance Milan's canal system, specifically the Naviglio Grande and Naviglio Pavese canals.

The project's objective is to transform the canals into a multifunctional urban space that caters to various activities, such as leisure, culture, commerce, and tourism. The initiative includes improving the riverfront environment, renovating historic buildings, establishing pedestrian and cycling paths, and creating recreational and dining areas.

Through the Naviglio Canal project, Milan's canal system will have undergone significant improvements and restoration, becoming a central attraction and social hub in the city. The canal banks provide opportunities for walking, cycling, enjoying the historic architecture, and admiring picturesque views. In addition, the presence of art studios, galleries, cafes, and bars near the canals offers a wide range of cultural and entertainment experiences for both residents and tourists.

The success of the Naviglio Canal project will have had a transformative impact on Milan's urban landscape, infusing the city with charm and vibrancy. The implementation of this project showcases how historical heritage can be seamlessly integrated into modern urban life through effective urban regeneration initiatives, resulting in an appealing and sustainable urban space.

Overall, the Naviglio Canal Project serves as a significant urban regeneration program for Milan, elevating the city's cultural, touristic, and social value by restoring and enhancing its canal system. This project exemplifies the potential of preserving and leveraging historical heritage to create an attractive and sustainable urban environment that offers a diverse range of experiences and activities for residents and visitors alike.

For the analysis of the Naviglio Canal project in Milan, we have selected two canal projects from European cities with similar historical and cultural backgrounds as case references: the reopening projects of the Madrid Canal and The Hague Canal.

The canal projects in Madrid and The Hague have indeed served as successful examples of urban regeneration, showcasing significant accomplishments in enhancing the city's image, fostering social interaction, enriching cultural value, and attracting tourists. The design principles and approaches demonstrated by these projects have provided invaluable insights when designing the Naviglio Canal in Milan. By leveraging the experiences and lessons from these projects, I can gain a deeper understanding of how to utilize the canal as a central element of urban development and seamlessly integrate it into Milan's urban planning and design, ultimately achieving a thriving, sustainable, and vibrant canal area.

From the Madrid Canal project, I can learn about the importance of transforming abandoned or underutilized canals into dynamic urban spaces. By incorporating green areas, recreational amenities, and pedestrian-friendly pathways along the canal, Milan can create an inviting environment for residents and visitors, encouraging social interaction and promoting sustainable mobility. The Madrid Canal project also exemplifies the significance of integrating the canal area with the surrounding urban fabric, ensuring seamless connectivity and accessibility throughout the city.

Similarly, the reopening of The Hague Canal highlights the value of historical and cultural preservation in canal projects. By restoring and revitalizing the Naviglio Canal, Milan can showcase its rich heritage and cultural significance, attracting tourists and creating a distinct sense of place. The lessons from The Hague Canal project emphasize the importance of community engagement, as well as the integration of art, culture, and recreational activities along the canal, all of which contribute to a vibrant and dynamic canal area.

By incorporating the design principles and approaches observed in these successful canal projects, Milan can leverage the transformative power of the Naviglio Canal to revitalize the surrounding areas, boost the city's attractiveness, and provide a unique and memorable experience for residents and visitors. Through careful planning, community involvement, and a sustainable mindset, Milan can harness the full potential of its canal system, fostering a prosperous and thriving urban environment for years to come.

5.2 MADRID RÍO, A GREEN LUNG ALONG THE BANKS OF THE MANZANARES

The Madrid Riverbank Park is located on the west side of the central city of Madrid, the capital of Spain. This 10-kilometer-long linear park built along the bend of the Manzanares River is an important part of Madrid's green landscape. Different from the step-by-step construction according to the plan, the completion of the Riviera Park in Madrid is the consensus of urban development in exchange for huge "tuition fees" in the process of dynamic development of the city and the river.(Burgos&Garrido, 2003)

The Riviera Park in Madrid is a world-class example of improving ecological efficiency driven by the transformation of transportation facilities. Through the underground transformation of the city's large-scale transportation infrastructure, the Manzanares River will return to the city, and then drive the construction of parks on both sides of the shoreline and the renewal of urban space.

Therefore, the project is the most important urban construction project in Madrid in recent decades and the most ambitious urban renovation project in Europe in recent years. Another major feature of the Madrid Riverside Park project is that the underground construction of the ring road was completed in three years, and the construction of nearly 120 hectares of riverside parks was completed in the next four years. This stems from a visionary and courageous mayor - Albert Luiz Gagliardon, who served as mayor of Madrid from 2003 to 2011. Through strategies such as reclassifying roads and splitting large projects into small ones, he successfully completed the renovation project during his two terms of office.

5.2.1 Ring road "big excavation": the road goes into the ground and the river is returned to the city.

Before becoming an attractive urban park, the Manzanares River was surrounded by a ring road called the M30. The M30 highway was built in the 1970s and is the third ring road in Madrid following the American development model. This ring road is built along the river and passes through the city, isolating the central urban area of the city from the surrounding urban areas.

At the end of the last century, when the M30 was completed as a whole, it could no longer meet the daily traffic flow of 200,000. Traffic accidents occurred frequently on some road sections, and the noise and exhaust pollution were serious. The water quality of the Manzanares River, which is caught in the middle of the road, continues to decline and the environment is gradually deteriorating. In the process of urban expansion, the function of the Manzanares River as a river gradually weakened. Urban power facilities and drainage systems are gradually converging towards the river, and the banks of the river have become urban infrastructure "corridors". The harsh environment and inaccessible Manzanares River gradually disappeared from the sight of Madrid citizens and became a marginal space of the city. (Burgos&Garrido, 2003)

In 2003, the newly appointed mayor decided to conduct a drastic "surgery" on this traffic artery, undergrounding the M30 section that bounds the Manzanares River, to suture the divided urban space.

This project, known as "M30 Underground", started construction in September 2004. The 6-kilometer-long underground tunnel cost 3.7 billion euros. After completion, it will relate to the east and west sections of the tunnel and the newly built tunnel of the main street in the urban area, becoming the longest urban traffic tunnel in the world. The new underground tunnel has greatly improved traffic conditions by installing traffic control systems, fire protection systems, and ventilation systems. At the same time, it also systematically integrates urban infrastructure pipelines, including power pipelines, sewage systems, gas pipelines, data optical fibers, etc., becoming an important urban lifeline for Madrid.

Although the underground transformation of M30 is costly, it undoubtedly has a positive impact on urban development: it not only improves traffic flow but also greatly reduces pollutant emissions caused by congestion. After the transformation of the M30, the incidence of traffic accidents has dropped significantly, and the economic losses caused by traffic accidents have also been greatly reduced.

5.2.2 "Sewing the city" with parks: creating a green space system along the river and creating a new waterfront space.

The underground M30 ring road has released a lot of ground space for the city. The government took the opportunity to launch the Madrid Riverside Park Reconstruction Plan to re-plan the areas along the river. Stitching urban spaces and shaping liveable riverbanks have become the two core goals of the project. To introduce innovative ideas for the creation of public spaces, in 2005, the Madrid City Council organized a worldwide design competition. WEST8 from the Netherlands and Spanish local firm MRIO jointly submitted a proposal for urban landscape regeneration above the tunnel, and finally won the competition. In addition to the leading global design firm, local experts and scholars from various fields participate in project planning, including engineers, architects, landscape planners, biologists, sociologists, artists, etc., which together form a strong expert team The team explored the construction of rivers and green spaces from multiple dimensions.

The Madrid Riverside Park project covers a total area of 120 hectares. Construction began in 2007 and was completed in 2011. Establishing an urban green corridor along the riverbank, connects other valuable outdoor spaces in the surrounding area and becomes a new green development axis that stitches the central urban area and the surrounding groups of the city.

Fig.16 The Madrid Riverside Park project
http://www.cnlandscaper.com/jingguancase/show-1490.html

1. The east and west are stitched together, connecting the two sides of the city with a bridge

To better connect the two banks of the river, many new bridges have been erected on the Manzanares River, including 30 new bridges designed by international design firms and 3 old bridges with a long history. The collision of new and old has established the unique cultural tone of this area and has become a new urban landmark of Madrid.

Argensula Pedestrian Bridge: The longest bridge in Riviera Park in Madrid, the spiral structure and metal material makes this bridge a dazzling landmark on the river. The main body of the bridge is divided into two sections, which fully meet the needs of residents along the coast to pass through traffic and get close to nature. The bridge itself acts as a landscape and an important urban viewing platform overlooking the park and surrounding area.

Cascara Bridge: The curved arcade made of concrete depicts the beautiful outline of the bridge, and the regularly arranged steel suspension cables lightly lift the steel plate bridge deck, making this 41-meter-long bridge lively. Inside the dome, there are mosaic murals specially designed by Spanish painter Daniel Canoga for this purpose. All kinds of people are portrayed in the most charming life scenes on both sides of the river.

2. Connecting the north and the south, connecting the urban green space system in series

The connection of the Madrid Riverside Park has further improved Madrid's urban green space system. From north to south, the Riviera Park in Madrid connects Spain's largest urban green space pastoral home, the Royal Garden Moorish Garden in the north, and the Manzanares Linear Park and Enrique Tierno Calvin Park in the south.

3. Composite function: meet the needs of all ages for all-weather activities

From the perspective of the function of the park itself, the Riviera Park of Madrid has become a river integrating life, culture, and ecological functions, and it is a place for leisure activities covering all ages and all weather.

"River of life": multiple space types, creating rich types of activities.

The Riviera Park in Madrid has not only recreational facilities for children, extreme sports venues for young people, but also exercise venues for the elderly. It has become a comprehensive social project integrating fitness, leisure, sports, communication, and other functions.

Children's play area: There are swings, cobwebs, hammocks, suspension bridges and climbing vines, etc., which are aimed at different age groups and provide activities of different difficulty levels. There are slides suitable for young children with high safety, and there are also activities based on skills, balance, and strength. Play area for older children. Among them, the skate park is the most attractive place for young people, and it is also the most dynamic place in Madrid Riverside Park. In addition, the wide promenade fully combines the living habits of the Spaniards who are keen on basking in the sun. The gentle trails, paved squares, landscape sketches, and rich design elements make the promenade full of fun.

"Cultural River": various culturally themed spaces gathered along the river.

Taking history as the axis to attract the gathering of cultural buildings, together shaping the cultural tonality of the area, providing citizens and tourists with a rich cultural experience. Among them, the most famous one is the slaughterhouse renovation area, which integrates cultural centres, botanical gardens, and museums. It is an important cultural carrier of the region and even the whole city, and an important strategic fulcrum for shaping the city's cultural brand. After the slaughterhouse closed in 1997, a complete renovation began in 2005. Madrid regards the project as an important opportunity to build a city's cultural brand and is determined to build it into a new cultural centre of the city. Through a series of projects such as strengthening walking accessibility, removing surrounding building obstacles, configuring open green space, and improving the surrounding environment, it is convenient for residents and tourists to arrive smoothly, and at the same time, it promotes the improvement of the environmental quality of the surrounding area. (Burgos&Garrido, 2003)

The Matadero Cultural Centre is a contemporary cultural and creative carrier integrating multiple functions such as exhibitions, music festivals, film screenings, and theatre performances. With the continuous improvement of cultural facilities and the continuous enrichment of cultural activities, Matadero Cultural Centre has gradually entered the public's field of vision as a popular tourist destination. From 2010 to 2014, the number of tourists in the Matadero Cultural Centre quadrupled to 1 million (Madrid had more than 4 million annual tourists in the same period), making it the fifth most valuable cultural carrier in Madrid.

Argensula Greenhouse Botanical Garden is also transformed from the space of a slaughterhouse. The steel and glass building displays a collection of approximately 9,000 plant species from different regions of the world. (Burgos&Garrido, 2003)

The Manzanares River Museum of Nature and History is a small exhibition hall showing the renewal process of the Manzanares River and its surroundings, where people can learn about the history of the symbiosis of the river and the city.

“Ecological rivers”: Restoring ecological order, explaining ecology with life.

During the renovation process, more than 33,000 plants were newly planted in the Riviera Park of Madrid, covering an area of 210,000 square meters of green space, becoming the "green lung" of the city. (Burgos&Garrido, 2003)

In the treatment of the river shoreline, the method of rewilding is adopted to restore the river ecosystem. The Manzanares River has changed from the original sewage river to an important corridor for the migration of birds and nocturnal animals - including kestrels, common swifts, swifts, white-bellied swifts, rock swallows, barn swallows, Redstart, house sparrows and other birds have become an important portrayal of regional ecology. This project also won the 12th Green Urban Design Award of Harvard University in 2015.

Although the underground transformation of highways and the transformation of linear parks cost a lot (3.69 billion and 410 million euros respectively), the benefits brought by these two projects to the city are also huge - during the construction process, they brought 94,000 yuan to the city. jobs and 32,000 long-term jobs, successfully activating the surrounding tourism service industry. It can be said that the transformation of the Madrid Riverside Park, from the upgrading of urban infrastructure to the improvement of urban public space to the reconnection of the river and the city, is a perfect reconstruction of urban space and has become a model of global public space transformation.

5.2.3 Promoting Urban Renewal: Taking the River as the Axis to Enhance the Value of Coastal Land

The story of Riviera Park in Madrid does not end here. Looking back at history, it can be found that the area around the Manzanares River has always been a relatively unpopular area in the city, initially occupied by industry and railways, and then surrounded by urban expressways.

The completion of the M30 underground and waterfront park projects brought the riverside area, which was originally on the city's edge, into the citizens' spotlight. The vacant land is waiting to be discovered, and the existing space needs to be improved urgently. A renewal project that can improve the quality of space and regional value is about to come out.

In 2010, under the leadership of the City Council, the Madrid Ministry of Urbanization and Housing and the Urban Planning Bureau jointly issued a heavyweight urban renewal plan - the Master Plan for Environmental Restoration of the Manzanares River. The plan aims to strengthen the connection between the west and the central city by creating and restoring the urban axis; improve the quality of life and revitalize regional development through spatial transformation and functional improvement; and integrate into the urban tourist route system as a tourist attraction. The renewal plan involves an average 500-meter-wide urban space along both sides of the river, for a total area of 390 hectares. (Burgos&Garrido, 2003)

The positive impact of the Manzanares River Environmental Restoration Master Plan has been significant. With the gradual implementation of the renewal plan, new businesses, offices, and residences have been completed one after another. At the same time, the original lower-level businesses have been fully activated, and regional development has attracted much attention. From 2012 to 2015, when surrounding housing prices generally fell by more than 20%, the housing price decline in the main areas on both sides of the Manzanares River (Arganzuela District and Usera District) remained stable within 20%. So, how does Madrid transform the negative urban space on both banks away from the river into a positive urban space embracing the river?

Most of the buildings around the Manzanares River were built in the 1960s and 1970s, lacking in accessibility and hardware facilities. Most of the businesses in the surrounding area are small businesses in the service industry, and the labor force participation rate in this area is lower than the average level in Madrid. Against this background, Madrid developed two main renewal strategies: (Burgos&Garrido, 2003)

Strategy 1: Building Restoration

For existing buildings, establish public subsidies for building restoration to improve safety, liveability, and accessibility conditions, involving nearly 30,000 residences. The core of this strategy is to divide the buildings within the renewal range into several grades according to the conditions of the building facilities and the current state of the landscape and carry out different degrees of renewal and improvement. Among them, there are not only the internal accessibility and environmental protection improvement projects of the building, but also the building facade improvement of the urban style, and the commercial space improvement of the regional revitalization.

Strategy 2: Regional revitalization

Designate the Urban Renewal Area (CRU) as the renewal engine, through the implantation of new functions, activate the vacant land and inefficient land use on both sides of the river, and enhance the economic vitality of the region. The strategy screened out 9 regeneration areas, involving 47 hectares of land.

Urban renewal in key locations

Based on the perspective of enhancing the city image, the space along the river is improved. After the completion of new roads, bridges, and other transportation facilities, the spaces on both sides of the river are fully activated, which also enhances the strategic significance of a series of spaces located at transportation nodes. (Burgos&Garrido, 2003)

CRU1: Improve the quality of space around the Matadero Cultural Centre and the fruit and vegetable market, strengthen the coordination with residents' daily life, and create a positive impact on the city's vibrant life.

CRU4: Improve the urban image portal at the intersection of major roads, strengthen the pedestrian continuity of the commercial space on the west bank of the river, and improve the spatial quality of the existing commercial space on the ground floor.

CRU5: Changing the image of the urban space between the Argentine Pedestrian Bridge and the Toledo Bridge. As the buildings in this area are old and the urban space is relatively dilapidated, it aims to improve the quality and image of the space through the reconstruction of building facades and the establishment of street parks.

Functional implantation in vacant areas

The improvement of traffic and the completion of the park have greatly enhanced the value of space along the river. Therefore, for the vacant land along the river, formulate new planning and operation strategies, and realize the value of the ecological environment through the implantation of new kinetic energy such as business, office, and residence. (Burgos&Garrido, 2003)

CRU2: Transform the vacant land after substation relocation into high-quality waterfront residences, providing facilities such as a gymnasium, sports field, tennis court, playground, adult swimming pool, and children's swimming pool.

CRU3: Implant new functions into the vacant land opposite the Matadero Cultural Centre and create a new waterfront interface by introducing commercial complexes and updating the facades of existing residences. CRU3 is a high-value area: located on the opposite bank of the Matadero Cultural Centre, and close to major traffic lines, with a high flow of people. In 2017, the 40,000-square-meter commercial centre Plaza Rio 2 was completed, accommodating 160 shops, restaurants, and entertainment facilities, providing about 1,800 local jobs.

CRU8: Give full play to the landscape value of the Madrid Riverside Park, activate urban idle land, build hotels and office space, and enhance regional value.

Existing function improvement or replacement

As the functions and images of the cities around the river continue to change, the functions of some surrounding plots are updated to meet the new positioning requirements. (Burgos&Garrido, 2003)

CRU6: Focusing on the renovation of the stadium, as the engine of regional development, the scope of influence will be extended to the surrounding plots and the opposite bank of the river.

The Vincent Calderón Stadium was originally the home of Atlético de Madrid. In 2018, with the official opening of Atletico Madrid's new home stadium, the Wanda Metropolitan Stadium, the Calderon Stadium was abandoned. Demolition of the stadium began in 2019 and is expected to be completed in 2021. After demolition, green spaces will be added, and commercial and residential functions will be implanted.
CRU7: Strengthen the connection between the block and the waterfront space, improve the commercial atmosphere of the block, and renovate the La Ermita shopping centre.

CRU9: The existing building groups are relatively closed and lack echoes with the river space. Open the waterfront interface through functional replacement.
The renewal plan is based on the core problems existing in the space on both sides of the riverbank, and through targeted improvement methods, a double leap in the quality and value of the regional space will be realized.

In summary, the establishment of the Madrid Riverside Park has opened a new chapter in the development of the city. This is not just an active investment in urban transportation and green space, but also a successful investment in the vision of urban development.

5.3 THE HAGUE CANALS

The Hague Canal, also known as The Hague Old Canal, is an artificial canal located in The Hague, Netherlands. Its construction began in the 14th century and was initially intended for the city's defense. The canal runs through the heart of The Hague, connecting the North Sea with the city's network of small rivers and canals.

Throughout history, the Hague Canal served as a vital transportation route for goods and people. It facilitated trade and shipping between The Hague and other Dutch cities and international ports. Visitors can admire numerous historic buildings, museums, theaters, churches, and charming canal houses along the canals of The Hague, offering a captivating glimpse into the city's rich history and culture.

Today, the area surrounding The Hague Canal has become a popular tourist destination. Visitors can enjoy leisurely cruises or rent bicycles to explore the picturesque canal-side path and immerse themselves in the beautiful surroundings. The canal area is dotted with cozy cafes and restaurants, providing delightful spots to savor a meal while overlooking the water. Although the Hague Canal no longer serves commercial traffic, it remains an integral part of the city's identity and continues to attract both locals and tourists who appreciate its serene ambiance.

In 2019, there were discussions about a project to revive The Hague's 17th-century canals, which were filled in the 20th century. This vision was developed by MVRDV in collaboration with local community organizations, aiming to rejuvenate a neglected section of the historic city center. The project sought to enhance sustainability, economy, transportation, and water management in the area, ultimately revitalizing the historic center and improving the city's overall infrastructure in a sustainable and economically viable manner.

Fig.17 Design Render
https://www.mvrdv.com/projects/407/the-hague-canals?photo=18487

Document available at link
https://www.mvrdv.com/projects/407/the-hague-canals?photo=18487

5.3.1 The MVRDV's project background

The Hague, unlike other Dutch cities, has never focused primarily on trade reliant on a central canal network, as it was established as a governmental center. Consequently, many canals were filled in between 1910 and 1970. In the 1970s, a section of the neighborhood was nearly demolished to make way for a highway. However, citizen activism successfully halted the demolition, albeit after significant damage was done to the once-intact canal area. In recent years, community activism has seen a resurgence.

In 2018, a community initiative called for the closure of two red-light district streets, which the city government agreed to. Encouraged by this success, residents set their sights on reopening the lost canals and promoting the ecological and economic aspects of the area. Local resident Shireen Poyck played a key role in uniting various community initiatives and stakeholders through her 'Grachten Open' (Canal Open) initiative. She involved Jan Knikker, a partner at MVRDV, in the project. MVRDV developed a vision for reopening the canals based on the work of the residents, with input from a study of historic canals conducted by local firm BAU architects.

Document available at link
https://www.mvrdv.com/projects/407/the-hague-canals?photo=18487

The restoration plans involve reopening the main canals and reviving smaller canals that had become dead ends or disappeared due to underground works or buildings. Each of these canal stubs is intended to serve as an urban activator, and proposals include concepts such as swimming canals, koi canals, and even surf canals, aligning with The Hague's ambition to become a sports city.

Architect and MVRDV founder Winy Maas emphasized the importance of neighborhoods like The Hague's Old Center in shaping the city's identity and attracting tourism, noting that this area has somehow been forgotten. The project presents a unique opportunity for urban regeneration, improving the local economy, and making strides in the urban energy transition.

The challenges of incorporating tramlines and other infrastructure into what was once a canal received special attention. While The Hague has some experience in canal restoration, with a small stretch of canal already repaired and transformed into a combination of car parks, open water, and dining areas, the complex underground parking situation led MVRDV and the local community to focus on keeping the plans simple and realistic.

5.3.2 The project objectives

The reopening of The Hague Canal aims to enhance the city's sustainability, social interaction, and urban vitality through the transformation of the disused canal into a multifunctional urban space. The project seeks to achieve the following objectives:

Enhanced Urban Vitality: The reopening of the canal will inject new life and vibrancy into the heart of The Hague. It will create a welcoming environment that caters to the needs and desires of both residents and visitors. The revitalized canal area will offer inviting spaces for relaxation, socialization, and entertainment, contributing to the overall vitality and attractiveness of the city.

Social Interaction: The reopened canals will serve as gathering places for people to meet, connect, and engage with one another. The pedestrian-friendly paths, cycling lanes, and recreational areas along the canal will encourage outdoor activities and foster community interaction. This social aspect of the project aims to strengthen the sense of belonging and promote a lively and inclusive urban environment.

Sustainability: The reopening project aligns with The Hague's commitment to sustainability. By repurposing existing structures such as disused railway bridges, the project minimizes the need for new construction, thus reducing resource consumption and energy usage. Additionally, the emphasis on pedestrian and bicycle infrastructure promotes sustainable modes of transportation, contributing to the city's efforts in creating a more environmentally friendly urban landscape.

Urban Image Shaping: The reopened canal will become an iconic landmark and a distinctive feature of The Hague's urban fabric. It will contribute to shaping the city's image and identity, attracting more tourists and residents alike. The revitalized canal area will offer a unique and visually appealing urban space, adding to the overall attractiveness and charm of The Hague.

In summary, the reopening of The Hague Canal aims to create a sustainable, socially engaging, and visually captivating urban environment that enhances the vitality and image of the city.

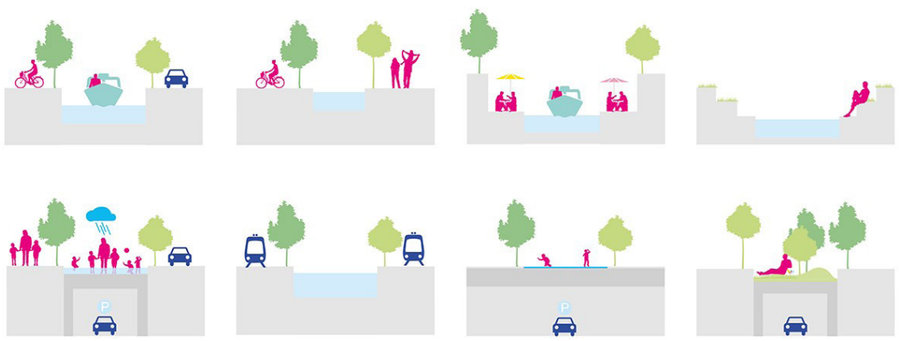


Fig.18 project concept
https://www.mvrdv.com/projects/407/the-hague-canals?photo=18487

Fig.19 project design analysis
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Fig.20 design before
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Fig.21 design after
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Fig.22 design before
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Fig.23 design after
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Fig.24 design before
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Fig.25 design after
https://www.mvrdv.com/projects/407/the-hague-canals?photo=18487

5.3.3 The similarities and differences between the Hague Canal and the Milan Naviglio Canal

The canals in The Hague and Milan share some commonalities but also exhibit notable differences. Here are their key similarities:

Historical Significance: Both the Hague and Milan boast canals with a long history. These waterways were historically utilized for commercial transportation and played a vital role in connecting cities and regions.

Cultural and Tourist Attractions: The canals in both cities have evolved into significant cultural and tourist destinations. They captivate tourists and residents alike, offering a captivating ambiance to appreciate historical architecture and scenic views, and engaging in water activities.

Nevertheless, there are distinct differences between the canals in The Hague and Milan:

Size and Length: The canals in The Hague are relatively smaller and shorter in length, primarily traversing the city center. Conversely, Milan possesses a more extensive canal network, comprising numerous main and tributary canals, spanning a larger area.

Function and Usage: Presently, The Hague's canals serve predominantly as recreational and aesthetic spaces, no longer utilized as commercial corridors. In contrast, some of Milan's canals still serve a practical purpose, facilitating freight and transportation within the city.

City Style and Environment: The Hague, located in the Netherlands, showcases unique Dutch architecture and style. Milan, an Italian city, embodies distinct Italian architecture and cultural ambiance. Consequently, the surroundings and urban characteristics surrounding the canals differ between the two cities.

In summary, the canals of The Hague and Milan hold significant importance within their respective cities, providing residents and visitors with distinct experiences. These waterways possess remarkable qualities in terms of history, culture, and tourism, exemplifying the distinct charm of their respective regions.

5.3.4 Conclusion

By studying the reopening of The Hague Canal, we can draw inspiration for designing the park around the Milan Canal to achieve a similar effect. Here are some refined design ideas:

Creating versatile spaces: In the park design, we can envision the area around the Milan Canal as a multifunctional urban space. Taking a cue from The Hague, we can plan pedestrian paths, cycling lanes, and other amenities that cater to walking, cycling, and leisure activities, providing people with a variety of options for outdoor recreation.

Promoting social interaction: Designing public squares, open-air cafes, and other social spaces that are connected to the canal can encourage people to engage and interact with one another. Installing seating areas, outdoor lounges, and other facilities in the park can provide people with spaces to relax and socialize.

Emphasizing ecological sustainability: Placing a focus on ecological sustainability in the park design around the Milan Canal is essential. Similar to The Hague, we can prioritize the preservation and expansion of green areas, planting trees and flowers to offer natural shade and picturesque views. Additionally, employing sustainable design principles and using environmentally friendly materials can encourage sustainable behaviors and promote environmentally conscious transportation options to foster the park's sustainable development.

Incorporating cultural elements: The park design around the Milan Canal can incorporate local cultural elements to highlight Milan's unique cultural and artistic style. Consideration can be given to art installations, cultural display areas, outdoor performance venues, and other features that provide visitors with artistic and cultural experiences.

Integration with the city: Similar to The Hague's approach, integrating the area around the Milan Canal with the rest of the city is crucial. This can involve establishing seamless connections with surrounding streets and squares, providing convenient transportation options and accessibility, and making the park an integral part of the city center.

Overall, by applying the lessons learned from the reopening of The Hague Canal, we can focus on creating versatile spaces, promoting social interaction, emphasizing ecological sustainability, incorporating cultural elements, and integrating the park with the city. This will result in a vibrant, inviting, and engaging public space that offers a unique experience for both residents and visitors.

5.4 THE OUTCOMES AND RELATIONSHIPS AND OUR DESIGN PROPOSAL

Through the analysis of the Navigli Canal in Milan and the Rio Riverside project in Madrid, we can realize the great contribution of urban rivers to the landscape, and the importance of urban rivers to water resources, nature conservation, and recreation. In addition, rivers also have certain environmental, social, cultural, and economic values.

Rivers serve many functions such as providing connections between landscapes and communities, they also gather people around the same ideas of a creative and sustainable environment. All sectors of society as well as private and public stakeholders should be involved in the development of river management plans to find effective solutions for the use of natural resources.

Ecological goals and economic development goals should be mutually beneficial and win-win. Public and private developments create a sense of connection and stewardship for the river by drawing people to the waterfront to live, dine, shop, relax, play, and participate in cultural events. Healthy and well-functioning river systems are attractive to residents and businesses. A society that enjoys the features and activities of the riverfront also cares about the long-term sustainability of the river system. Communities have begun to understand the appeal of a more natural riverfront to residents and visitors. In addition to the tourism advantages, there are several other benefits including cost-effective flood protection, improved water quality, lower infrastructure costs, and increased property values and tax base.（Bülent Cengiz, 2012）

Protect and restore the character and function of natural rivers. Rivers provide some vital natural benefits to the areas in which they are located and must therefore be protected. Natural features such as meanders, backwaters, wetlands, and gentle banks of rivers have important ecological functions. (Bülent Cengiz, 2012) There are also benefits for residents, such as cleaner water and flood storage. Restoring these features may not be possible in many urban areas, but even a little effort can have positive effects. Environmental improvements can be achieved in even the most affected rivers.

There may be several barriers, including physical, political, social, and economic, to overcoming and increasing public use and enjoyment of these public resources for riverfront projects. There have been many successful projects designed to include spaces dedicated to parks, walkways, marinas, and special events such as concerts and festivals. In a good riverfront design, the needs of all neighborhoods, ages, and cultures in the community should be considered. Community members should be able to experience the river up close. In turn, these physical and visual experiences will help create vibrant and diverse places that encourage a sense of community and an appreciation for nature.

At times, urban waterfronts can present conflicts of interest. Recreational trails and wetlands are often linked to waterfront condominiums and port facilities. It is not always possible to pay particular attention to economic development and environmental issues of urban river banks. Judging from the current structure, only a few cities can truly create a completely natural river environment. On the other hand, riverfront developments aimed at enhancing the economic life of the city should not exclude natural features, damage composite riverfronts, or limit public access. Riverfront communities should also take advantage of integrating and balancing ecological, social, and economic concerns.

The design and planning process for a riverfront should involve a broad range of community members. This process should expand beyond the identification of traditional stakeholder groups and include communities that may not have used the riverfront in the past. Different communities and constituencies may have different needs. Riverfronts can be designed to be more lively, inclusive, and successful if these different priorities are considered. (Bülent Cengiz, 2012) Local officials, developers, and planners should be involved in public meetings to ensure everyone is targeting the same vision and that all important ideas are known.

Any river city has a unique relationship and nested history with its river. The riverfront should have a special feel and look that relates directly to the city's history and inspires and celebrates the city's character. Every city has its unique cultural 31memory, and the formation of a city's culture is inseparable from factors such as its geographical location. The regional characteristics of the city reflect its distinctive regionality and have different landscape characteristics from other regions. Landscape regional characteristics can not only show the inherent natural landscape of the region but also continue the context of human history. The humanistic feature of the landscape is the natural continuity of the city's character. If the city loses the unique imprint of humanity, the city's characteristics and vitality will disappear. The humanistic characteristics of the landscape affect the development of the city from all aspects of the city and continue the life of the city. Everyone who lives in the city needs to gain a sense of belonging in places with rich memories such as the streets they pass by, the houses they live in, and the families they live in. Once we blindly reject the past and abandon traditional cultural factors in the process of urban development, the cultural landscape of the city will disappear in the precipitation of history, and the significance of the city will be ignored. Residents should know that the rivers in their cities give their areas their character and provide their areas with wildlife habitat, recreation, drinking water, and employment opportunities. Once residents appreciate these values, they become advocates for protecting and restoring the riverbank.

Convenient transportation is a necessary condition to attract people to the river. Another important point is the visual connection to the river from the nearby commercial and residential areas. Physical and visual access should not be limited to selected communities or businesses along redeveloped rivers. Riverfronts may offer many recreational uses, such as biking and viewing. Riverfront communities should be provided with areas or facilities that offer multiple possibilities for use.

Whether wading, fishing, boating, or sitting by the river, people should be allowed to engage and interact with the river at appropriate locations. Economic revitalization projects on the riverfront, such as new developments mixed with housing, restaurants or cafes, and open spaces, become more successful when visual and physical access to the water is included.

Riverside is rich in human and natural history. Information and wayfinding systems can define the river, its environment, and how the history of the river and the city are connected. Certain activities such as educational and cultural programs, performances, and public art events can be organized to draw people to the river.

Ecological education is especially important along urban rivers, where most ecosystems have been destroyed in their original form. Because of their active and visually rich environment, rivers can be used as powerful tools for science and nature education. Raising public awareness of the river and its natural systems will provide an awareness of stewardship and a connection to the history of the river.

With the development of society, people's spiritual needs are getting higher and higher, and they yearn for a harmonious coexistence with nature. The existence of the riverside scenic spot eliminates the boredom, panic, and anxiety of people in the city about high-rise buildings, vehicle exhaust, and noise emissions. The design goal of the riverside scenic spot is to create a comfortable living environment, let people return to nature, experience the fun of natural ecology, and promote ecologically sustainable development. The integration of ecologically sustainable development and urban planning and construction makes the city as a whole give people an aesthetic appreciation, reflecting the harmony and unity between human beings and nature. In the process of riverside landscape design, facing the endangered environment, we should strengthen the awareness of protection, vigorously promote the construction of urban landscape green space systems, minimize the traces of artificial design, fully display the charm of nature, and at the same time give people a feeling of good urban ecological environment and liveable environment.

With the development of society and the economy, people's spiritual needs and requirements for quality of life are constantly improving. The riverside landscape design needs to update the design concept, and fully embody "people-oriented" in the design concept. The riverside landscape planning and design make people pay more attention to the protection of water resources and realize the importance of sustainable development in landscape design. Riverside governance will no longer focus solely on flood control and drainage, and its landscape and ecological efficiency will be valued and studied by more people.

PART.3

06

THE DESIGN PROPOSAL

6.1 THE MAIN DESIGN REFERENCE TO ADDRESS OF THE PROJECT'S AIM

6.1.1 Site Analysis

In the early stage of the project, we got a preliminary understanding of the site through field surveys and visits.

First, we investigated the public facilities around the park, and we found that the park is surrounded by many historical places of interest. These include 4 churches (Basilica di Sant'Eustorgio, Portinari Chapel, Basilica di San Lorenzo Maggiore, Parrocchia Ortodossa Romena - Parohia Ortodoxă Română), a museum (Museo Diocesano). The monuments are dominated by ancient Roman architectural styles. The middle of the park is bisected by a main road. The Milan government plans to reopen the canal here and build a new subway line (Metro Line 4) to facilitate travel for tourists and city residents.

The Navigli district is one of the trendiest and most picturesque in Milan, where the lively spirit coexists with its alleys' intimate and silent atmosphere. Located southwest of Milan, the Navigli district begins from Porta Ticinese, where the Darsena is located, the ancient port of Milan and today the heart of the district, from which the Naviglio Grande and Naviglio Pavese courses depart.

The navigable canals crossed by small bridges, the alleys overlooked by the typical riviera houses, underground fashion shops, antique dealers' shops, art studios, bookshops, and many bars, Italian and ethnic restaurants, and countless clubs which enliven the evenings of Milanese and those passing through the city... the Navigli is one of the trendiest and most picturesque districts of Milan, where the young and lively spirit blends with the cozy atmosphere similar to that of a small town.

Animated by day and night, the neighborhood is always in the heart of the Milanese. In addition to the nightlife, some historic events organized by the Naviglio Grande Association are held here: the Mercatone dell'Antiquariato (every Sunday of the month), Fiori e Sapori sul Naviglio Grande (in spring and autumn), and Arte sul Naviglio (in May) has always been a must to browse through the many stalls and, in the meantime, stroll in this corner of Milan.

Then every Saturday, on the bank of Ripa di Porta Ticinese, towards via Valenza, the famous Fiera di Sinigaglia is held the most famous and oldest flea market in the city, of which traces date back to the 1800s.

At Christmas, the Naviglio Grande becomes one of the most evocative areas of the city to immerse yourself in the festive atmosphere, thanks to the lights that shine on the water and create an enchanted atmosphere.

Secondly, there are 3 schools around the park, including elementary, middle, and university. This means that the young crowd will breathe new life into the park. The park is not only a leisure place for the elderly and the surrounding residents, but also a sports playground for young people and children.

After analyzing the distribution of public facilities around the site, we randomly conducted an inquiry survey on the people around the site. The aim is to learn more about people's needs in and around the park.

Map.26 Site survey

Map.26 Prepared by the author

6.1.2 Introduction

As previously mentioned, the competition organizers asked the participants to revive the "water city charm" of Milan, participants were tasked with conceptualizing the future of Milan and envisioning a symbiotic relationship between the city and the Navigli Canal and had to develop a plan and strategy for reopening the entire 8 km long navigable canal path. While focusing on environmentally friendly design, mobility, and the relationship between water and urban space.

After the urban strategy, it was necessary to select one of the eight given plots to be designed. After an overall urban analysis of Milan and a specific analysis of the surroundings of each site, we decided to choose Parco Giovanni Paolo II (formerly known as Parco delle Basiliche.)

This site has an absolute geographical advantage and a rich historical background. First, the canal crosses the park horizontally, secondly, it has the strong humanity advantage which is close to the archaeological park on the left and to the University of Milan on the right, meanwhile just 650 meters from Darsena di Milano. In addition to the excellent geographical advantage, this park is surrounded by four important historical buildings, whose history originates as early as the 4th century.

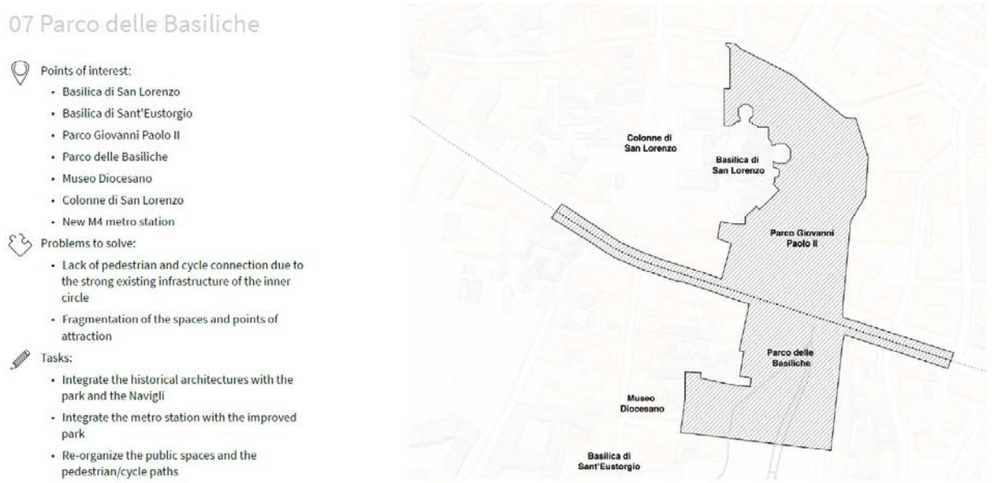


Fig.26 Milan Navigli Canal Challenge
https://architecturecompetitions.com/naviglicanalchallenge/brief

After the above-mentioned analysis, in our design, we wanted to reach those goals.

1. Strengthen the connection between the canal and the public space of the park

2. Strengthen the connection between the historic buildings in the park

3. Strengthen the connection between the subway station and the park

4. Reorganize public spaces and walking/biking paths

5. Enriching the functions of the park

To achieve the above goals, we conducted a detailed data collection covering three aspects of Milan Park design, canal development feasibility, and sponge city design, and considered them from various perspectives, including economic and traffic. These cases were used as a reference point for our design, both to provide solid mathematical modeling support for our proposal and to fully incorporate citizen input as a basis for the design. As a result, our design was able to demonstrate feasibility as well as scientific validity.

6.1.3 Project Objectives

For the urban strategy of Milan, we decided to intervene and provide solutions in four areas: opening the canals, traffic, greenery, and landmarks.

The canals: the gradual zoning of the 8 km canals and the creation of bicycle paths along the river enhance the continuity of the urban area, aiming to revive the charm of the water city of Milan.

Transportation: from mixed traffic - Less car - no car city, in addition to the bike paths along the river, a closed loop of urban bike paths will be created, allowing the whole city of Milan to be explored by bike. This will not only reduce the number of carbon emissions in the city but also help to achieve the goal of carbon neutrality.

Greenery: a cycling boulevard along the 8 km canal.

Landmarks: With the established bicycle system, it is possible to reach any one of the important landmarks within the Milan metropolitan area in a maximum of 10 minutes.

In the design of the park, our design objectives were as follows.

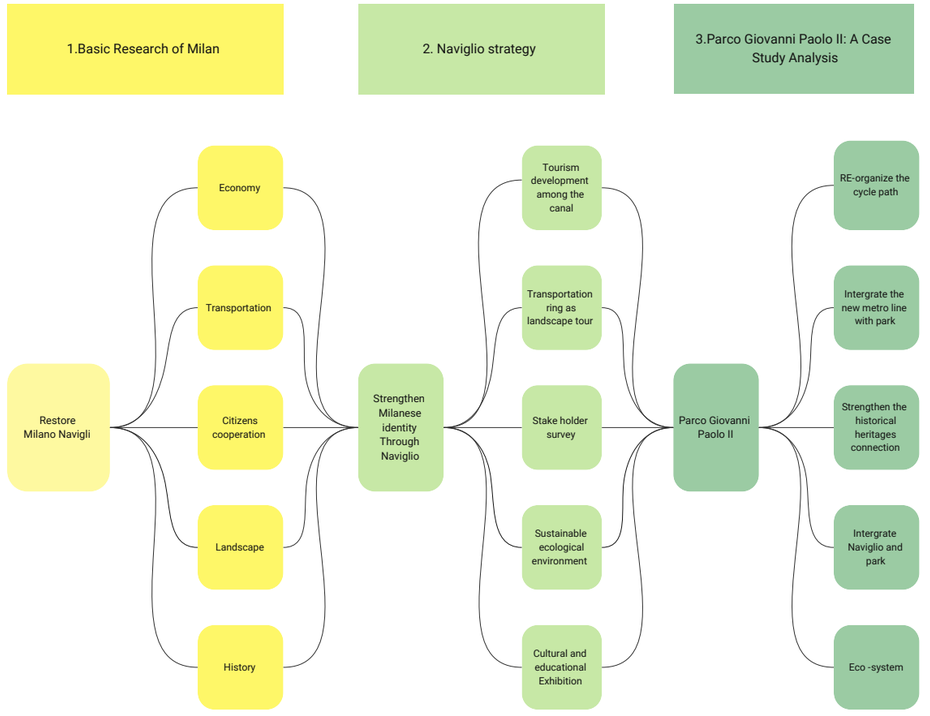
1. To reorganize and design the cycling paths through the whole park as well as connect the archaeological park next door.

2. Strengthen the connection between the museum and the park utilizing enhanced exhibitions.

3. Address flooding issues using sponge city strategies.

4. Enhance the comprehensive park ---- to create a rain garden with educational functions.

Map.27 Project Objectives



Map.27 Prepared by the author

6.1.4 Challenges

Economic Feasibility of Opening the Canal

The COVID-19 pandemic further exacerbated Italy's economic difficulties. the country was severely affected by the health crisis, leading to lockdown measures and a sharp decline in economic activity. And there are expectations for each section of the canal.

With the support of the government, and by searching for papers, we obtained that the collective benefits of opening the canal and urban renewal would be approximate twice the estimated construction costs, thus proving that the project is socially feasible. However, this does not necessarily mean that the project will result in financial benefits. The public sector needs to determine the financial resources needed to subsidize the project, which could potentially be obtained through a one-time tax on the increased value of the property. (2017, Boscaccia,)

How to keep the original function of the park.

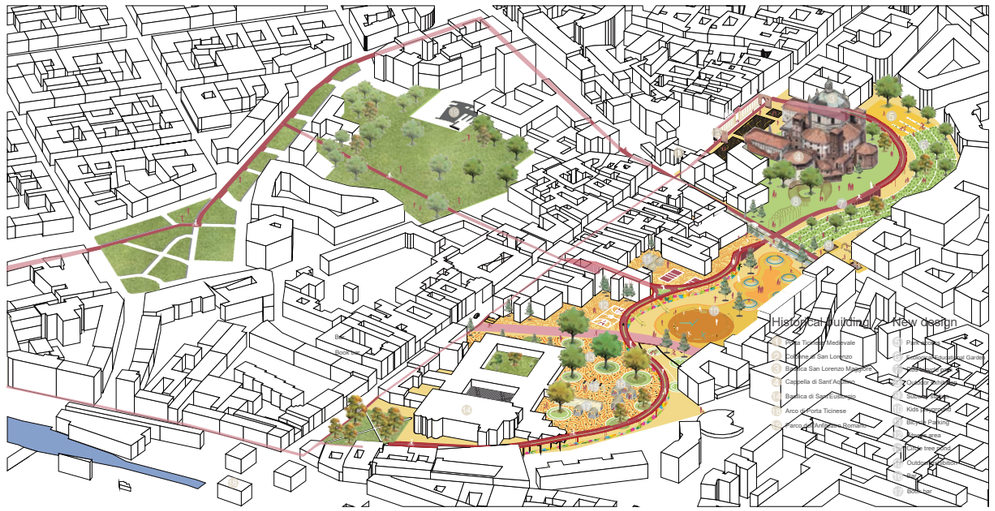
In the design of the project, we went through three important steps: designing the bridge - keeping half of the bridge - and removing the bridge to keep the original quiet and peaceful function because this park is a supernatural park that brings inner peace to nearby residents.

At the very beginning, we wanted to design an above-ground bicycle track inside the park, combining modern design with historical buildings, not only to provide a good cycling environment but also to allow people to observe the whole park from different heights. In the further design, we understood that around the historic buildings, there was a need to keep enough blank areas that would not block the historic buildings to protect the view of the historic buildings. Since the lower half is mainly the back of the new building museum as well as the church, where half of the church façade is still covered by the museum, we decided to keep the lower half of the bridge.

Map.28 The first site plan

Map.28 Prepared by the author

Map.29 The first site axonometric



Map.29 Prepared by the author

After the redesign, we found that even if only the lower part of the bridge was preserved, it was still too close to the church and the museum. In addition, and most importantly, the park is seen as an extremely peaceful and natural place. The introduction of modern design elements would have destroyed the original tranquil atmosphere. In today's modern cities, having a peaceful park where people can find inner peace is undoubtedly extremely valuable. Therefore, we decided to keep the bike path flowing but remove the bridges so that all bike paths are on the ground.

Map.30 The second site plan

Map.30 Prepared by the author

After the removal of the bridge, we originally created plots for three functional areas around the museum, proposing to complete the interior of the park, but found that the distance to the museum was too close and we intended to move it to the upper part in order to protect a wide enough pedestrian area at the entrance of the museum.

Ensure the park's original function

During our research, we found that the green area of the whole park is very large, and people can enjoy nature inside the park, but the park is single inside, especially lacking service facilities.

Flooding in Milan

Due to climate change, Italy is facing more and more climate challenges this year, including floods, especially the Bologna flood in May, which caused a lot of casualties and property damage.

According to the research, there are 407 properties in Milan that have greater than a 26% chance of being severely affected by flooding over the next 30 years. This represents 45% of all properties in Milan.

The environmental impact of flooding in Milan cannot be ignored. Flooding events can lead to water contamination and damage to local ecosystems in addition to property damage. Therefore, it is one of the challenges we are facing to make use of the park's disaster prevention function to resist the risk of natural disasters.

Docume nt available at link
https://riskfactor.com/city/milan-illinois/1749009_fsid/flood

Map.31 The Final site plan

Map.31 Prepared by the author

6.1.5 Design references

In the design, we focused on the Chinese sponge city concept and the article "Public participatory mapping of cultural ecosystem services: Citizen perception and park management in the Parco Nord of Milan (Italy)."

Introduction to sponge cities:

“The so-called sponge city is to give full play to the original topography of the rainfall accumulation role, give full play to the natural substrate and ecological substrate on the infiltration of rainwater, give full play to vegetation, soil, wetlands, etc. on the natural purification of water quality, so that the city like a "sponge", the rainwater has the absorption and release function, can resiliently adapt to environmental changes and respond to natural disasters.”

Urbanization and the construction of various gray infrastructures have led to the destruction of vegetation, soil erosion, increased impervious surfaces, fragmentation of river and lake water bodies, and interruption of surface water and groundwater connections, which have greatly changed the hydrological conditions such as runoff confluence, with a general trend of accelerated confluence and high flood peak values. The runoff volumes of many rivers have changed dramatically in the last 50 years, while the construction of dikes has led to significant decreases in runoff volumes in most rivers.

Document available at link
https://www.gov.cn/xinwen/2015-10/09/content_2944151.htm

Fig.27 The Green Sponge System of Zhongguancun Life Science Park
Yu Kongjian, Zhang Dong, Li Xianghua, et al. The Planning for the Life Science Park in Zhongguancun, Beijing[J]. City Planning Review, 2001, 25(5): 76-80.

Fig.28 The Green Sponge System of Qiaoyuan Park in Tianjin City
Yu Kongjian, Shi Chun, Wen Hangjian. Tianjin's Case: Design Blueprint of the Qiaoyuan[J]. Architectural Journal, 2006 (5):80-81.

Similarly, Milan is also exposed to a great risk of flooding. As we mentioned earlier in the chapter, the artificial canals, and natural rivers within the city of Milan lack a natural buffer zone, and when flooding occurs, not only do they face loss of life and property, but also environmental problems such as land loss, destruction of animal habitats, and the spread of disease. In this case, the canal risks associated with dredging the canal are also necessary factors that must be considered in our design.

Practice Cases include the Zhongguancun Life Science Park in Beijing in 2000 (Figure 26), which was designed with a green space system using artificial wetlands to collect rainwater and purify medium water, and was called the cell of earth life ; and the Tianjin Qiaoyuan wetland system in 2007 (Figure 27), which formed a bubble-shaped ecological sponge through simple filling and excavation to collect rainwater and solve urban flooding while carrying out urban ecological restoration of brownfields, and play an integrated ecosystem service.

After understanding the practical scope and working principle of sponge cities in China, we decided to take the excess water in the park to be absorbed by the green space and discharged into the canal, as well as the municipal pipeline to solve the problem.

Also, in the thesis, in this thesis, Milan North Park took a referendum to rank the residents' expectations of local parks. In the ranking of these expected functions, the educational function was ranked first by the citizens.

After this conclusion, we decided to combine the educational function and the sponge city for the surrounding elementary schools and for the people who visit the park.

Document available at link
Milliman J D, Farnsworth K L, Jones P D, et al. Climatic and Anthropogenic Factors Affecting River Discharge to the Global Ocean, 1951-2000[J]. Global and Planetary Change, 2000(62): 187-194.

6.2 DESIGNING THE PROJECT: KEY DESIGN CHOICES AND FRAMEWORK

6.2.1 Confirm the target

The construction of the Milan Canal dates to the Middle Ages and is thousands of years old. After a long struggle against the Holy Roman Empire, Milan finally became a free city-state in the 12th century, when it decided to connect the moat that surrounded the city walls with a network of irrigation rivers built by religious organizations such as the Cistercians and the Humbles. But with the industrial revolution and the advent of more convenient means of transportation, the Milan Canal gradually fell out of sight.

The planning of the Milan Canal has a crucial role to play in reintroducing the charm of the Milan Canal and improving the quality of life in the city. This paper explores step by step the process of how to open the canals and establish connections between cities, and how the transportation, greenery, and infrastructure around the canals will develop in the next 50 years. Among the plots given by the organizer, the representative ones with human and geographical advantages are selected and designed in detail, elaborating how the urban strategy can be applied to the plots to achieve the purpose of revitalizing the canals, strengthening the urban connections, and improving the infrastructure.

6.2.2 Stakeholder

Identifying stakeholders in urban design and understanding their needs can efficiently design functional spaces according to their needs.

In order to accurately get the stakeholders and their needs, we adopted both questionnaires and on-site research. The contents of the questionnaires are as follows.

1. What is your identity?
-1. Local resident
-2. Students in the neighborhood
-3. Visitor
-4. Nearby worker

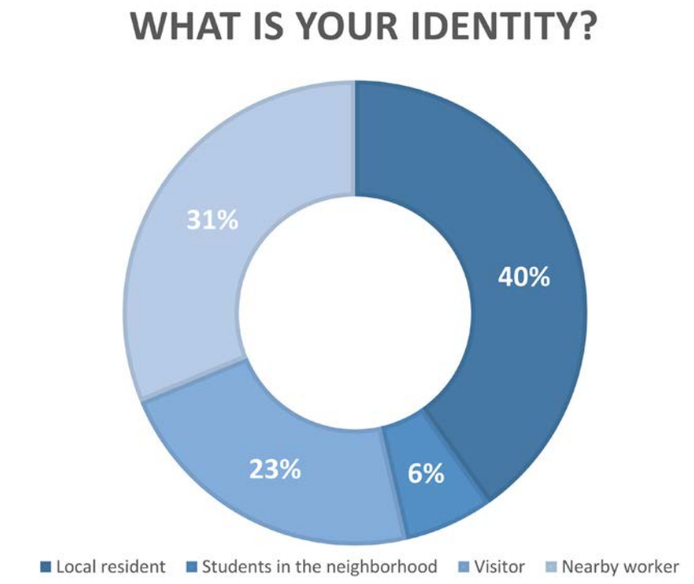
2. How often do you come to the park?
-1. Every day
-2. 2-3 times a week
-3. Once every two to three weeks
-4. Once a month

3. How long do you usually spend in park?
-1. 10 minutes or less
-2. 10 minutes to half an hour
-3. half an hour to 1 hour
-4. 1 hour or more

4. What do you usually do in the park?
-1. Exercise
-2. Walking
-3. Communicating
-4. Eating a meal
-5. Spirituality and religion

5. Rank the parks according to your preferred function
-1. Ecological education
-2. Cultural heritage
-3. Spiritual and religious
-4. Recreation
-5. Exhibition

Map.32 Question 1



Map.32 Prepared by the author

Based on the provided data, we can draw the following conclusions:

Identity of Park Users:

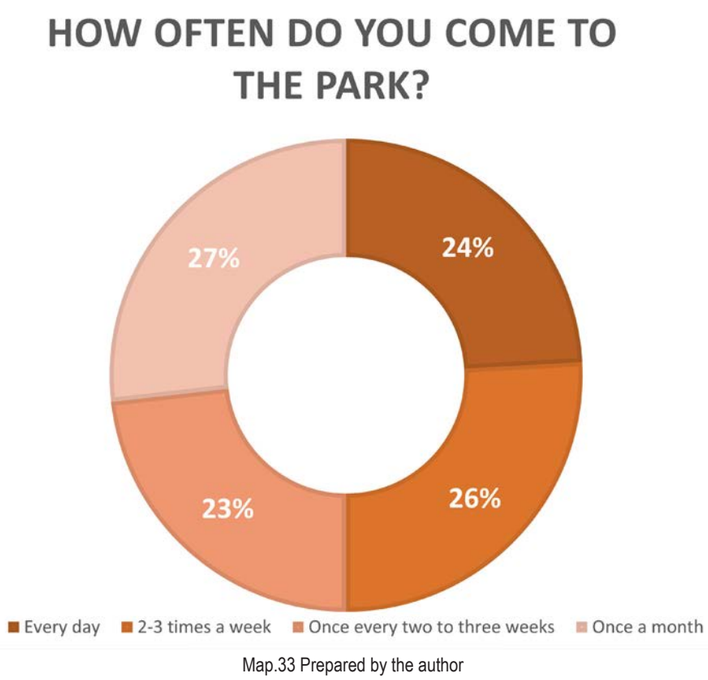
The majority of park users (40.18%) are local residents, indicating a strong sense of ownership and connection to the park.

Visitors (22.32%) play a significant role in park utilization, highlighting its appeal to tourists and individuals from outside the neighborhood.

Nearby workers (31.25%) also contribute to the park's user base, likely utilizing it during their break times or after work.

Students in the neighborhood (6.25%) represent a smaller portion of park users, suggesting that the park may not be their primary recreational or socializing space.

Map.33 Question 2



Map.33 Prepared by the author

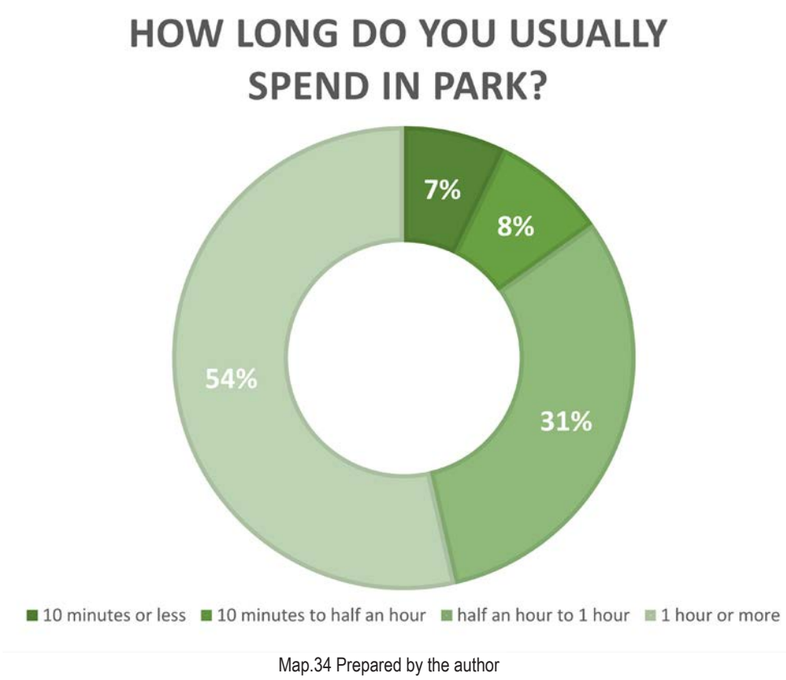
Frequency of Park Visits:

The data shows a fairly even distribution in terms of park visit frequency, with the highest percentage of respondents (26.79%) visiting once a month.

A significant portion of users (24.11%) visit the park every day, indicating a regular and frequent utilization of the park as part of their routine.

The remaining respondents visit the park 2-3 times a week (25.89%) or once every two to three weeks (23.21%).

Map.34 Question 3



Map.34 Prepared by the author

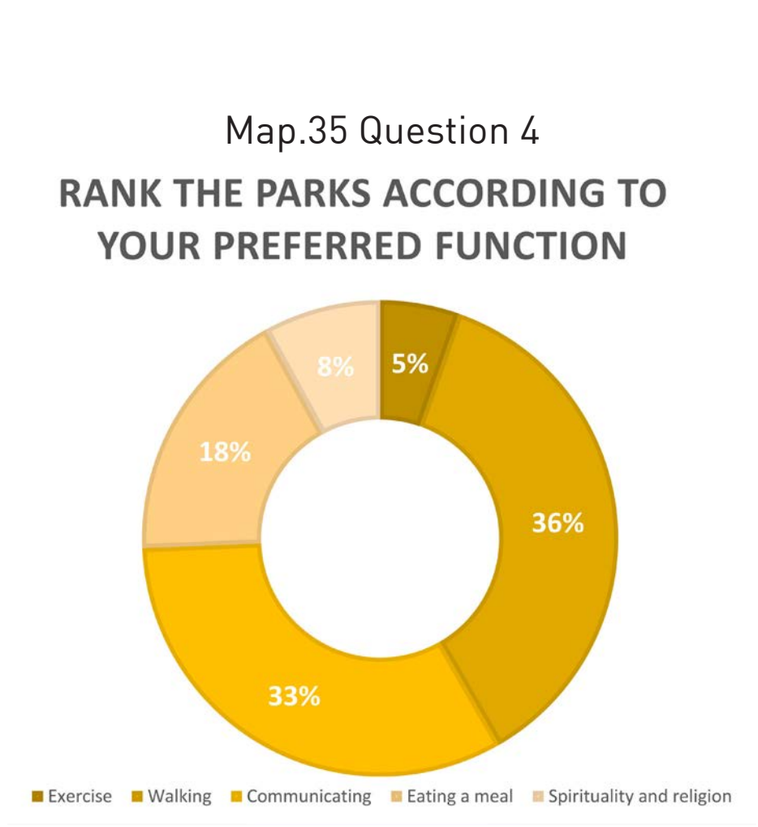
Duration of Park Visits:

The majority of park users (53.57%) spend one hour or more in the park, indicating a preference for longer stays and engagement in various activities.

A significant percentage of users (31.25%) spend between half an hour and one hour in the park, suggesting a balanced level of utilization.

A smaller percentage of users spend 10 minutes or less (7.14%) or between 10 minutes and half an hour (8.04%) in the park, indicating more brief visits.

Map.35 Question 4



Map.35 Prepared by the author

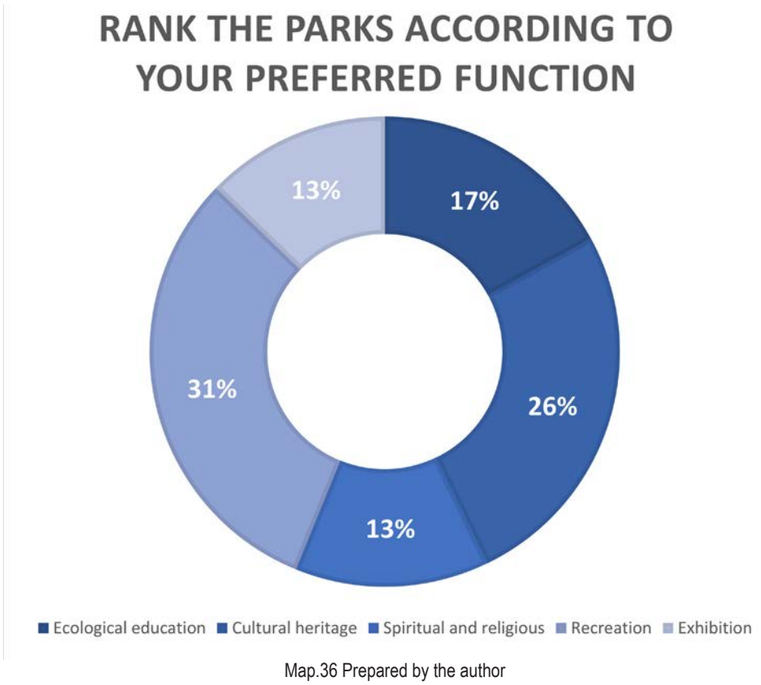
Activities in the Park:

Walking is the most common activity reported by park users (36.29%), emphasizing the importance of the park as a recreational and leisure space.

Communication and social interaction (32.71%) play a significant role, highlighting the park's role as a gathering place for individuals to connect and engage with others.

Eating a meal (17.64%) and spirituality/religion (8%) are also mentioned as activities in the park, indicating the park's versatility in accommodating various needs.

Map.36 Question 5



Map.36 Prepared by the author

Preferred Functions of Parks:

Recreation ranks as the top preferred function of the park (31.71%), reflecting the significance of providing spaces for leisure, sports, and relaxation. Cultural heritage (26.29%) is also highly valued by park users, suggesting an appreciation for the park's historical and cultural significance. Ecological education (17.36%) and exhibition (13%) are moderately ranked, indicating an interest in environmental awareness and educational opportunities. Spiritual and religious functions (13.64%) are mentioned by a smaller portion of respondents, showing a niche preference for such activities in the park.

The data indicates that the park attracts a diverse range of users. It is visited with varying frequency and duration, with a preference for longer stays. The park is primarily used for walking, socializing, and engaging in recreational activities. The preferred functions of the park include recreation, cultural heritage, and ecological education. These findings can guide the design and management of the park to better cater to the needs and preferences of its users, promoting a prosperous and sustainable park environment.

First of all, in the field research, we found that the stakeholders of the park are mainly composed of the following personnel: Real estate developers, Office workers, government, Patients, Pet owners, Students, shop owners, Sports enthusiasts, Local residents, and Tourists. We interviewed them and got their demands for the park in the following aspects: Better park environment, Increase economy, Better cultural experience, Public recreational facilities, Time efficiency, Traffic efficiency, Connected public space, and revitalizing Milan's water city culture.

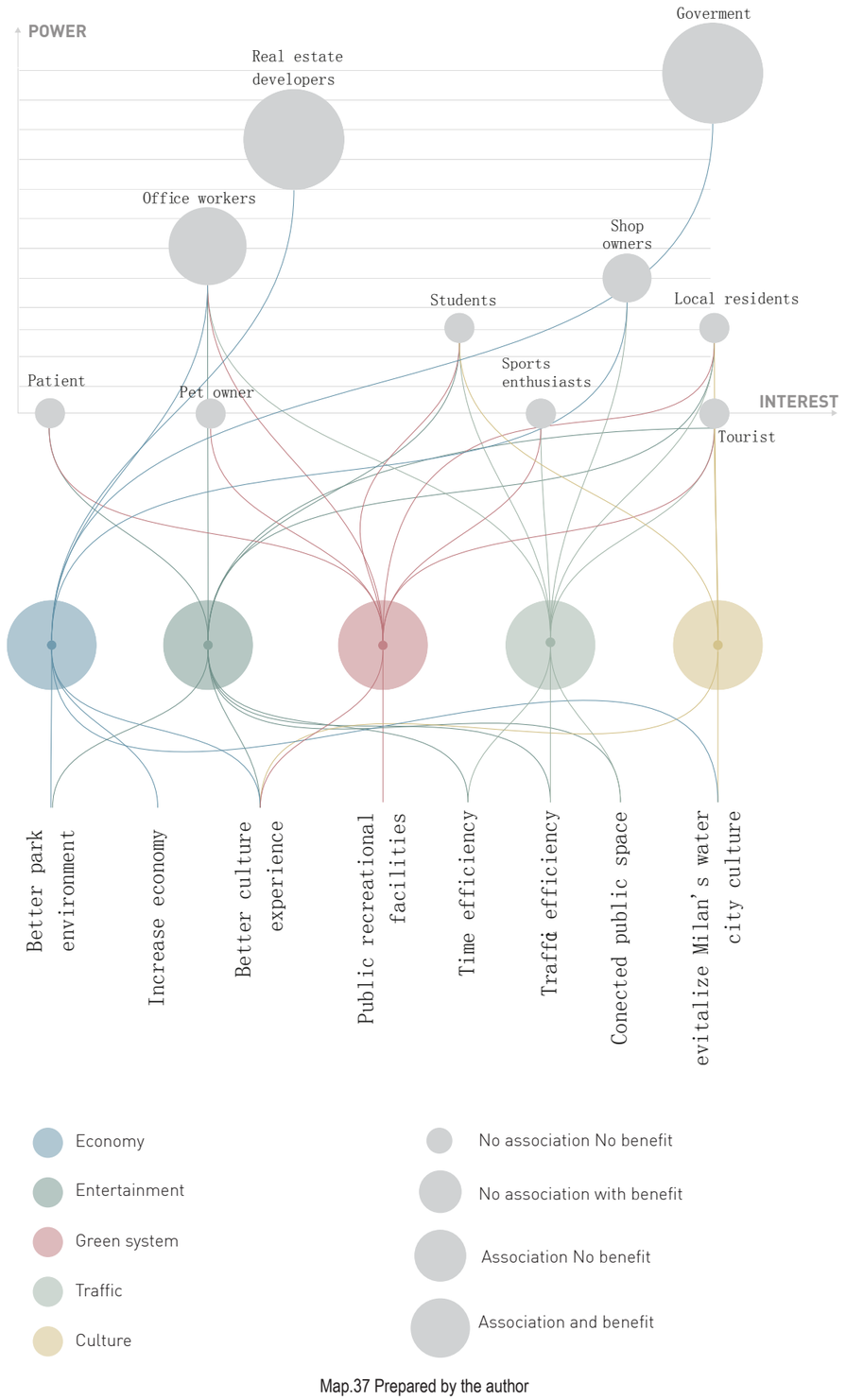
The stakeholder map analysis shows that the big winner is the government, which has the highest interest and gains the most benefit for the redevelopment of the Naviglio Canal, while ranking second in terms of interest in this project, with the support of the store unions, is the surrounding stores with relative high benefits, as the construction of the metro station and the subsequent development of tourism can stimulate.

The third-ranking is for the local residents, as the development of the surrounding environment will contribute to the physical and mental health of the residents and the tourists who come to visit the city follows up, who generally stay in a city for a short period, in the range of 4 to 5 days. So they will not have much power.

This project has great potential but is also located in a prime location, so it is of great interest to developers, followed closely by office workers. Then there are sports enthusiasts, pet owners, and patients.

In summary, the main target groups for the project are students, tourists, local residents, sports enthusiasts, and stores. The scope of all their activities is directed toward historical buildings and canals.

Map.37 Stakeholder Map



Map.37 Prepared by the author

6.2.3 How to implement the strategy

After defining the stakeholder needs and design goals, we had a clearer blueprint in our mind- we wanted to create a natural park that would show the charm of the canal, with a good traffic system and bring inner peace to the users.

Design concepts

The shape of the park was generated by the following steps:

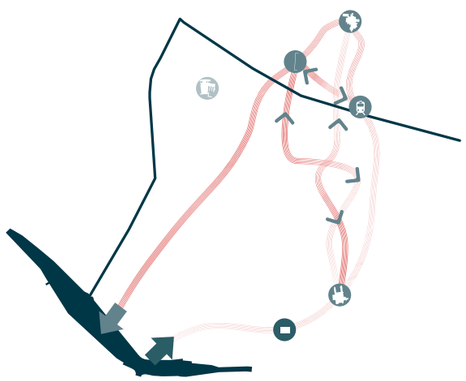
1. Identifying the important sites around the surrounding park as well as the buildings and establishing a connection between them.

2. The proximity to the archaeological park and the canal will attract a lot of people to the park, considering the function of the original site and the old buildings inside the apartment - the museum and the church - the main functions are set for sports, education, and exhibitions.

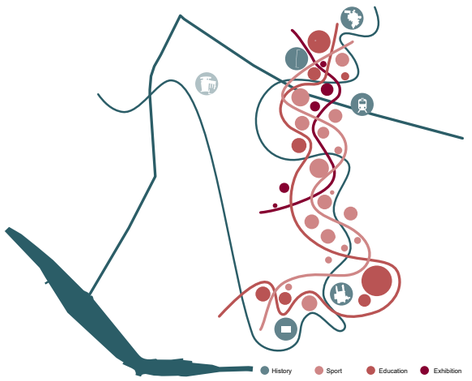
3. The original park is very natural and quiet, but the infrastructure is not well fulfilled beside the sidewalk, and the bicycle is mixed. Therefore, we decided to make the natural functions remain on the right side of the park. Sports, education, and exhibitions take place on the left side of the park. The activities of the riverfront trail are carried out along the topography around the canal.

4. After the above analysis. A cycle path will run through both parks, strengthening the connection between the public spaces, and regulating the use of the footpaths and cycle paths, meanwhile according to the bike path make the specific functional area. Make the users visit the whole park easily.

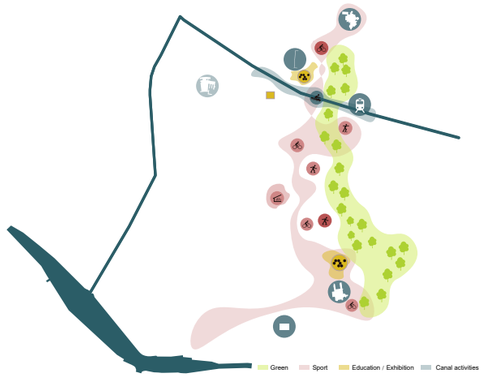
MAP.38 PARK CONCEPT



1. Connections between important spots



2. Activities Penetration in park



3. Function allocation accroding to stakeholderns between important spots

4. Onsite allocation

Map.38 Prepared by the author

Sponge city

“Italy is particularly vulnerable to flooding: It suffers two-thirds of Europe’s landslides; 94 percent of municipalities are at risk of landslides, flooding or coastal erosion; and more than 8 million people are affected, according to a 2021 report by ISPRA, the national institute of environmental research and protection. ”

“Italy faces a higher risk of flooding, and if a low likelihood storm resulting in severe flooding (a 1 in 100-year flood event) were to occur today, it could affect 405 properties in Milan. The probability of such an event occurring at least once during the life of a 30-year mortgage is 26%. 30 years later, an event with the same probability would affect 406 properties due to changes in the environment.”

Document available at link
https://www.politico.eu/article/italy-floods-emilia-romagna-la-marche-trigger-blame-game/
https://riskfactor.com/city/milan-illinois/1749009_fsid/flood#current_&_future_risk

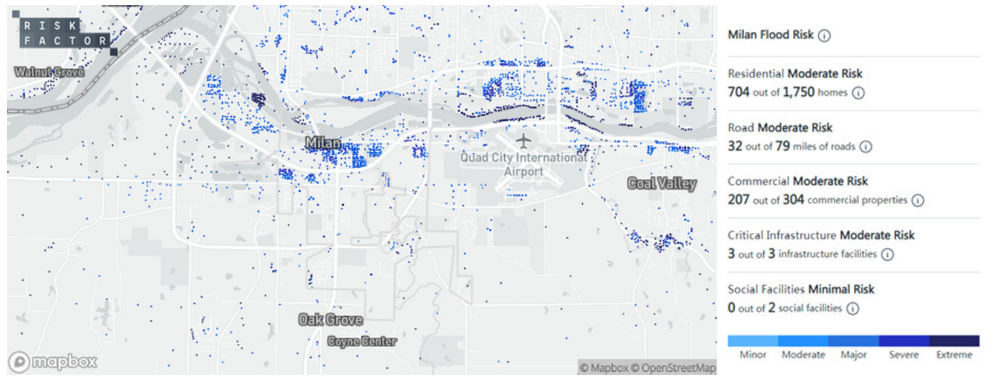


Fig.29 Milan flood risk
https://riskfactor.com/city/milan-illinois/1749009_fsid/flood

How it works?

Inside the park, the concept of a sponge city is implemented to manage and utilize water effectively. This approach involves absorbing and draining water in a sustainable manner, helping to mitigate the impact of heavy rainfall and reducing the risk of flooding.

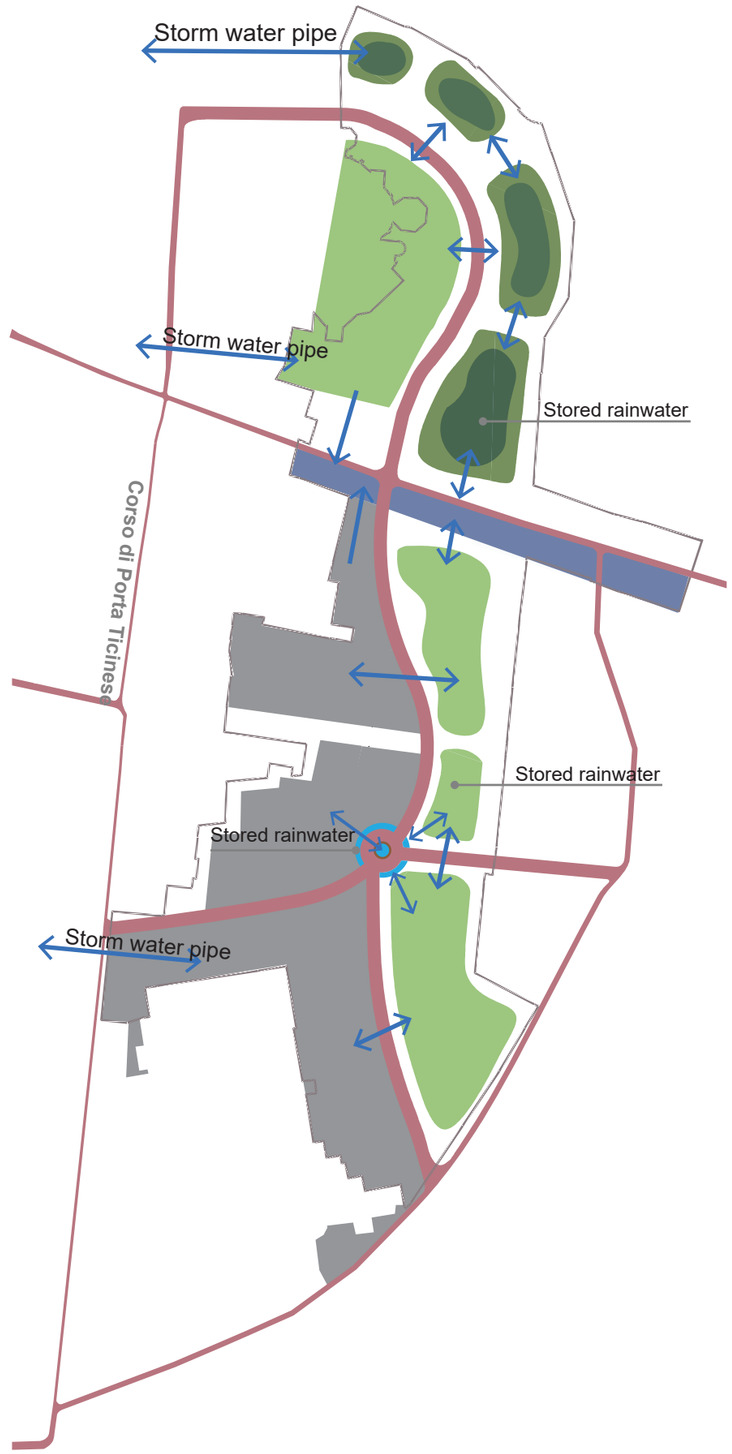
Canal Water Discharge: The water near the canal is discharged into it, utilizing the natural flow of the canal to channel and store water. This helps in regulating water levels and preventing overflow during periods of heavy rain. By directing the water into the canal, it acts as a natural drainage system, ensuring proper water management within the park.

Rain Gardens: Rain gardens are designed to absorb rainwater within the park. These gardens are strategically located to capture and retain rainwater, allowing it to slowly infiltrate into the ground. The plants and vegetation in the rain gardens help in the absorption process, as they have the capacity to hold and filter water effectively. This approach reduces the amount of runoff and promotes groundwater recharge, contributing to the overall sustainability of the park's water management system.

Municipal Rainwater Pipe: For areas near the city roads within the park, rainwater is directed to the municipal rainwater pipe system. This infrastructure is designed to collect and manage rainwater from urban areas. The pipe system efficiently transports the water to appropriate outlets, preventing water accumulation and minimizing the risk of flooding. By integrating the park's water management with the municipal infrastructure, the overall drainage system is optimized.

By implementing these sponge city principles within the park, the management of water is enhanced, creating a more sustainable and resilient environment. The combination of natural water bodies, rain gardens, and municipal infrastructure helps to ensure effective water absorption, drainage, and utilization, reducing the impact of heavy rainfall events and promoting a healthier ecosystem within the park.

Map.39 Water Flows



Map.39 Prepared by the author

In Section B-B', rain gardens (low-lying areas, areas covered by bark or ground cover plants) are used, which collect rainwater and reduce the flooding of stormwater surface runoff by retaining it in infiltration, avoiding its excessive pooling, and reducing pollution through processes such as adsorption, degradation, ion exchange, and volatilization.

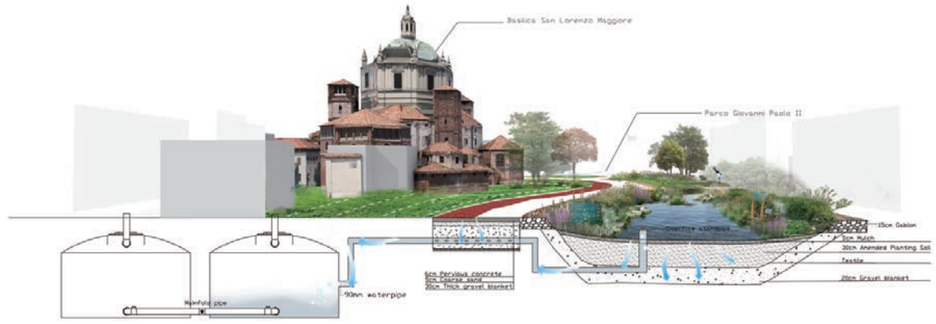
The basic principle is to use rain gardens and ground using permeable paving to collect water through pipes to a water collection device, which is then squeezed by a pump head to make sprinkler heads to spray water and irrigate grass. Rain gardens do not only collect rainwater but also have educational functions (will be mentioned in chapter Educational garden). The layers of the rain garden from top to bottom are 15cm Galbion, 5cm Mulch**,** 30cm Amended Planting Soil, Textile, and 20cm Grovel blanket. The layers of permeable paving are, in order from top to bottom, 6cm previous concrete, 5 cm coarse sand, and 30cm thick gravel blanket.

In sections A-A', the main drainage principle is that the water on the left can be collected by the rain garden depending on the topography, or with the steps on the right excess rainwater can be discharged into the canal, and the same on the right.

Map.40 Section diagram

Map.40 Prepared by the author

Map.41 Section A-A'



Map.41 Prepared by the author

Map.42 Section B-B'

Map.42 Prepared by the author

Educational garden

In the garden, to enhance the visitor experience and provide educational opportunities, signs with QR codes will be installed. These QR codes can be scanned by visitors using their smartphones, providing them with valuable information about the plants in the garden. Visitors will be able to access details such as plant names, plant habits, and a plan showcasing how the plants change throughout the four seasons. This interactive feature allows visitors to learn about local plant species and gain insights into the dynamic nature of the garden throughout the year. Additionally, visitors can also access information about the workflow of the rain garden, understanding how it functions in managing and utilizing water effectively.

For elementary school students, the signage will present visual graphics and information that introduces them to plant habits and the growth cycle changes. This educational approach helps young students understand how plants grow and evolve over time. It provides them with an opportunity to connect with nature and learn about the importance of plants in the environment. Along with that, the signage will also explain the workflow of the rain garden, showcasing its role in sustainable water management.

After the tour, visitors can take a break and relax on the grass near the Basilica San Lorenzo Maggiore. The serene and picturesque surroundings offer a peaceful spot for rest and enjoyment. Whether it's sitting on the grass, having a picnic, or engaging in recreational activities, visitors can make the most of this tranquil setting near the basilica.

Map.43 Educational Garden

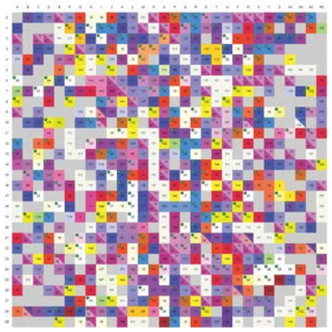
How the eductaional garden works?

Park position

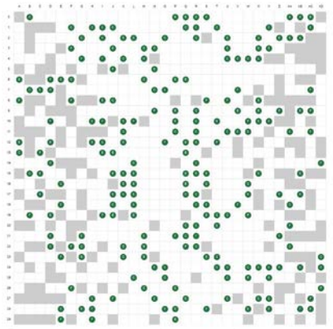
From the information research we found out thatin Milanese, the most important function of the park is educational function.

Therefore, we intend to place rain gardens with educational functions around the church to educate students and visitors in the neighborhood by showing the cycles and habits of local plants in Milan.

Plants position

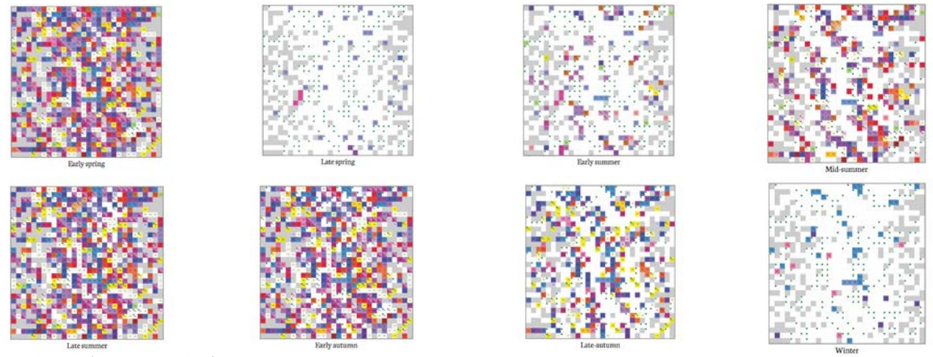


Grass matrix

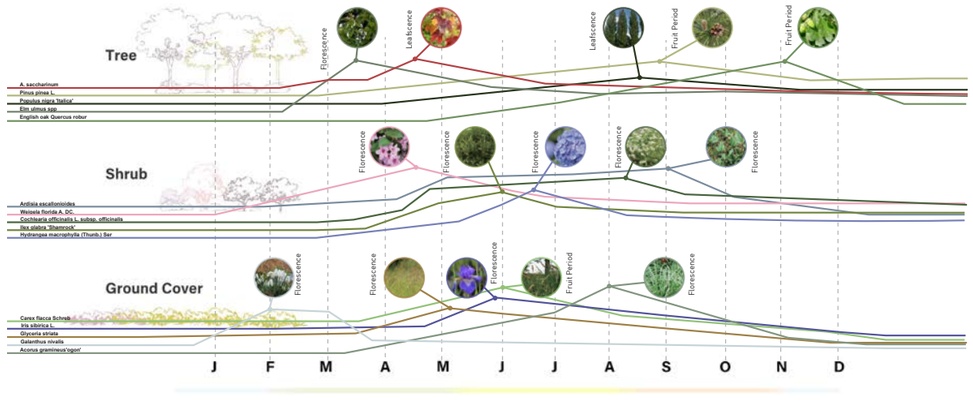


Green dots show where to place grasses. These are planted under certain plants that lose theirleaves quickly.This grassy matrix' helps to prevent weeds spreading over bare soil and provideshabitat for pollinators and other wildlife.

Sesonal views



Growth cycle(Main reprenstive)



Map.43 Prepared by the author

Map.44 PLANT INFORMATION 1

Key	ID	Plant name	Quantities	Plant Density	No. of plants to order
	E	*Calamagrostis brachytricha**	114	1	114
	111	*Echinops sphaerocephalus* 'Arctic Glow'	72	1	72
	31	*Allium schoenoprasum*	64	3	192
	47	*Teucrium hircanium*	64	5	320
	C	*Carex divulsa**	59	2	118
	F	*Carex remota**	45	2	90
	137	*Clematis heracleifolia*	39	1	39
	102	*Solidago virgaurea*	29	1	29
	35	*Eryngium alpinum*	28	1	28
	166	*Echinops ritro*	27	1	27
	130	*Rosmarinus officinalis*	26	1	26
	18	*Achillea millefolium* 'Moonshine'	25	9	225
	25	*Cirsium rivulare* 'Atropurpureum'	25	2	50
	105	*Potentilla fruticosa*	25	2	50
	28	*Leucanthemum vulgare*	23	1	23
	117	*Lobelia siphilitica*	23	2	46
	109	*Cirsium* 'Mount Etna'	22	2	44
	70	*Agastache aurantiaca* 'Tango'	21	2	42

Map.44 Prepared by the author

Map.45 PLANT INFORMATION 2

Key	ID	Plant name	Quantities	Plant Density	No. of plants to order
	123	*Acanthus spinosus*	19	1	19
	144	*Hypericum calycinum*	18	1	18
	57	*Salvia nemorosa* 'Amethyst'	17	1	17
	30	*Helenium* 'Moerheim Beauty'	16	2	32
	96	*Borago officinalis*	15	2	30
	17	*Selinum wallichianum*	13	1	13
	37	*Digitalis parviflora Jacq.*	12	2	24
	174	*Campanula lactiflora*	12	1	12
	19	*Achillea millefolium* 'Terracotta'	11	2	22
	38	*Digitalis purpurea*	11	2	22
	135	*Geranium* 'Melinda'	8	1	8
	44	*Verbascum nigrum*	7	1	7
	54	*Salvia nemorosa* 'Caradonna'	7	1	7
	68	*Hylotelephium spectabile*	7	1	7
	23	*Aster amellus* 'King George'	6	1	6
	24	*Papaver orientale* 'Karine'	6	2	12
	133	*Phuopsis stylosa*	6	2	12
	154	*Angelica archangelica*	6	1	6
	7	*Geranium sanguineum*	5	2	10
	32	*Allium ampeloprasum*	5	4	20
	20	*Limonium platyphyllum*	4	1	4
	40	*Digitalis ferruginea*	4	2	8
	97	*Geranium sylvaticum*	4	1	4
	103	*Centaurea atropurpurea*	4	2	8
	4	*Bergenia* 'Abendglocken'	3	2	6

Map.45 Prepared by the author

Map.46 PLANT INFORMATION 3

Key	ID	Plant name	Quantities	Plant Density	No. of plants to order
	101	*A. tomentosa* 'Robustissima'	3	1	3
	113	*Rudbeckia fulgida*	3	2	6
	134	*Geranium* 'Sweet Heidy'	3	1	3
	143	*Hylotelephium telephium (Atropurpureum...*	3	3	9
	147	*Artemisia lactiflora*	3	1	3
	165	*Cichorium intybus*	3	1	3
	2	*Genista lydia*	2	1	2
	9	*Centaurea nigra*	2	3	6
	27	*Echinacea paradoxa*	2	2	4
	34	*Knautia arvensis*	2	1	2
	48	*Veronica longifolia* 'Marietta'	2	1	2
	56	*Calamintha nepeta subsp. nepeta*	2	1	2
	65	*Anthemis tinctoria* 'E.C. Buxton'	2	2	4
	66	*Geranium rozanne*	2	2	4
	86	*Ajuga reptans* 'Purple Torch'	2	3	6
	94	*Anthyllis vulneraria*	2	1	2
	141	*Erysimum* 'Bowles's Mauve'	2	2	4
	64	*Euphorbia corallioides*	1	2	2
	88	*Campanula carpatica*	1	4	4
	114	*Agastache rugosa* 'Liquorice White'	1	1	1
	118	*Lotus germanicus*	1	2	2
	163	*Scilla siberica*	1	4	4
	175	*Nepeta x faassenii*	1	2	2

Colour: Colour in planting diagram
ID: Number in planting diagram
Plant name: Latin name of your plant
Pixels: Total number of pixels where the plant appears

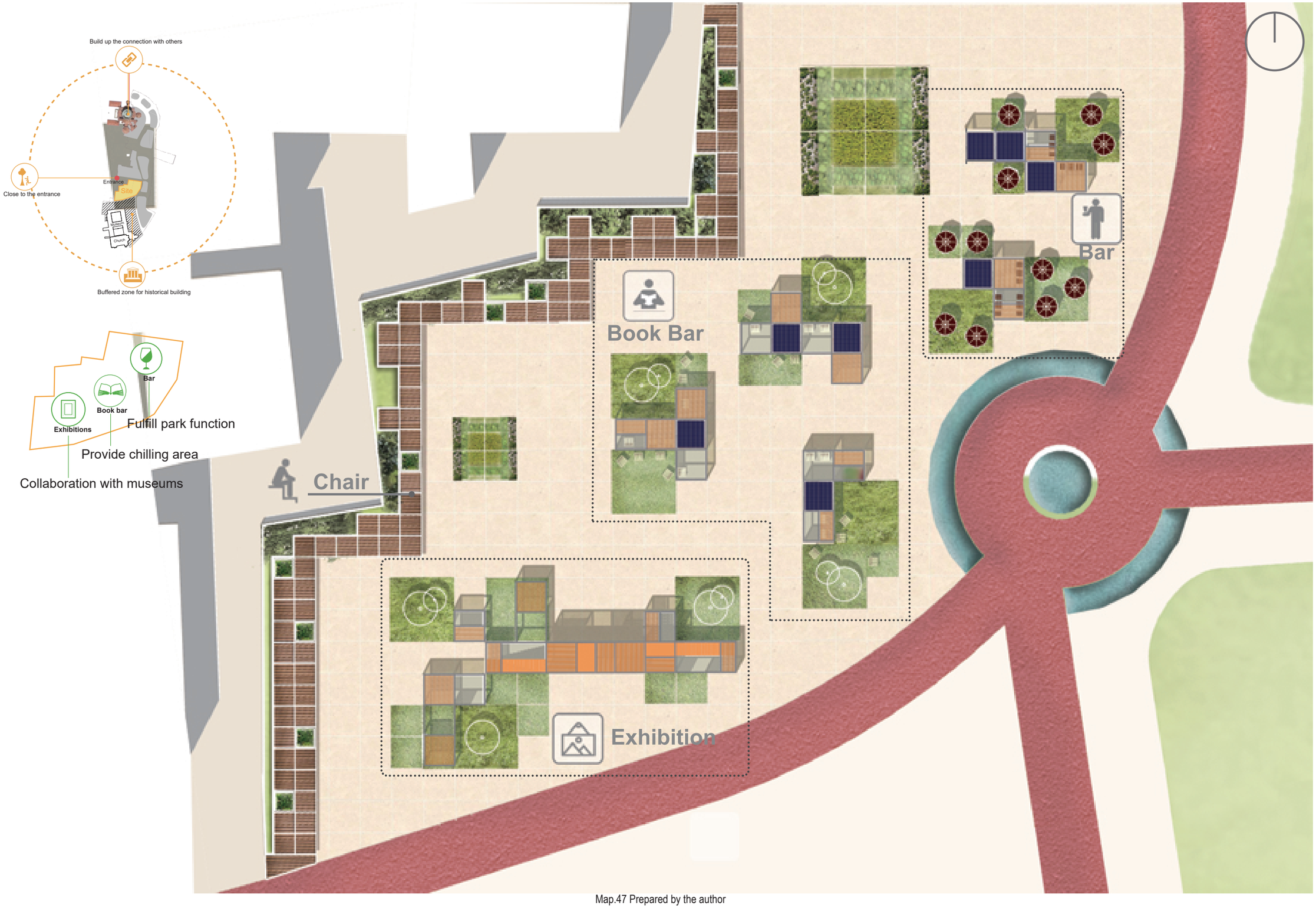
Map.46 Prepared by the author

Small Square

We have incorporated a small square in the park design, aiming to provide a social and gathering space for people to meet, rest, and interact. The square is designed with three distinct functional areas: an exhibition area, a book bar, and a coffee bar.

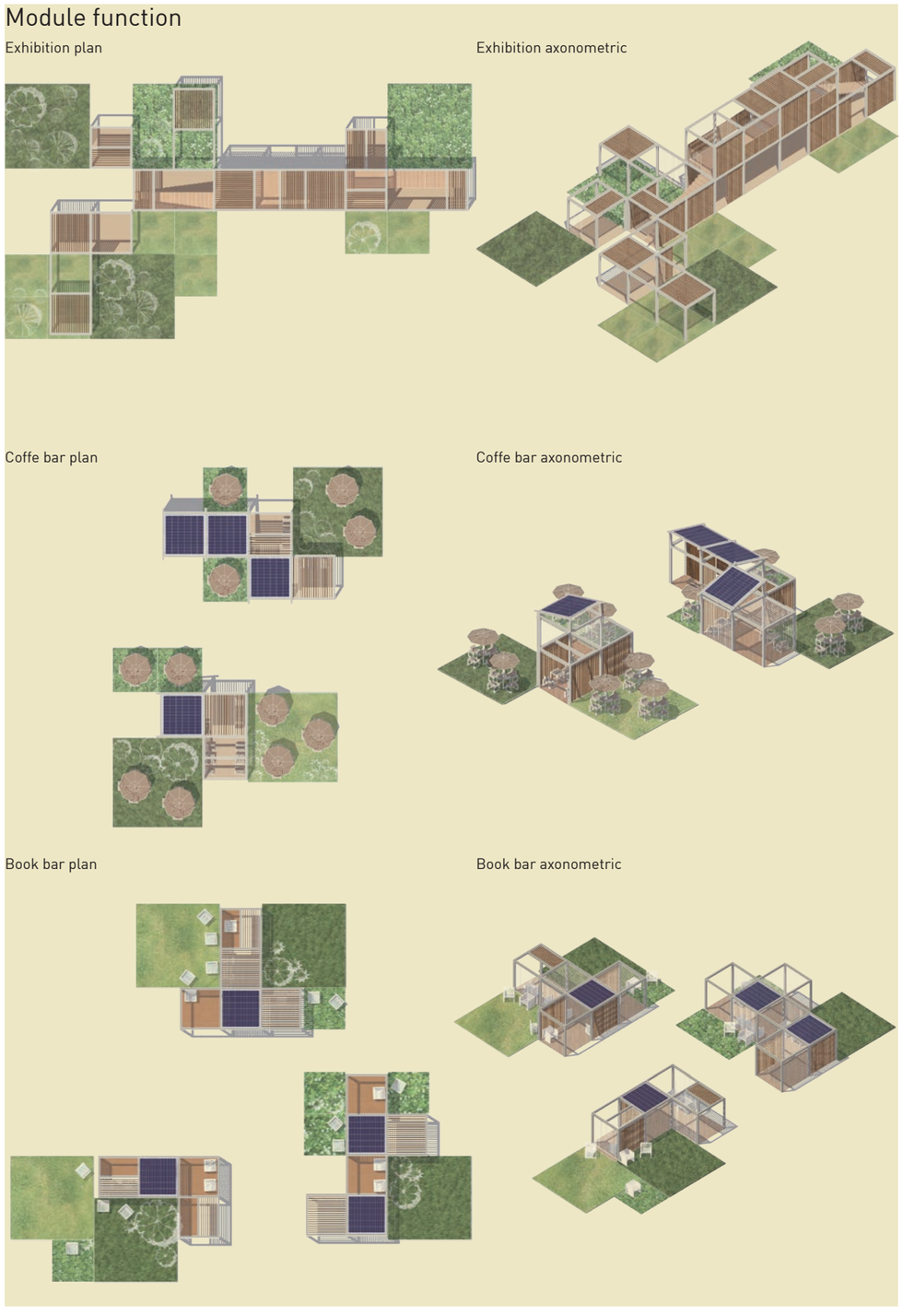
The exhibition area, located on the south side of the square in close proximity to the museum, serves as a venue for various events, cultural exhibitions, and performances. It enriches the park's content and provides opportunities for visitors to experience different historical and cultural charms. This area not only enhances the park's appeal but also attracts more tourists and participants.

Map.47 Small square



Map.47 Prepared by the author

Map.48 Module Function



Map.48 Prepared by the author

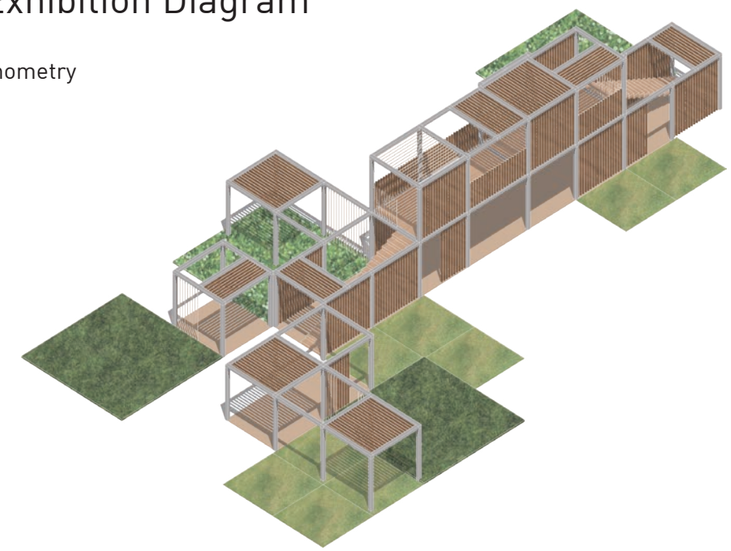
The book bar is situated in the middle of the square, offering a tranquil and comfortable environment for reading and studying. It provides a secluded space away from the hustle and bustle, allowing individuals to immerse themselves in books, magazines, or newspapers. Visitors can enjoy a peaceful atmosphere while broadening their knowledge and finding joy in reading. The book bar is not only a place for cultural and educational exchanges but can also host book lectures, reading clubs, and literature discussions. It caters to students from nearby schools, allowing them to engage in learning experiences at the museum and then take a break in the book bar. Additionally, the elderly and literature enthusiasts in the surrounding community can relish outdoor reading. These exchange activities not only expand people's horizons but also foster cultural interaction and knowledge sharing within the community.

On the north side of the square, the coffee bar creates a space for people to enjoy coffee and a leisurely atmosphere in the park. It provides a relaxing environment for individuals to gather with friends or family, savor coffee, indulge in snacks, and engage in pleasant conversations. The coffee bar adds charm and vibrancy to the park, making it more appealing to visitors, especially those seeking a casual coffee experience. It becomes a highlight and destination within the park, offering a unique ambiance. Moreover, the coffee bar presents business opportunities and revenue streams. By leasing the coffee bar space to businesses, the park management can generate rental income, which can be utilized for park maintenance, improvements, and promotional activities, further fostering the sustainable development of the park.

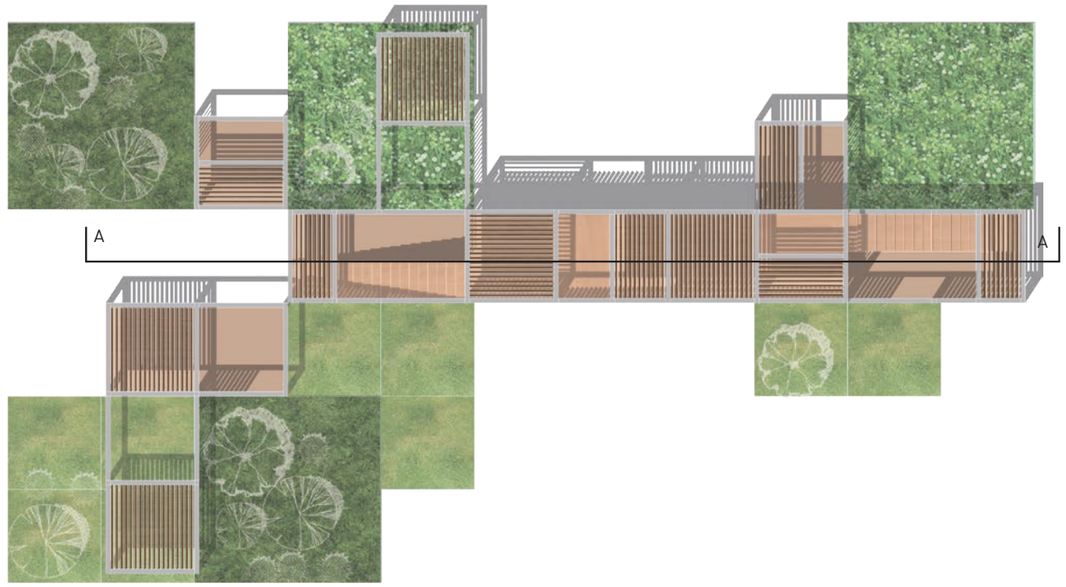
In addition to these features, we have incorporated essential green areas within the square. The north side accommodates a 144-square-meter lawn, providing a space for picnics and sunbathing. It also offers a designated area for children to engage in activities such as football. Surrounding the exhibition area, book bar, and coffee bar, we have incorporated green spaces of various sizes, including lawns, shrubs, and trees. These diverse green areas add visual interest to the square, enhancing the overall park experience and providing enjoyment for visitors.

Map.49 Exhibition Diagram

Exhibition Axonometry



Exhibition Plan

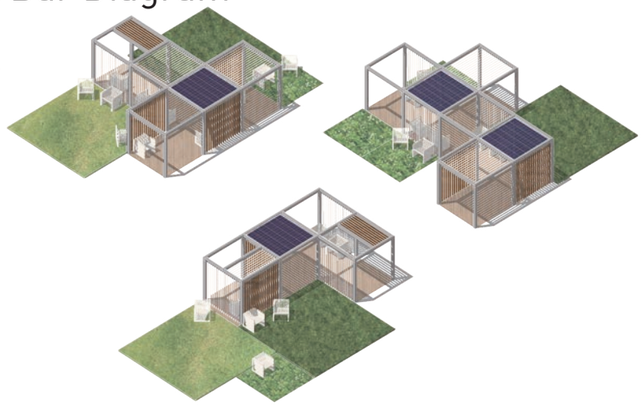


Exhibition section A-A

Map.49 Prepared by the author

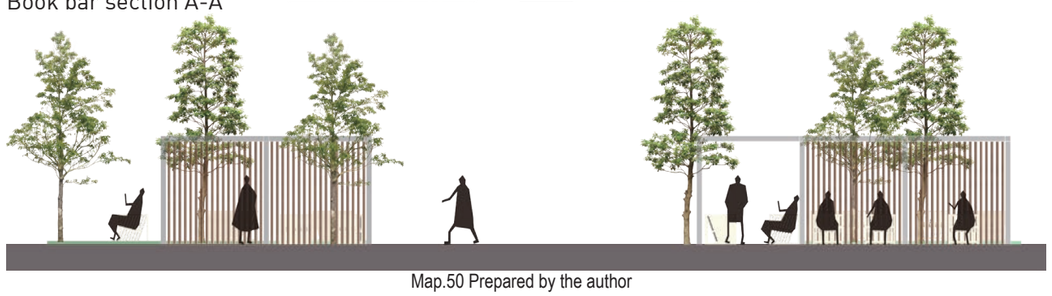
Map.50 Book Bar Diagram

Book bar Axonometry



Book bar Plan

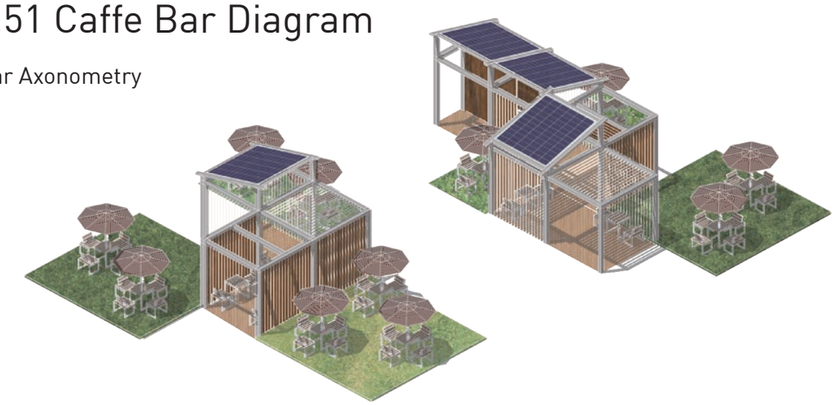
Book bar section A-A



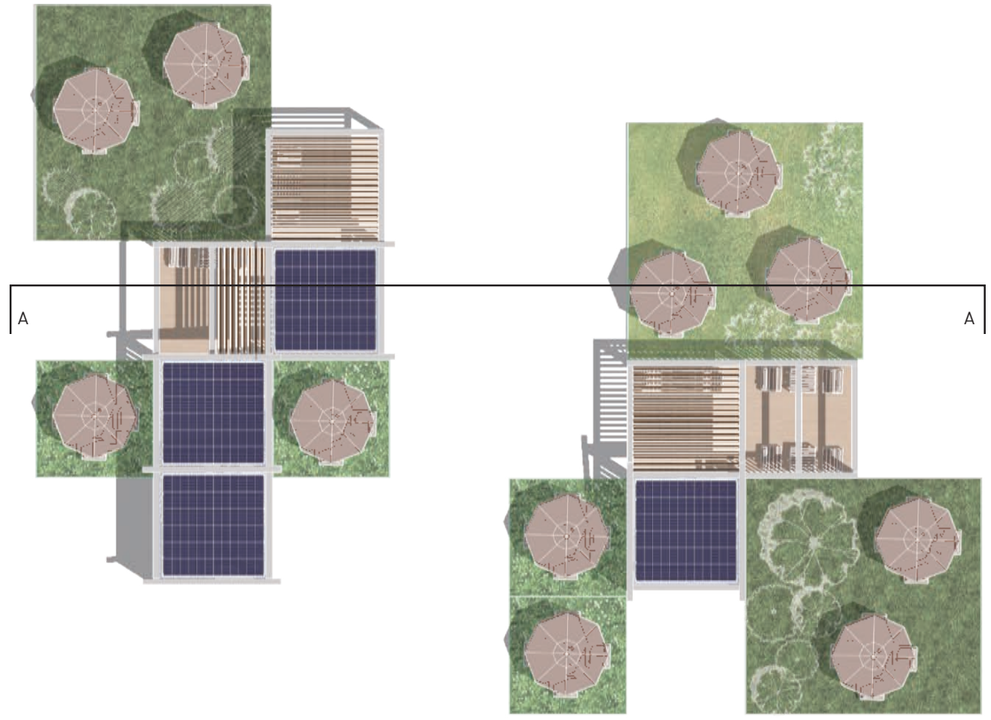
Map.50 Prepared by the author

Map.51 Caffe Bar Diagram

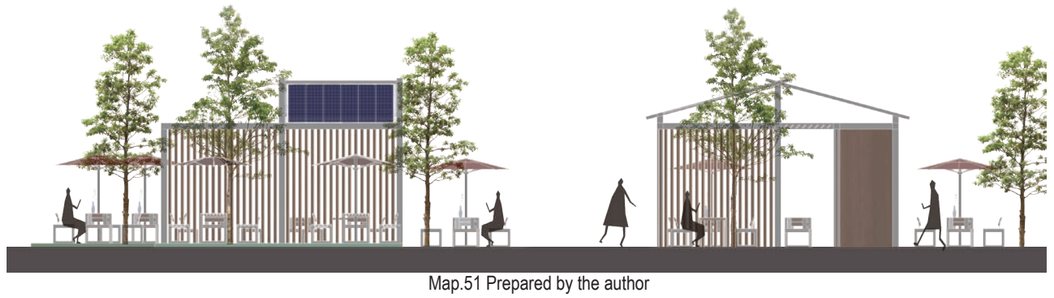
Caffe bar Axonometry



Caffe bar Plan



Caffe bar section A-A



Map.51 Prepared by the author

Module design

These modules consist of different types of modules, each with its configuration. There are two types of modules: one is a 3.6*3.6*3.6m³ cube, and the other has an additional 15° tilted roof.

These modules are supported by steel frame structures, with the sides composed of wooden panels rotated at a 45° angle. This design ensures that sunlight can enter the modules from different angles, creating a dynamic and ever-changing interior space. The ground is supported by wooden frames and covered with wooden boards. The roofs of the cube modules are made of treated wooden boards tilted at a 45° angle, which prevents direct sunlight while allowing partial sunlight to penetrate. In the summer, well-planned shading provides a comfortable environment for the occupants. The roofs with a 15° tilt are covered with solar panels.

The steel frame structures provide stable support for these modules, while the rotating wooden panels allow for diverse and changing sunlight penetration. This design enables natural light to enter the interior space at different times and angles. The use of wooden flooring adds a natural and warm touch, harmonizing with the overall design style.

The roofs of the cube modules are designed with a 45° tilt angle using treated wooden boards to ensure durability and reliability. This design helps prevent direct sunlight from entering the interior, reducing the heat load while allowing moderate light transmission. During the summer, well-designed shading creates a cool and comfortable environment for the residents.

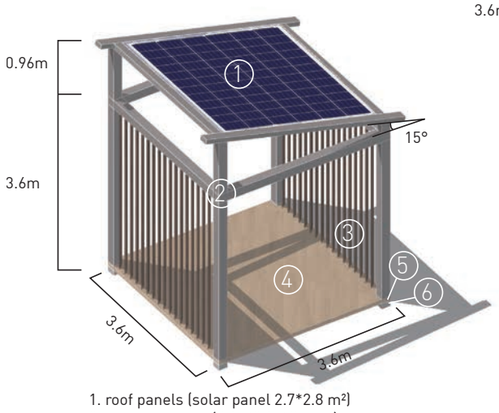
The roofs with a 15° tilt are composed of solar panels, maximizing the utilization of solar energy resources. The solar panels absorb sunlight and convert it into electricity, providing a sustainable power supply for the modules. The use of this green energy source helps reduce reliance on traditional energy sources and is environmentally friendly.

In summary, these modules combine steel frame structures with specially designed wooden panel roofs to provide stable support and diverse natural light penetration. We also emphasize functionality, aesthetics, and environmental sustainability, aiming to create a modern and sustainable relaxing space for residents.

Map.52 Module Information

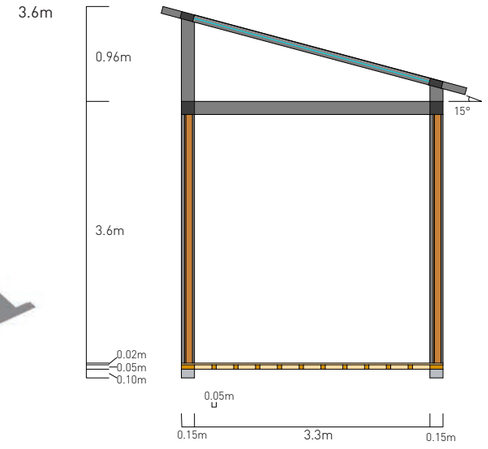
Module 1

Module Axonometry



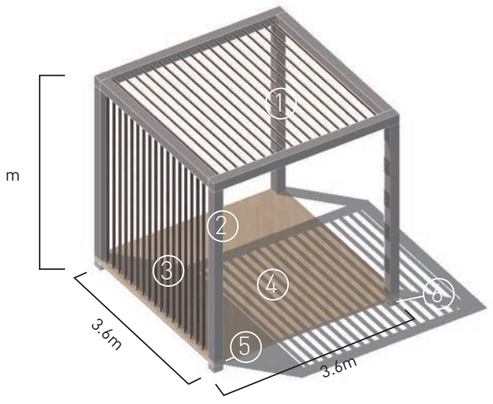
1. roof panels (solar panel 2.7*2.8 m²)
2. steel structure (0.15*0.15*3.6 m³)
3. wooden partition (0.1*0.02*3.6 m³)
4. wooden planks (3.6*3.6*0.02 m³)
5. wooden beams (3.6*0.05*0.15 m³)
6. steel foundations (0.01*0.15*0.15 m³)

Module Section



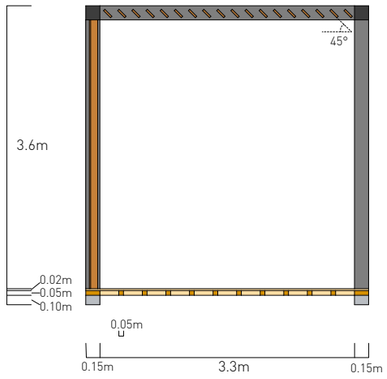
Module 2

Module Axonometry



1. roof panels (wooden planks 0.1*0.02*2.7 m²)
2. steel structure (0.15*0.15*3.6 m³)
3. wooden partition (0.1*0.02*3.6 m³)
4. wooden planks (3.6*3.6*0.02 m³)
5. wooden beams (3.6*0.05*0.15 m³)
6. steel foundations (0.01*0.15*0.15 m³)

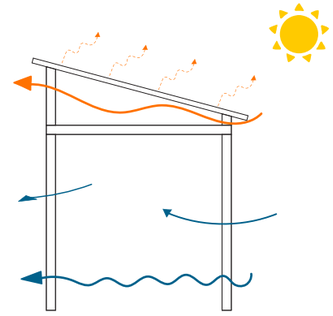
Module Section



Map.52 Prepared by the author

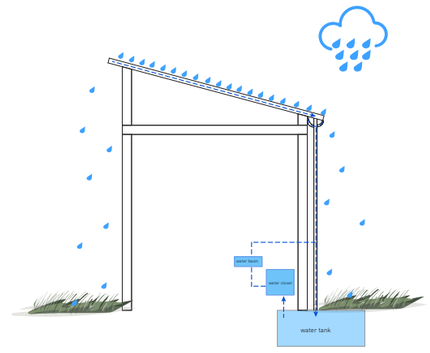
Map.53 Module sustainable analysis

Ventilation



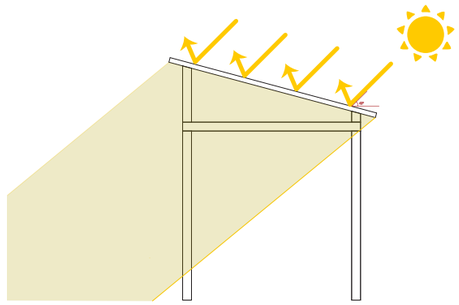
The double roof protects from direct sunlight and increment natural ventilation

Water cycle



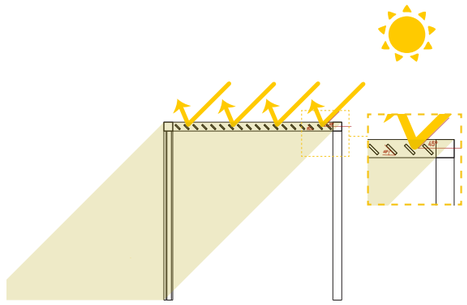
Water is collected and filtered with purifier

Shadow



module 1

15° pitched roof to prevent direct sunlight

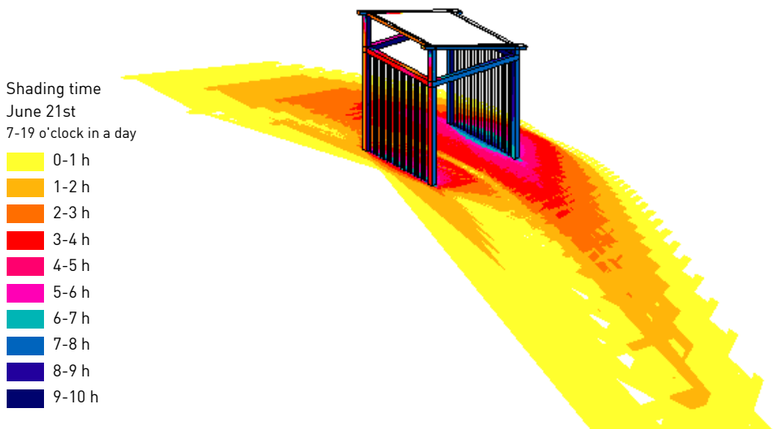


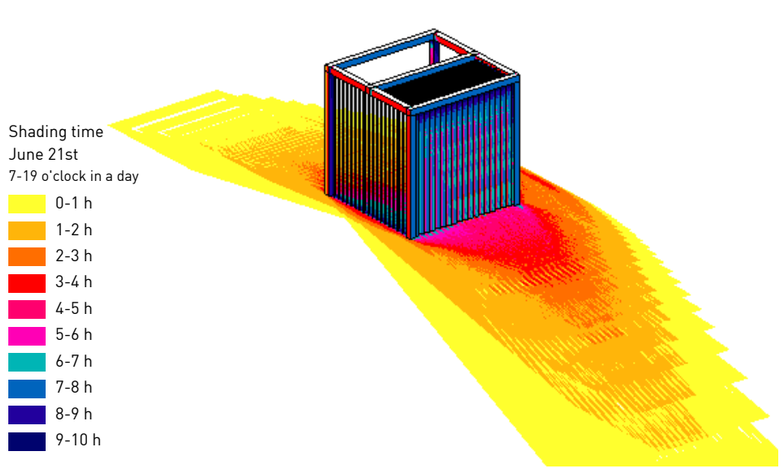
module 2

45° sloping planks prevent direct sunlight

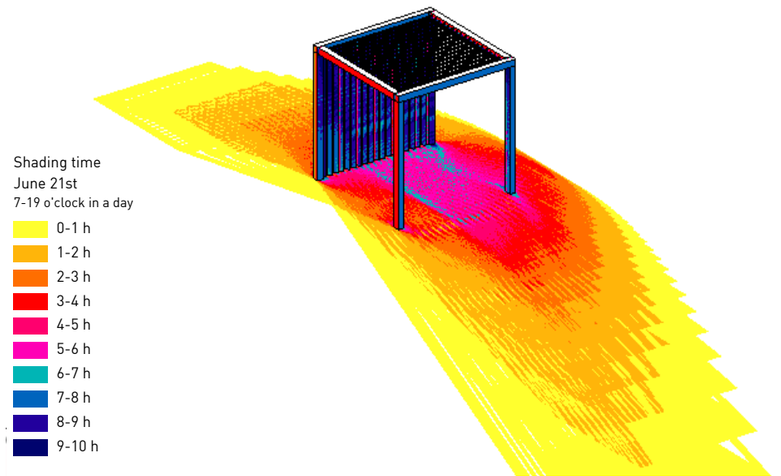
Map.53 Prepared by the author

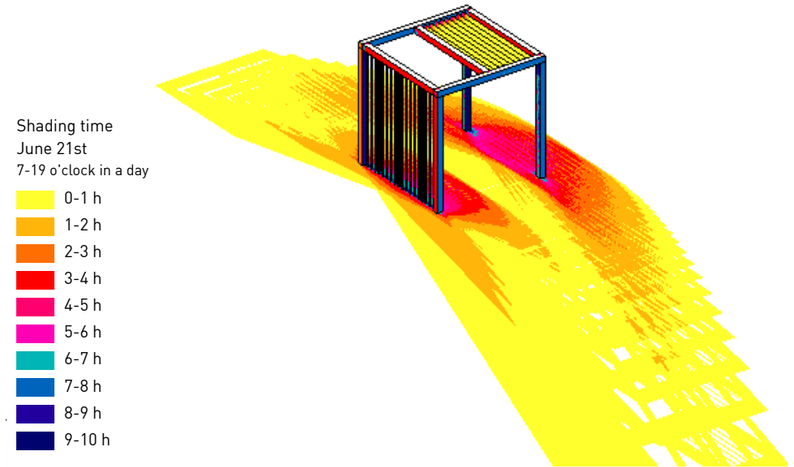
Map.54 Module shading analysis





Map.54 prepared by the author

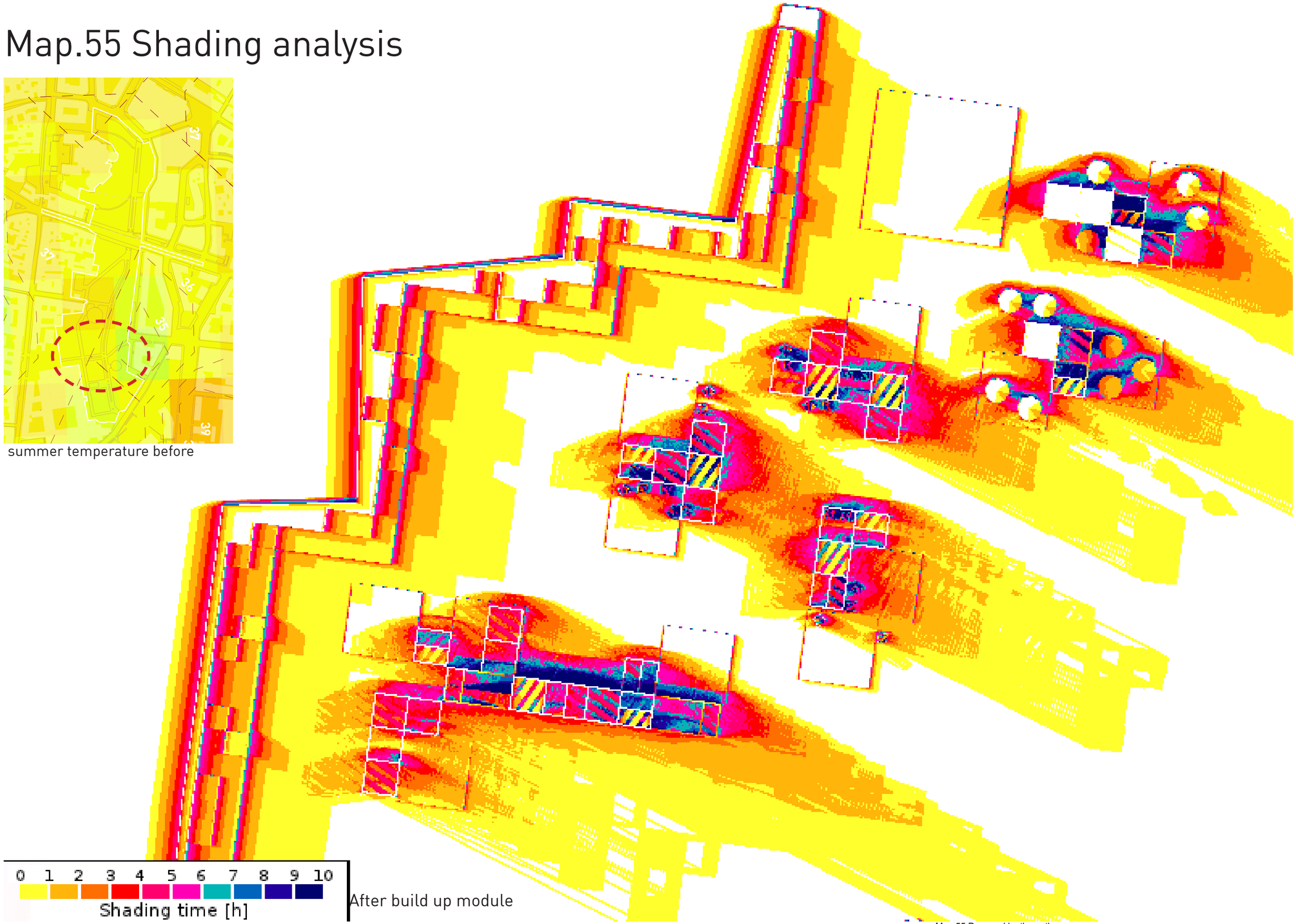




Map.54 prepared by the author

Map.55 Shading analysis

summer temperature before

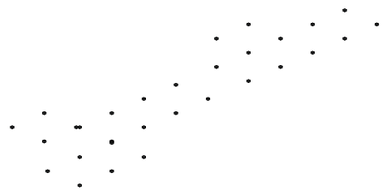


After build up module

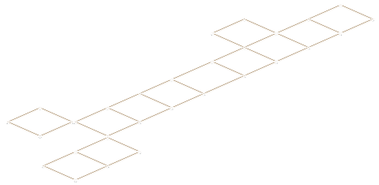
Map.55 Prepared by the author

Map.56 Module Construction

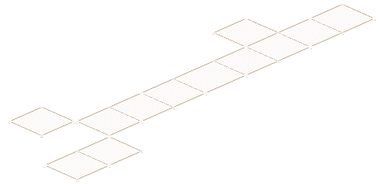
Construction Step



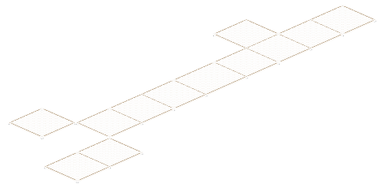
01. Positioning and installation of foundations



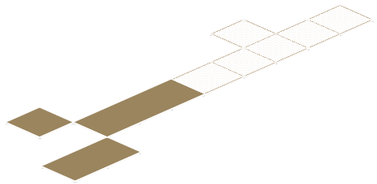
02. Placement of the main beam structure of the lower floor



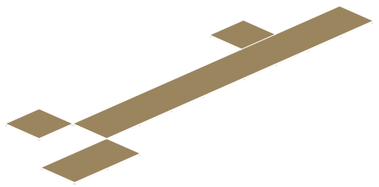
03. Placement of the secondary beam structure of the lower floor



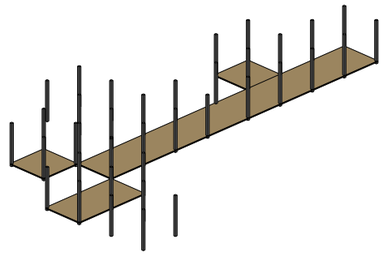
04. Placement of the secondary beam structure of the lower floor



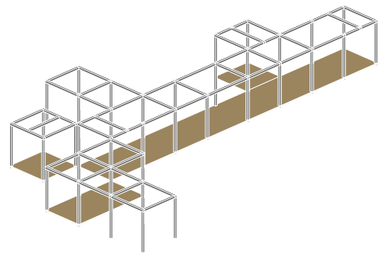
05. Fix the wooden planks on the foundation beams



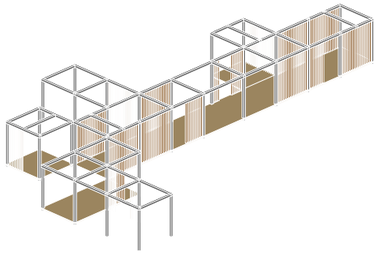
06. Fix the wooden planks on the foundation beams



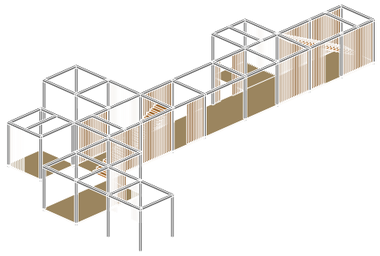
07. Fitting and fixing of composite pillars



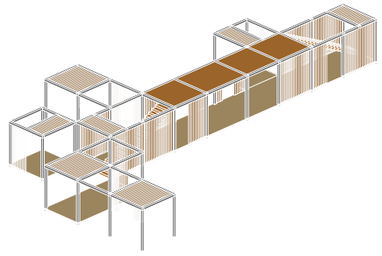
08. Asswblmly of beams



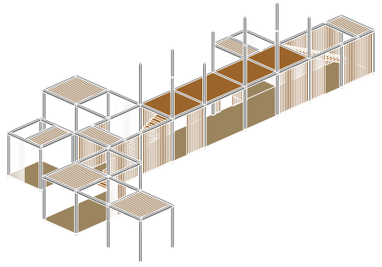
09. Place the partition and nail them to the base



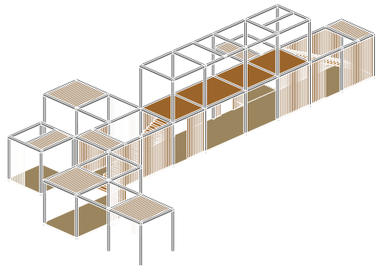
10. Place and Install Stairs



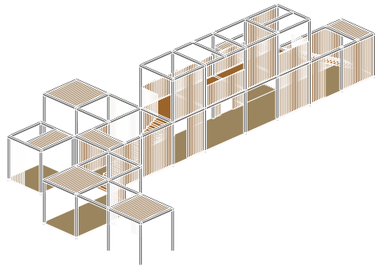
11. Adding the slabs



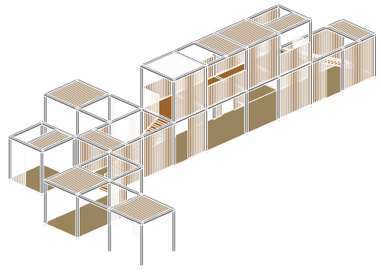
12. Fitting and fixinng pillars on the second floor



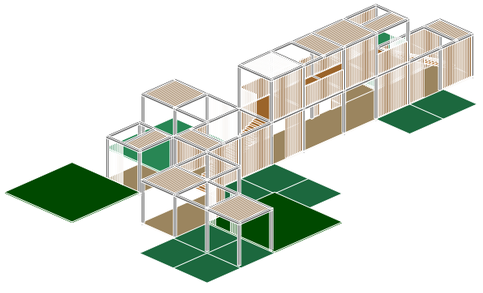
13. Asswblmly of beams on the second floor



14. Place the partition and nail them to the second floor



15. Adding the roof panels



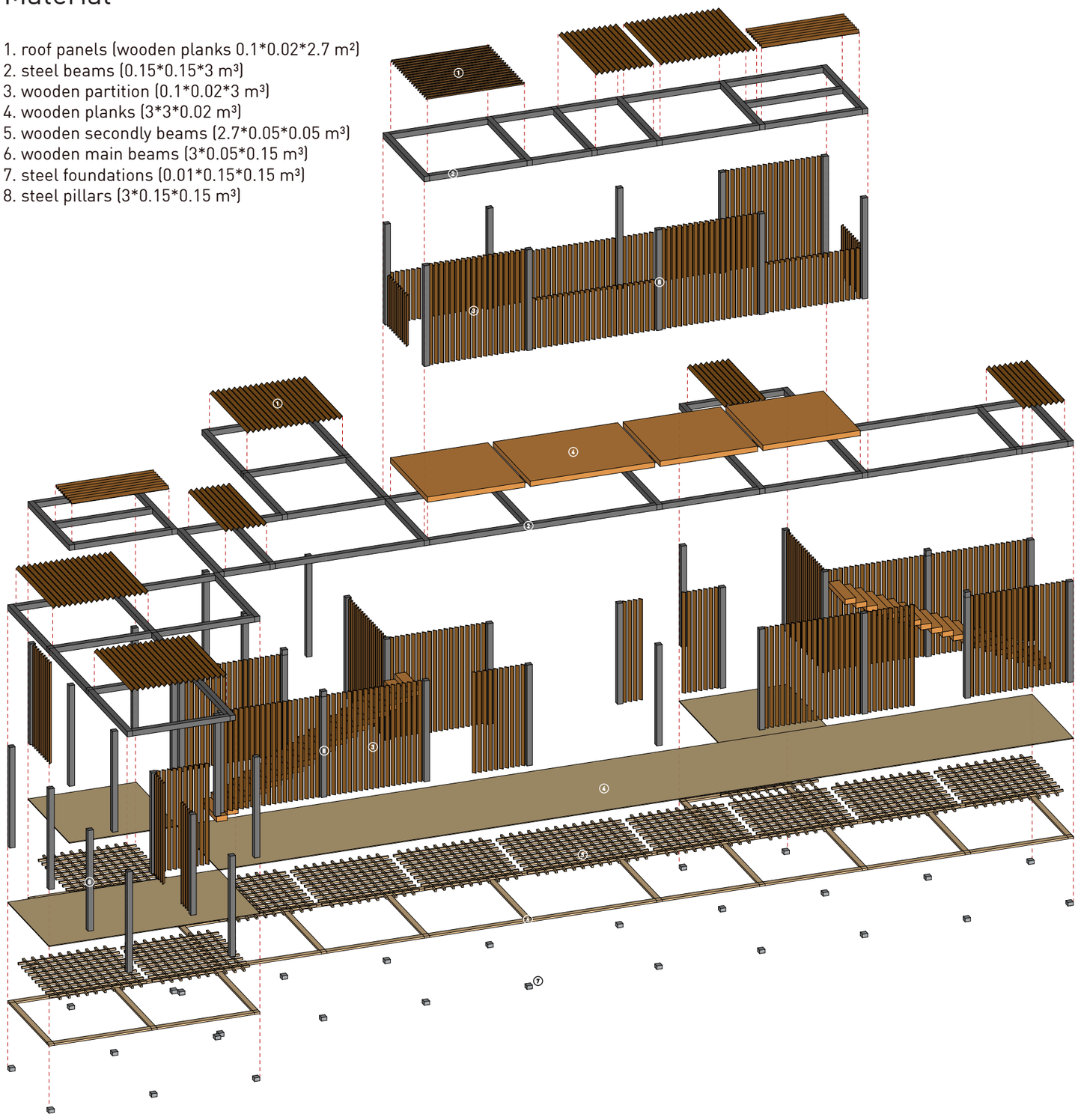
16. Place green areas around Module structures

Map.56 Prepared by the author

Map.57 Explosive view

Material

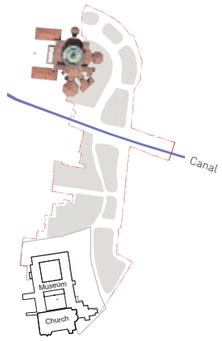
1. roof panels (wooden planks 0.1*0.02*2.7 m²)
2. steel beams (0.15*0.15*3 m³)
3. wooden partition (0.1*0.02*3 m³)
4. wooden planks (3*3*0.02 m³)
5. wooden secondly beams (2.7*0.05*0.05 m³)
6. wooden main beams (3*0.05*0.15 m³)
7. steel foundations (0.01*0.15*0.15 m³)
8. steel pillars (3*0.15*0.15 m³)



Map.57 prepared by the author

6.3 CONTENTS AND TECHNICAL DATAS

Map.58 Technical data 1



Total area: 55866.90 ㎡

Name: Parco Giovanni Paolo II

Function: Education, Sport, Culture, Leisure

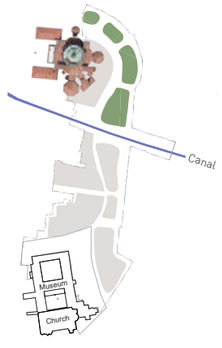
Stakeholder:
Real estate developers, Office workers, Goverment, Patient,Pet owner, Students, shop owners, Sports enthusiasts, Local residents, Tourist

Area: 5078.90 ㎡

Name: Red bicycle path

Function: Sport

Stakeholder:
Real estate developers, Office workers, Sports enthusiasts, Local residents, Tourist



Area: 20183.44 ㎡

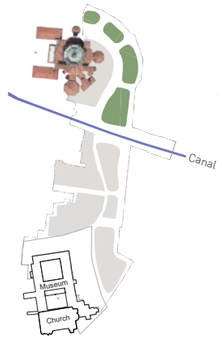
Name: Green area

Function: Leisure

Stakeholder:
Real estate developers, Office workers, Goverment, Patient, Pet owner, Students, shop owners, Sports enthusiasts, Local residents, Tourist

Map.58 Prepared by the author

Map.59 Technical data 2

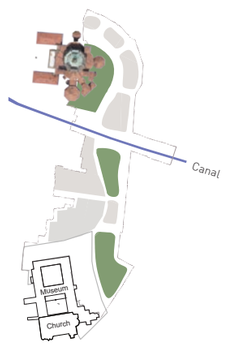


Area: 5925.99 ㎡

Name: Educational rain garden

Function: Absorb extra rain garden, Education.

Stakeholder:
Primary student, Tourists, Local residents, Patient, Pet owner

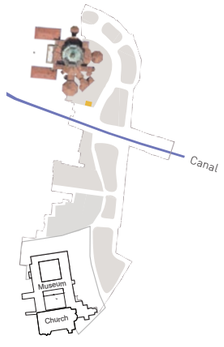


Total area: 6686.13 ㎡

Name: Grass ground

Function: Leisure

Stakeholder:
Real estate developers, Office workers, Goverment,Patient, Pet owner, Students, Sports enthusiasts, Local residents, Tourist



Total area: 145 ㎡

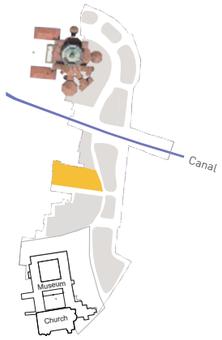
Name: Subway station

Function: Transportation

Stakeholder:
Real estate developers, Office workers, Goverment, Tourist

Map.59 Prepared by the author

Map.60 Technical data 3

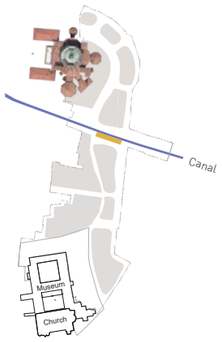


Total area: 2611.19 ㎡

Name: Fitness area

Function: Sport, Leisure

Stakeholder:
Students, Sports enthusiasts, Local residents, Tourist



Total area: 419.41 ㎡

Name: Water font

Function: Leisure

Stakeholder:
Real estate developers, Office workers, Goverment,Patient, Pet owner, Students, Sports enthusiasts, Local residents, Tourist

Total area: 824.02 ㎡

Name: Pet Park

Function: Sport, Leisure

Stakeholder:
Real estate developers, Pet owner

Map.60 Prepared by the author

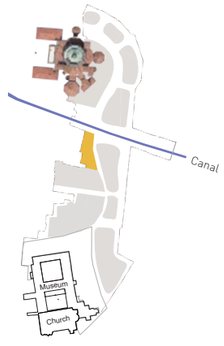
Map.61 Technical data 4

Total area: 4196.92 ㎡
A: 207.36 ㎡
B: 181.44 ㎡
C: 103.68 ㎡

Name: Square

Function: Leisure, Reading, Culture, Exhibition

Stakeholder:
Students, Office workers, Local residents, Tourist

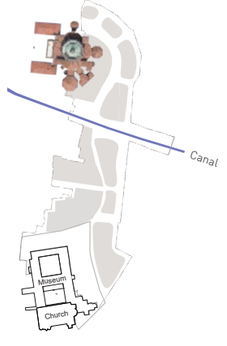


Total area: 756.98 ㎡

Name: Skateboard plaza

Function: Sport, Leisure

Stakeholder:
Goverment, Students, Enthusiasts, Local residents, Tourist



Area: 828.17 ㎡

Name: Canal

Function: Absorb extra rainwater, Leisure

Stakeholder:
Real estate developers, Office workers, Goverment, Patient, Pet owner, Students, shop owners, Sports enthusiasts, Local residents, Tourist

Map.61 Prepared by the author

6.4 OUTCOMES AND BENEFIT FOR DESIGN

To revitalize the Naviglio Canal, strengthen community cohesion, and enhance the urban image and allure of Milan, we have introduced new features in the park design. These include educational gardens, rain gardens, sports areas, riverside rest areas, and small squares. We aim to augment the park's diversity and functionality, thereby improving its overall charm and value.

Educational Garden

The Educational Garden is a specially designed area that offers students and visitors from surrounding schools valuable educational and learning opportunities. It showcases a variety of plant species and is equipped with informative signage and interpretive boards, fostering an understanding of plants, ecosystems, and environmental protection. Through interactive displays, people can easily and joyfully explore the world of plants. This garden serves not only as an environmental education hub but also promotes the cultivation of ecological awareness and the adoption of sustainable lifestyles.

Rain Garden

The Rain Garden serves as a unique area for the collection and treatment of rainwater. By incorporating suitable vegetation and soil structures, it efficiently filters and absorbs stormwater, mitigating flood risks and improving water quality. This sustainable stormwater management approach not only benefits the environment but also enhances the park's aesthetic appeal. Additionally, it provides an opportunity for people to learn about the importance of water management.

Sports Area

The Sports Area is designed to meet the fitness and recreational needs of individuals. It includes basketball courts, tennis courts, and other outdoor sports facilities. These amenities provide a convenient space for residents to engage in various activities such as basketball, tennis, running, and more. The presence of these facilities not only promotes a healthy lifestyle but also encourages social interaction and community cohesion.

Small Square

Small Square serves as a gathering and exchange space, facilitating social and cultural events. Within the square, features such as a book bar, café bar, and exhibition area are incorporated, offering opportunities for reading, leisure, art appreciation, and interaction. This design not only adds diversity and vitality to the park but also provides residents with a community hub that encourages social interaction, cultural exchange, and community cohesion.

Riverside Rest Area

The Riverside Rest Area is meticulously designed to create a pleasant leisure space where people can relax and enjoy the picturesque scenery of the canal. It offers comfortable seating and a viewing platform, allowing visitors to peacefully admire the beauty of the river. Additionally, trails and scenic paths can be integrated into the riverside rest area, providing people with the opportunity to take strolls and immerse themselves in the tranquility of nature.

In conclusion, the incorporation of educational gardens, rain gardens, sports areas, small squares, and riverfront resting areas into the park design of Milan's Naviglio Canal will yield a multitude of benefits for both residents and visitors. Beyond enhancing livability, promoting sustainability, and fostering economic activity, this design approach will facilitate social interaction, improve overall well-being, and safeguard the cultural heritage of the Naviglio Canal. By transforming the Naviglio Canal area into an alluring destination, it will bring about prosperity and development to both the city and the local community.

6.5 THE LINK WITH THE NAVIGLI URBAN SYSTEM

Parco Giovanni Paolo II, formerly known as "Parco delle Basiliche", is a park in the city of Milan. It is so called because it connects the Basilica of San Lorenzo with the Basilica of Santo Eustorgio. The wide green corridor runs through Via Molino delle Armi, which is part of the Cerchia dei Navigli.

Parco Giovanni Paolo II, one of the historical centers of Milan, is located only 600 meters away from Navigli, 550 meters to the left of the archaeological park and 1.7 kilometers to the right of the University of Milan, attracting a large number of visitors not only because of its proximity to the canal and its proximity to historical buildings, but also because it is surrounded by residential areas, hospitals and schools. It is also surrounded by residential areas, hospitals and schools, attracting residents, patients and students to the park and the canal.

The Navigli is very important to the people of Milan and is an important status symbol for the people of Milan. To emphasize this even more, in our park we decided to open up the canal and let it pass through the park, making it a part of the park.

With the opening of the canal, the canal will not only influence the way the park is accessed, but also the internal functions of the park, such as greenery, landscaping, and infrastructure. This link will not only form a closed loop around the park, reaching the Archaeological Park and the Cerchia dei Navigli, but will also be part of the 8 km bike path in Navigli, which will facilitate the flow of bicycles throughout the park, guaranteeing the safety of pedestrians and, from the city's point of view The link also makes it easier to connect the whole city to each other and to reach any landmark in a maximum of 15 minutes, which is three times less time than the previous transportation system. In terms of landscape, we have adopted a sponge city strategy to reduce the risk of flooding by directing the flow of rainwater to open canals through different topographies, which can effectively avoid the problem of rainwater hoarding.

07

CONCLUSION

7.1 DESIGN PROPOSAL'S MAIN OUTCOME: THE TARGET OF NAVIGLI URBAN LANDSCAPE ENHANCEMENT

7.1.1 Improving the Landscape of the Naviglio Canal: Reasons and Importance

Enhancing the landscape of the Naviglio Canal holds significant importance for the city of Milan. It not only increases the city's attractiveness and cultural value but also provides various benefits that contribute to the overall well-being of residents and visitors. The followings are the reasons and importance of improving the Naviglio Canal's landscape:

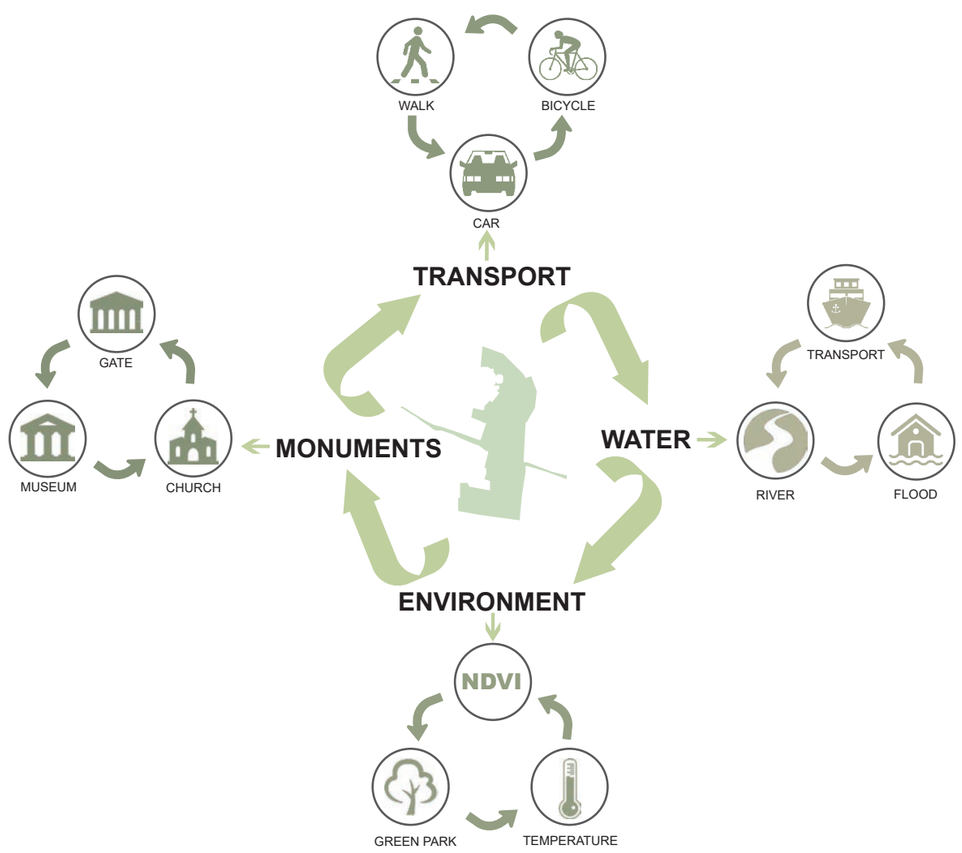
Preserving and showcasing the cultural heritage

The Naviglio Canal is a historical treasure with deep cultural and historical significance. Enhancing its landscape helps preserve and showcase this valuable cultural heritage, allowing future generations to appreciate and understand its historical context. This instills a sense of pride and cultural identity among urban residents and contributes to Milan's cultural richness.

Enhancing the city's image and reputation

A beautifully landscaped canal serves as a striking symbol for the city, elevating its image and reputation. The Naviglio Canal becomes a distinctive landmark that attracts tourists and investors alike. By enhancing the landscape, Milan can improve its overall appeal, leading to increased tourism, business opportunities, and economic growth.

Map.62 Target



Map.62 Prepared by the author

Fostering tourism development

The improved landscape of the Naviglio Canal creates a compelling tourist attraction. Visitors are drawn to its charm, historical buildings, and cultural events. This, in turn, drives tourism development, generating revenue for local businesses, creating employment opportunities, and supporting the growth of related industries. It positions Milan as a vibrant and desirable destination for both domestic and international tourists.

Providing recreational and entertainment spaces

The elevated canal landscape offers recreational and leisure opportunities for residents and visitors. People can enjoy activities such as walking, cycling, boating, or simply relaxing and savoring the canal-side ambiance. These spaces serve as inviting gathering points, fostering social interaction, and creating a sense of community among residents.

Promoting environmental sustainability

Enhancing the canal's landscape provides an opportunity to incorporate sustainable practices and technologies. This includes implementing green infrastructure, such as rain gardens and sustainable drainage systems, which help manage stormwater, improve water quality, and support the ecological health of the canal. By integrating sustainable design principles, Milan can showcase its commitment to environmental stewardship and inspire sustainable living practices among residents.

In conclusion, the improvement of the Naviglio Canal's landscape brings numerous benefits to Milan. Additionally, incorporating sustainable practices contributes to environmental sustainability and reinforces Milan's position as a forward-thinking and environmentally conscious city.

7.1.2 The functions of each part of the park project design play an important role in enhancing the landscape of the Naviglio Canal and the image of the city of Milan

Educational Garden

The educational garden within the park project design plays a crucial role in enhancing the landscape of the Naviglio Canal and benefiting both the city of Milan and its residents in several ways.

Firstly, the educational garden serves as a platform for environmental education and awareness. By providing informative signage, educational materials, and guided tours, the garden offers an opportunity for residents and visitors to learn about the names, characteristics, and ecological functions of various plant species. This kind of environmental education raises public awareness about ecosystems and the importance of environmental protection. It promotes sustainable lifestyles and encourages individuals to take responsibility for preserving natural resources.

Furthermore, the educational garden can feature a diverse range of plant species, including endemic plants and wildflowers. This plant selection promotes ecological balance, preserves native biodiversity, and provides suitable habitats and food sources for wildlife. The garden can also demonstrate sustainable farming and gardening practices, teaching the public how to protect and maintain healthy ecosystems.

As part of the urban green space, the educational garden adds to the city's green areas, enhancing the aesthetic appeal of the cityscape. It provides a peaceful and rejuvenating environment for leisure and relaxation. Additionally, the vegetation in the garden helps to absorb carbon dioxide, purify the air, reduce the urban heat island effect, and provide benefits such as wind, dust, and noise reduction. This creates a more comfortable and healthy living environment for urban residents.

Moreover, educational gardens can incorporate local cultural and historical elements, showcasing the unique charm and heritage of Milan. By introducing traditional plants, incorporating landscape features, or incorporating art installations, the garden can create a distinct cultural atmosphere, piquing visitors' interest in the city's history and culture. Such a design reinforces the city's sense of identity and provides an interactive experience for visitors to engage with the local culture.

Finally, the educational garden serves as a public space that fosters social interaction and community connection. People can participate in gardening activities, host cultural festivals, or engage in environmental awareness programs within the garden. This community involvement helps to strengthen community cohesion, foster a sense of identity, and encourage communication and collaboration among neighbors.

In conclusion, the educational garden in the park project design plays a significant role in enhancing the landscape of the Naviglio Canal and benefiting the city of Milan. It promotes environmental education, contributes to ecological sustainability, enhances the urban environment, showcases local culture, and fosters community interaction and cohesion.

Rain Garden

We have incorporated rain gardens into the park project design, focusing on rainwater collection and treatment. These rain gardens serve multiple important purposes for the Naviglio Canal landscape and the city of Milan.

Firstly, rain gardens efficiently collect and utilize rainfall, alleviating the burden on urban drainage systems. By selecting appropriate vegetation and implementing suitable soil structures, the rain gardens effectively filter and absorb stormwater, reducing the risk of flooding. This proactive water management approach improves the overall water management in the city, safeguards water quality, and mitigates water pollution.

Moreover, the presence of rain gardens promotes sustainable water use and management. These gardens serve as educational platforms, raising public awareness about rainwater harvesting and utilization. They help people understand the significance of rainwater and encourage them to adopt more economical and rational water usage practices in their daily lives. By showcasing the benefits and applications of rainwater harvesting through rain gardens, individuals are inspired to embrace environmentally friendly actions and contribute to the city's sustainable development.

In addition to their functionality, rain gardens also contribute to the aesthetic appeal of the landscape. The design of the rain gardens harmoniously blends with the surrounding environment, creating visually pleasing and inviting spaces. The incorporation of vegetation and water features enhances the natural beauty of the area, providing residents and visitors with a tranquil and enjoyable setting to relax and rejuvenate.

Furthermore, rain gardens can serve as educational and engaging spaces. The public can actively participate in the construction and maintenance of these gardens, gaining practical knowledge about stormwater management and environmental protection. Seminars, workshops, and guided tours can be organized to deepen people's understanding of the value and function of rain gardens. This engagement fosters a sense of responsibility towards sustainability and environmental preservation, empowering individuals to implement sustainable practices in their daily lives.

In summary, the inclusion of rain gardens in the park project design brings numerous benefits to the Naviglio Canal landscape and the city of Milan. They contribute to efficient water management, protect water quality, enhance the aesthetic appeal of the surroundings, and serve as educational and engaging spaces for the public. The rain gardens play a vital role in promoting sustainable practices, raising awareness about environmental protection, and fostering a culture of sustainability within the community.

Sport Area

The inclusion of a sports area in the park project design brings significant benefits to the Naviglio Canal landscape and the city of Milan.

First and foremost, the sports area provides residents with a dedicated space for physical exercise and recreational activities. It offers various opportunities for activities such as jogging, walking, cycling, and other sports, which contribute to improved physical health and mental well-being. The availability of a well-equipped sports area encourages individuals to engage in regular exercise, leading to enhanced fitness, strength, and stamina, ultimately improving their overall quality of life.

Moreover, the sports area serves as a gathering place, fostering social interaction and community connectivity. When residents participate in sports activities within the area, they have the chance to meet new people, engage in conversations, and form connections with others. This promotes social integration, strengthens community bonds, and nurtures a sense of unity and belonging among residents. Organizing sporting events and team activities within the sports area further enhances community cohesion and camaraderie.

Additionally, a high-quality sports area contributes to the city's image and attractiveness. It signifies the city's commitment to the health and well-being of its residents, showcasing its dedication to modernization and progress. Serving as an iconic landmark, the sports area becomes a prominent element in city promotion and publicity, attracting more visitors and leaving a positive impression of Milan as a vibrant and active city.

In summary, the incorporation of a sports area in the park project design not only provides residents with a space for physical activity and recreation but also fosters social interaction and community cohesion. Furthermore, it enhances the city's image and attractiveness, positioning Milan as a city that prioritizes the well-being of its residents. The sports area becomes a significant component of the overall park design, contributing to the livability and vibrancy of the Naviglio Canal area.

Small Square

Small squares play a vital role in enhancing the landscape of the Naviglio Canal and the city of Milan, offering numerous benefits to residents and visitors alike.

First and foremost, small squares serve as vibrant gathering places, providing a convenient meeting point for people to connect, converse, and share ideas and experiences. They create a sense of community by fostering social interaction and facilitating cultural exchange. These squares also serve as ideal venues for community events, cultural performances, and musical shows, further enhancing community cohesion, promoting multicultural integration, and enriching the cultural fabric of the city.

Small squares offer opportunities for commercial and economic activities as well. By incorporating cafes, book bars, and exhibition areas, these squares attract people to indulge in food, literature, relaxation, and exploration of the surrounding historical and cultural heritage. This not only provides visitors with more choices and experiences but also enhances the overall attractiveness of tourism in the area.

Additionally, small squares provide ideal spaces for relaxation and entertainment. People can unwind in these squares and engage in activities such as reading, listening to music, and appreciating street art performances. With the inclusion of seating areas, green spaces, and well-designed landscapes, these squares offer a comfortable environment for leisure. Such spaces are essential in alleviating the stresses of urban life and improving the quality of life for both residents and tourists.

Furthermore, the design and decoration of mini squares contribute to the beauty and uniqueness of a city. A well-designed square can become an iconic landmark, reflecting the city's artistic taste and creativity. Through thoughtful landscape arrangements, art installations, and lighting designs, small squares shape the city's image, attract tourists and residents, and enhance the overall aesthetic value and appeal of the city.

In conclusion, small squares within the park project design hold immense significance in enhancing the landscape of the Naviglio Canal and the city of Milan. They foster social interaction, support cultural activities, stimulate economic vitality, provide leisure opportunities, and contribute to the aesthetic value of the city. These small squares are integral elements in creating a vibrant and livable urban environment.

Rest area along the river

Rest areas along the river play a significant role in enhancing the landscape of the Naviglio Canal and the city of Milan, offering various important benefits to both residents and visitors.

First and foremost, these rest areas provide a serene and natural space where people can unwind and escape the fast-paced urban environment. Through careful landscaping, the inclusion of green spaces, and the preservation of natural elements, these areas create a tranquil atmosphere that allows individuals to relax and rejuvenate. The presence of such natural landscapes not only promotes the physical and mental well-being of residents and tourists but also adds to the overall beauty and livability of the city.

The rest areas along the river also serve as ideal locations for leisure and social activities. Residents and visitors can engage in various recreational pursuits such as walking, jogging, cycling, or enjoying outdoor picnics. The amenities and facilities available, such as benches and open-air cafes, encourage people to spend quality time with family and friends. This fosters social interaction, strengthens community bonds, and cultivates a sense of belonging and connectedness among individuals.

Moreover, as the Naviglio Canal is a significant cultural heritage site of Milan, the rest areas along the river provide an opportunity for people to appreciate and experience its historical significance. Through informative signage and explanatory boards, these areas can educate visitors about the rich history and cultural heritage associated with the Naviglio Canal. This helps to raise awareness and appreciation for the city's traditions and cultural identity, contributing to the preservation and promotion of its unique heritage.

Furthermore, the presence of rest areas along the river enhances the city's appeal as a tourist destination, thereby generating economic benefits. Visitors can immerse themselves in the picturesque riverside scenery and immerse in the local culture and way of life. Commercial establishments such as shops, restaurants, and art workshops can be strategically located near these rest areas, attracting tourist spending and participation. This, in turn, drives tourism revenue, stimulates economic growth, and fosters the prosperity and development of local businesses.

In conclusion, rest areas along the river are integral components of the park project design, significantly enhancing the landscape of the Naviglio Canal and the city of Milan. They provide spaces for relaxation, leisure, and social engagement, contribute to the appreciation of cultural heritage, and have the potential to drive tourism and economic growth. These rest areas enrich the overall experience for residents and visitors, making Milan an even more attractive and vibrant city.

7.1.3 Sustainability in Naviglio Project Design

In our project design, the application of sustainability is a central focus, aiming to create a design that is environmentally responsible and promotes the long-term well-being of the community. Here are the key aspects of sustainability that we have incorporated into our design:

Water Resource Management

We have implemented various water resource management measures, such as rain gardens and water circulation systems. These initiatives effectively collect and utilize rainwater, reducing water consumption, minimizing flood risks, and improving water quality. Rain gardens are designed to filter and absorb stormwater, alleviating the burden on the sewer system and protecting local ecosystems.

Ecological Protection

Our design prioritizes the protection and promotion of the local ecosystem. We have carefully selected vegetation, implemented tree protection measures, and adopted sustainable garden management practices. These actions provide suitable habitats for native plant and animal species, contributing to biodiversity conservation. Additionally, reducing resource consumption, such as water and energy, helps minimize the project's environmental impact.

Renewable Energy Utilization

We have explored the integration of renewable energy sources to meet energy needs. For instance, solar panels have been installed in park infrastructure to generate clean energy. By utilizing renewable energy, we reduce reliance on traditional energy sources and mitigate greenhouse gas emissions, thus addressing the challenge of climate change.

Community Engagement and Education

Our project actively engages the community through various initiatives to raise awareness and understanding of sustainable development. We organize green events, environmental education classes, and tours to communicate the importance of sustainability to residents and tourists. By fostering community engagement and providing educational opportunities, we encourage individuals to adopt sustainable practices and contribute to the overall sustainable development of the community.

Construction and Material Selection

Sustainable construction and material choices are integral to our design. We prioritize energy-efficient, environmentally friendly, and renewable materials. By employing efficient building systems and sustainable construction practices, we aim to reduce resource consumption, minimize waste generation, and lower the project's carbon footprint. This approach creates a more sustainable built environment that aligns with the principles of sustainability.

In conclusion, our design incorporates sustainability principles in water resource management, ecological protection, renewable energy utilization, community engagement and education, and sustainable construction practices. By embracing sustainability, we aim to protect the environment, foster community well-being, and create a more sustainable and resilient future for both residents and visitors.

7.2 HOW THE DESIGN PROPOSAL CONNECTS THE NAVIGLI SYSTEM

The design of the newly created park demonstrates a holistic approach that encompasses physical and human connections, historical preservation, and addressing urban environmental challenges. The presence of the canal running through the park not only serves as a physical connection but also attracts more people to the park, fostering a sense of community and providing opportunities for visitors to learn about Milan's history, culture, and development.

The integration of the park and canal contributes to addressing urban environmental issues, particularly in water management. By utilizing the park's topography, excess rainwater is effectively drained into the canal, reducing the risk of flooding and contributing to the overall management of Milan's urban water system.

Preserving green spaces has been a priority in the park's design, creating a serene and verdant environment for visitors to enjoy. The inclusion of bicycle paths within the park and their connection to the existing 8 km canal bicycle path enhances the connectivity and accessibility of the park. A riverfront walkway further adds to the park experience, allowing visitors to appreciate the surroundings of the canal. However, it is acknowledged that there is room for further development in enhancing the water environment within the park.

It is crucial to consider the social, economic, and environmental consequences when evaluating the potential impacts of the design proposal. The park design aims to improve park amenities and infrastructure, which can contribute to increased housing prices in the neighborhood. Additionally, the park offers enhanced cultural experiences, educational opportunities, and a well-connected environment.

The inclusion of educational rain gardens is an innovative feature of the park design, catering to the interest of local Milanese citizens. QR codes and signage provide valuable information on local plant species, their habits, and seasonal changes, promoting environmental awareness and engaging park users.

Overall, the park design takes into account the needs of the local community and stakeholders. Its strategic location near the canal, hospital, archaeological park, and university enhance its value and potential positive impacts. By creating an improved park environment, fostering cultural experiences, enhancing connectivity, and promoting sustainability, the design has the potential to bring multiple benefits to the surrounding community and contribute to a vibrant urban environment.

7.3 THE BENEFIT OF COMPREHENSIVE DESIGN CHOICES

7.3.1 Sustainability in Naviglio Project Design

In the design of the reopening project of the Naviglio Canal, we have realized the importance of comprehensive design choices for the development of the project. Comprehensive design choices refer to the decisions and strategies that consider multiple factors and elements in the design process to achieve the best results and benefits. It encompasses various aspects such as functionality, efficiency, sustainability, aesthetics, environmental impact, and social engagement, aiming to address challenges and meet diverse needs in a holistic and integrated manner.

The significance of comprehensive design choices lies in their ability to provide comprehensive and integrated solutions, making the design more sustainable, efficient, and holistic. By considering multiple factors, comprehensive design choices can overcome the limitations of a single focus and leverage the strengths and potentials of all aspects to achieve optimal design outcomes.

Furthermore, comprehensive design choices improve design coordination and consistency. By considering the requirements and goals of each component, they ensure that they align and harmonize with one another, resulting in a cohesive design with a unified style and aesthetic impact.

Comprehensive design choices also foster community engagement and address stakeholder needs. Through effective communication and collaboration with all parties involved, comprehensive design choices can better reflect the needs and expectations of the community, enhancing the design's acceptance and long-term sustainability.

By taking into account environmental impact, resource utilization, and energy efficiency, comprehensive design choices can reduce the consumption of natural resources, minimize environmental burdens, and promote sustainable development. This helps improve the project's overall sustainability and resilience.

Therefore, comprehensive design choices play a crucial role in modern urban planning and architectural design. They not only enhance the quality and effectiveness of design, but also contribute to the sustainable development of society, environment, and economy. The concept and application of comprehensive design options are of significant value and importance.

7.3.2 Harmonization and Consistency Methodology

Promoting coordination and coherence was critical in the Naviglio Canal project, and we employed the following approach:

First, we prioritized comprehensive planning and design. During the initial stages of the project, we conducted thorough planning and design to ensure coordination and consistency among various components and functions. This involved gaining a deep understanding of the Naviglio Canal's historical and cultural background, analyzing the specific conditions of each area, dividing the project into distinct zones with different functions, and establishing connections and interactions between them. This comprehensive planning ensured the overall design's coherence and unified vision.

Next, we emphasized the use of unifying design elements. Throughout the Naviglio Canal project, we employed consistent design elements and themes such as color schemes, landscaping choices, and architectural styles. This created a cohesive visual identity that enhanced the project's overall harmony and integration with its surroundings.

Furthermore, we placed significant emphasis on the cultural and historical value of the Naviglio Canal in our project design. By highlighting and respecting the cultural and historical significance of the canal, we ensured that the entire project aligned with the local culture and traditions of Milan. This involved incorporating elements of local cultural characteristics, such as traditional architecture, artwork, or cultural performances, to showcase the unique charm of the project while preserving and safeguarding its historical heritage.

By employing these methods, we were able to promote coordination and consistency throughout the Naviglio Canal project, ensuring its successful implementation and long-term sustainable development.

7.3.3 Benefit

In the design of the Naviglio Canal as a whole and the surrounding pocket parks, integrated design choices have several advantages:

Firstly, comprehensive design choices allow for the consideration of multiple factors and elements, including functional requirements, environmental characteristics, and social impact. By taking a comprehensive approach, design choices can balance various needs and interests, ensuring the overall coherence and coordination of the design scheme.

Moreover, integrated design choices enable the optimization and utilization of available space resources. By considering the functional requirements of different areas, the design can effectively utilize each space within the Naviglio Canal and pocket parks. For example, based on the surrounding environment and specific needs, designated areas such as leisure spaces along the canal, children's play areas, and cultural exhibition areas can be planned to cater to different groups of people.

Comprehensive design choices also enhance the overall environmental quality, resulting in a visually appealing and welcoming design for the Naviglio Canal and pocket parks. By taking into account landscape design, vegetation choices, road layout, and architectural elements, a harmonious and unified environment can be created, providing a comfortable and enjoyable experience. Additionally, these design choices can improve environmental sustainability by incorporating considerations such as water resource management and energy utilization, thereby reducing the overall consumption of natural resources and environmental impact.

Integrated design choices foster community interaction and participation. By incorporating community needs and engagement mechanisms into the overall design, the sense of community participation among residents and tourists can be enhanced. Public squares, outdoor activity areas, and educational gardens can be incorporated to encourage social and cultural activities, promoting social interaction and communication.

Lastly, comprehensive design options offer the advantage of continuous development and flexibility. By considering future sustainability and scalability, design choices can adapt to future changes and evolving needs. This ensures that the overall design of the Naviglio Canal and pocket parks remains feasible and adaptable in the long term.

In conclusion, integrated design choices bring several advantages to the overall design of the Naviglio Canal and the surrounding pocket parks. By considering various factors and elements, these design choices create a comprehensive, coordinated, and sustainable solution. This results in a design that harmoniously integrates with its context, meets the needs of the community, enhances the overall environmental quality, and promotes community interaction and engagement.

08

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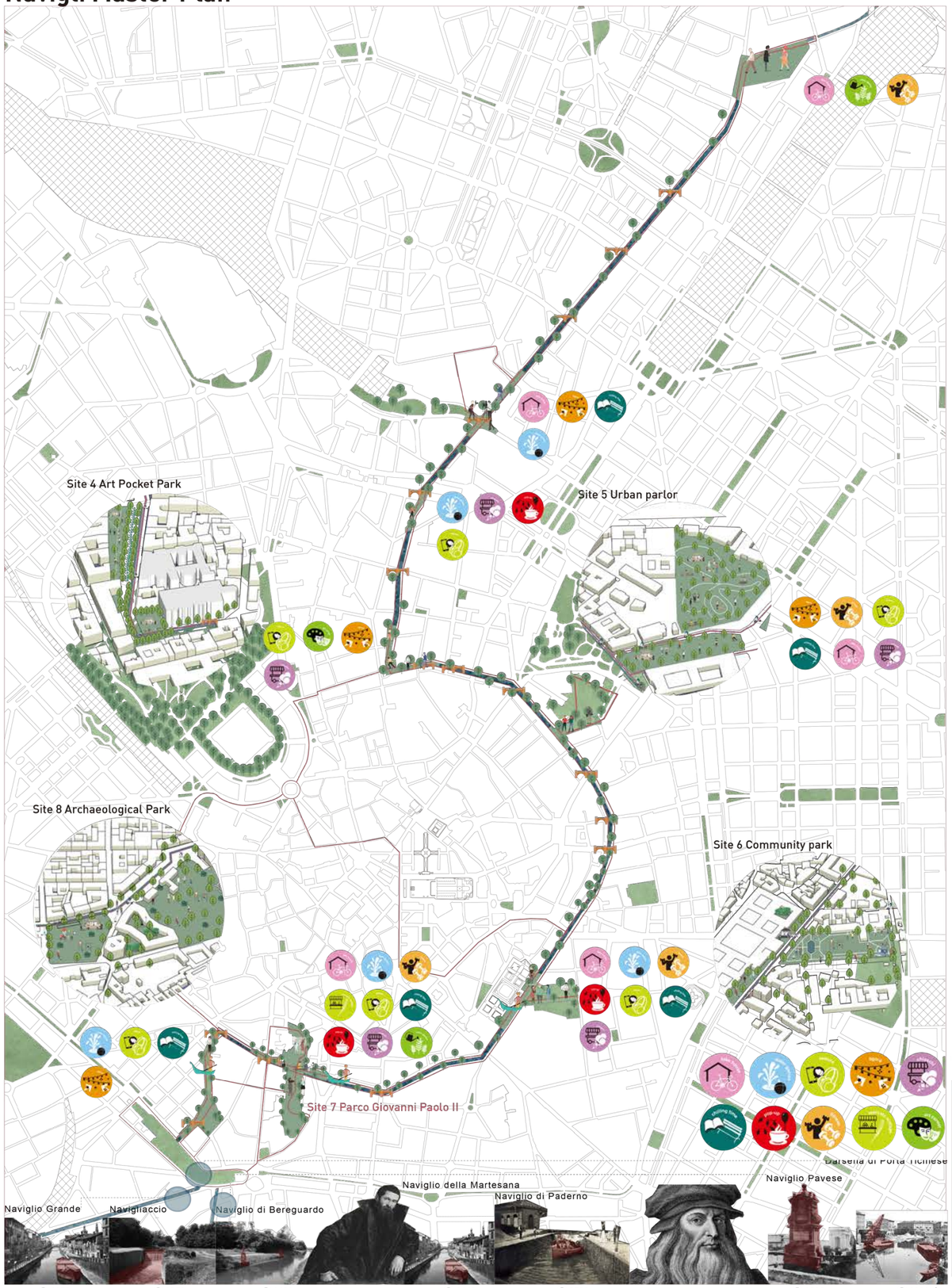
09

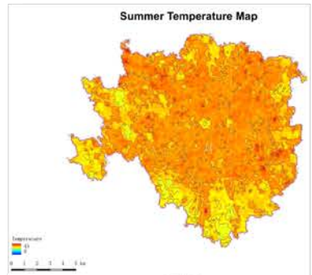
ANNEXE: DETAIL DRAWING

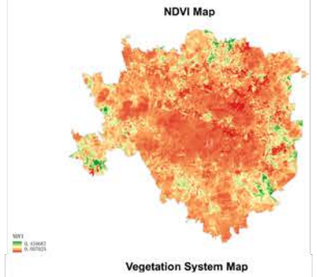
Milan Site Survey

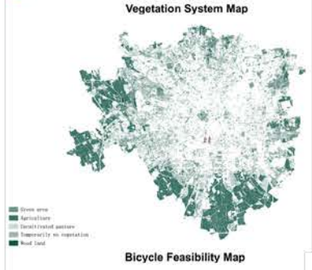
Navigli Master Plan

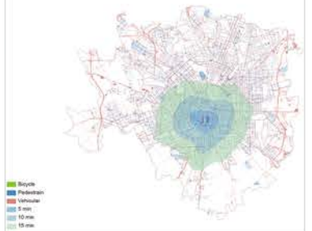


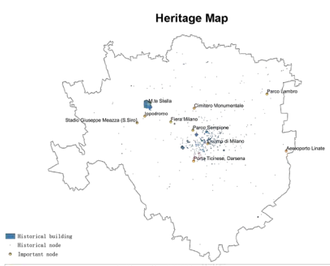
Milan basic information

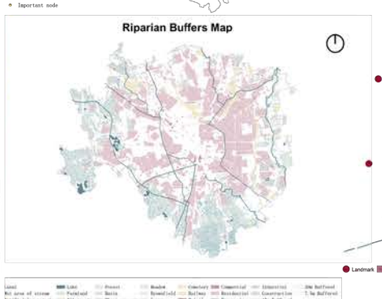




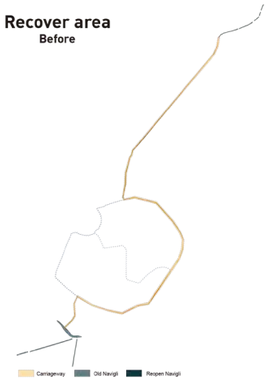


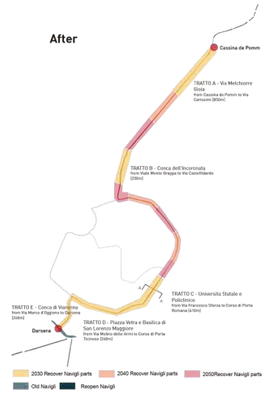


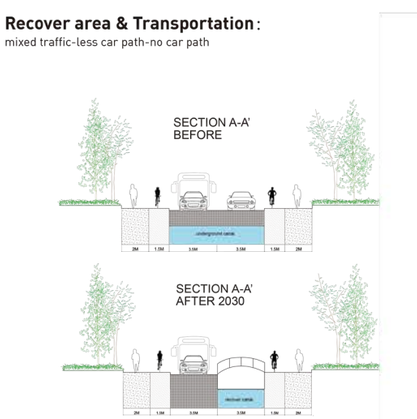


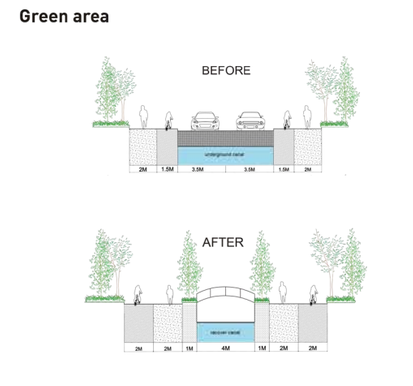


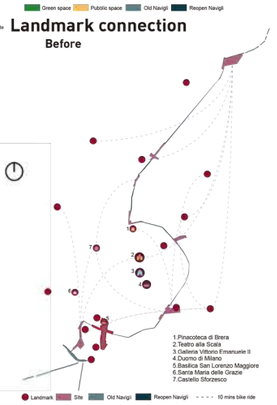
Naviglio strategy

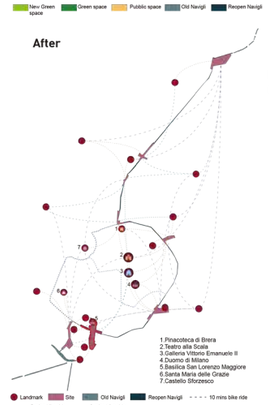


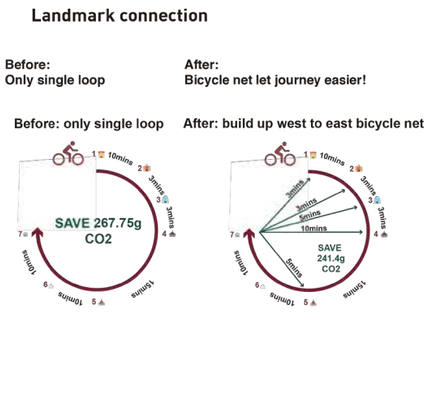












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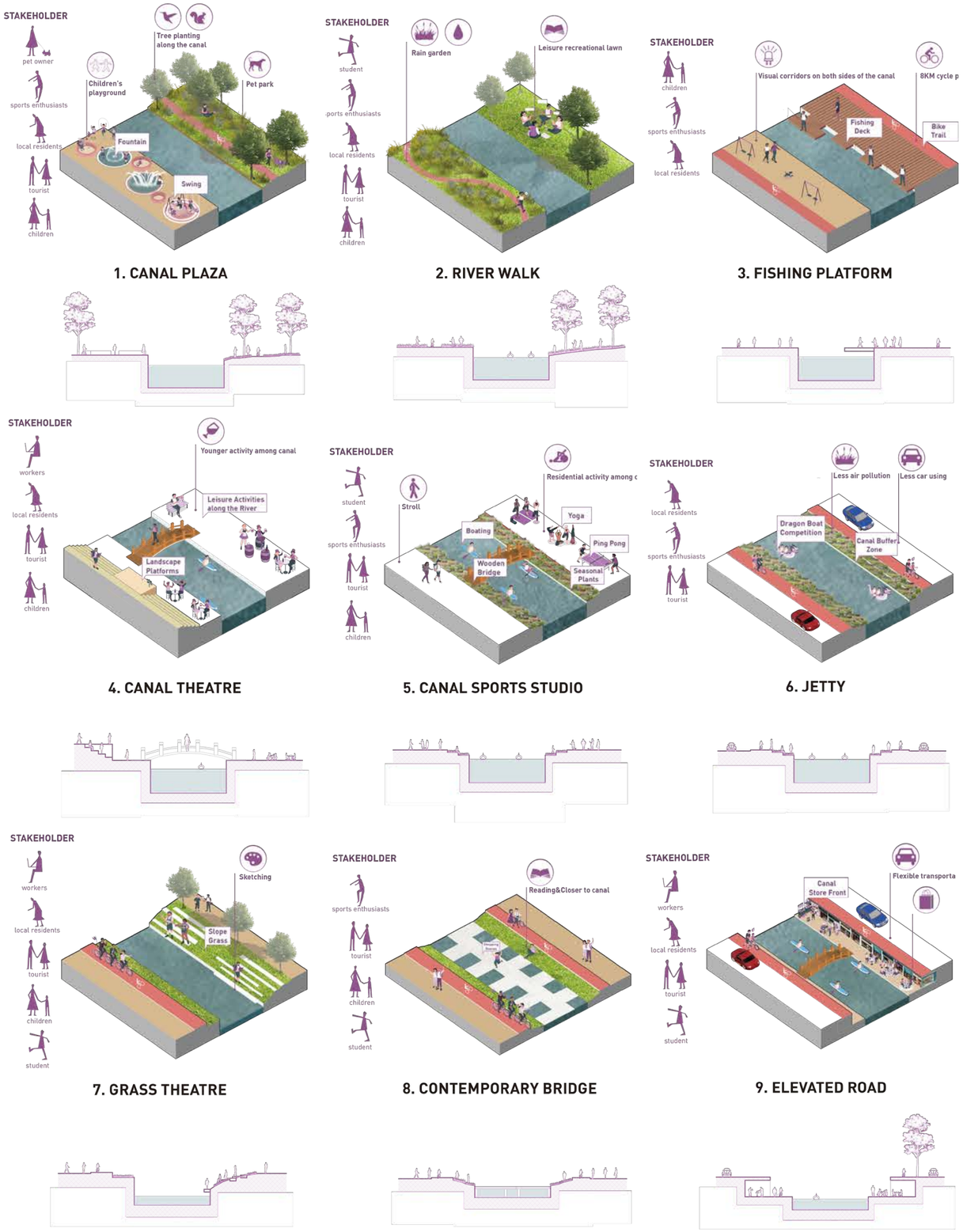
Navigli Canal Design Proposal

Navigli Diagram

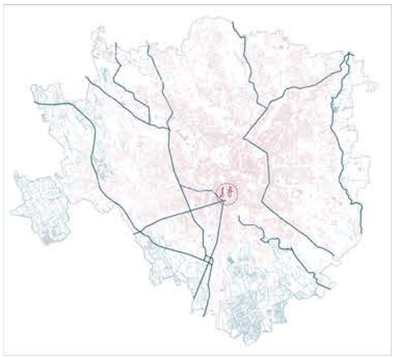


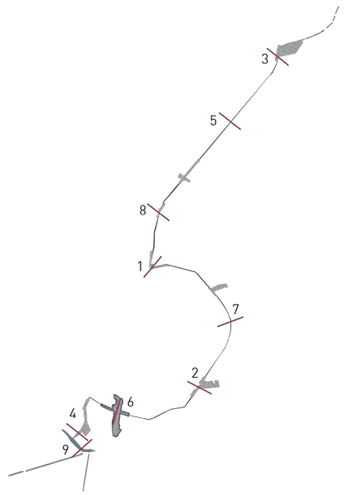
Navigli Mind Map

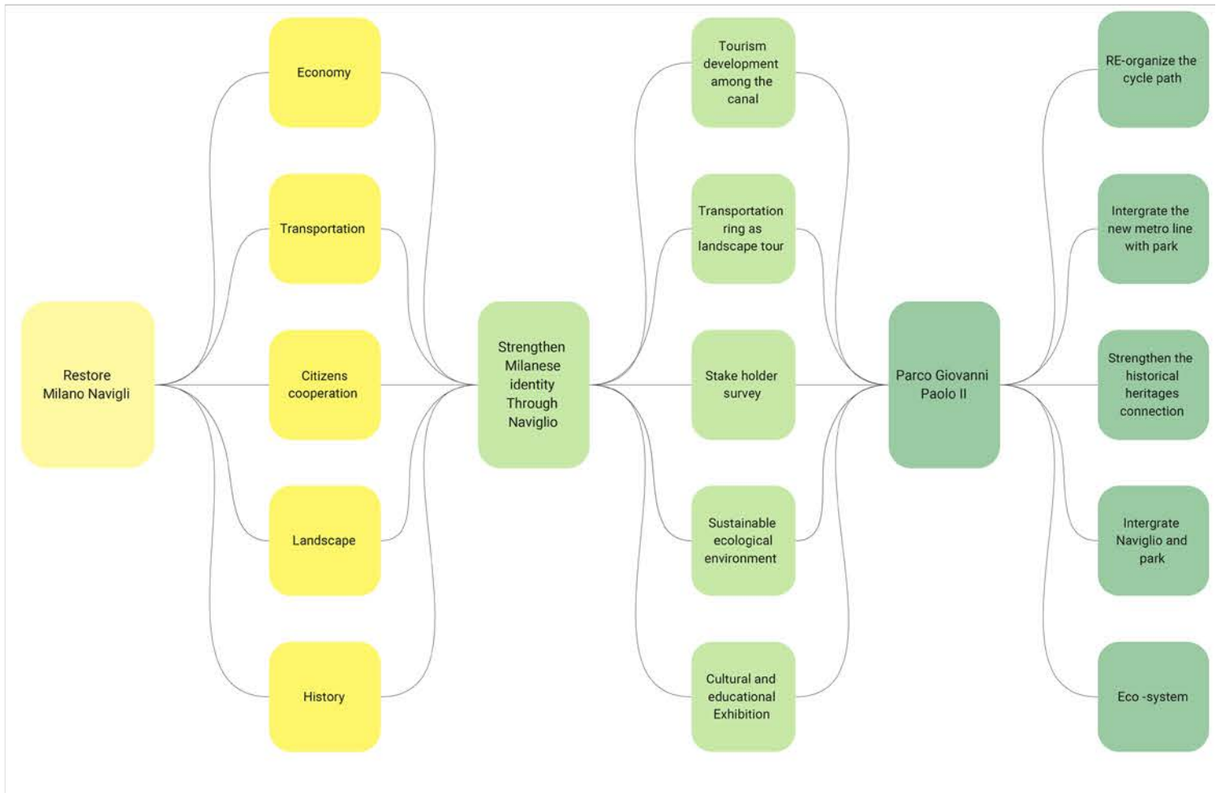
1.Basic Research of Milan

2. Naviglio strategy

3.Parco Giovanni Paolo II: A Case Study Analysis







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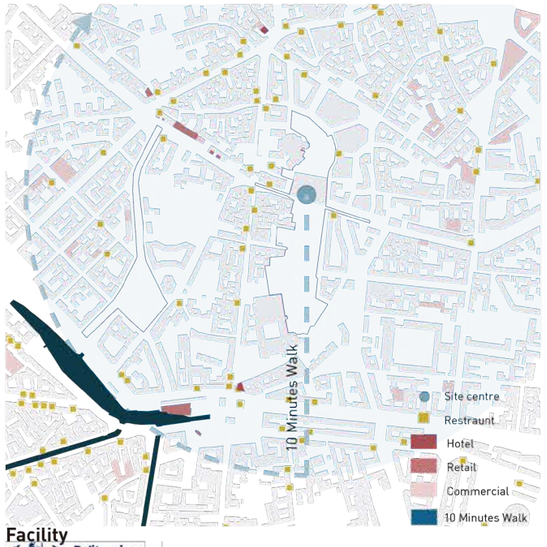
Parco Giovanni Paolo II Site Survey

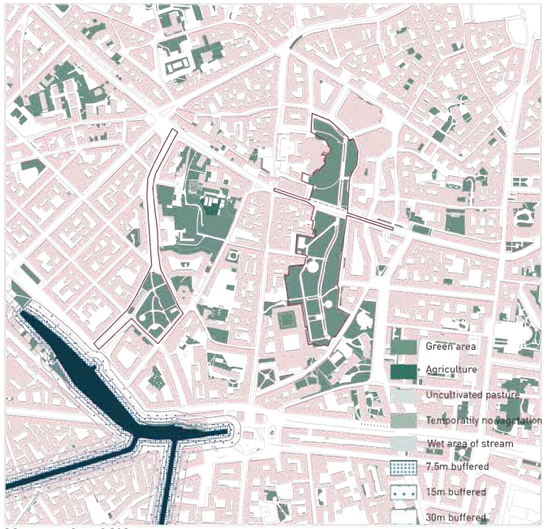
Park Surrounding analysis

Temperature

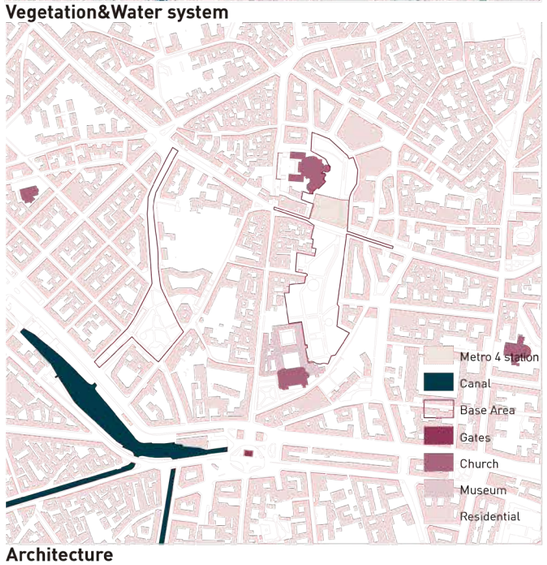
NDVI- Normalized difference vegetation index



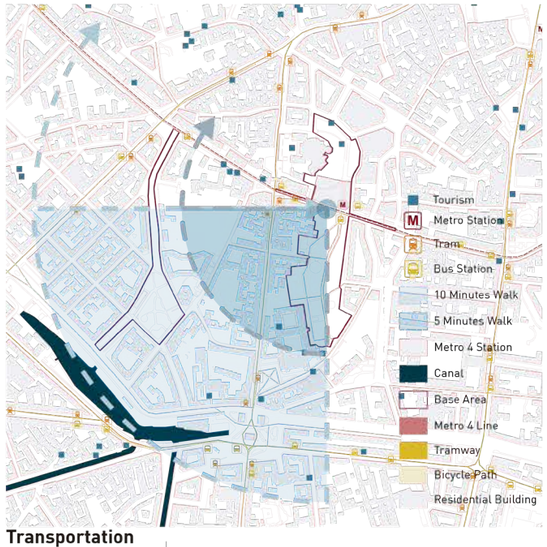
Facility



Vegetation&Water system

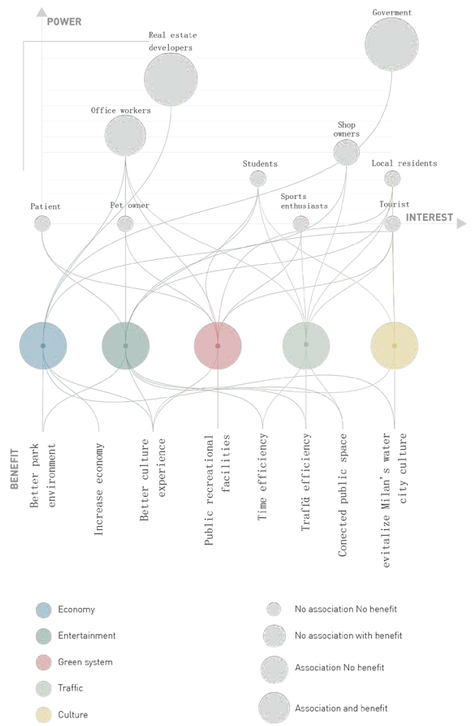


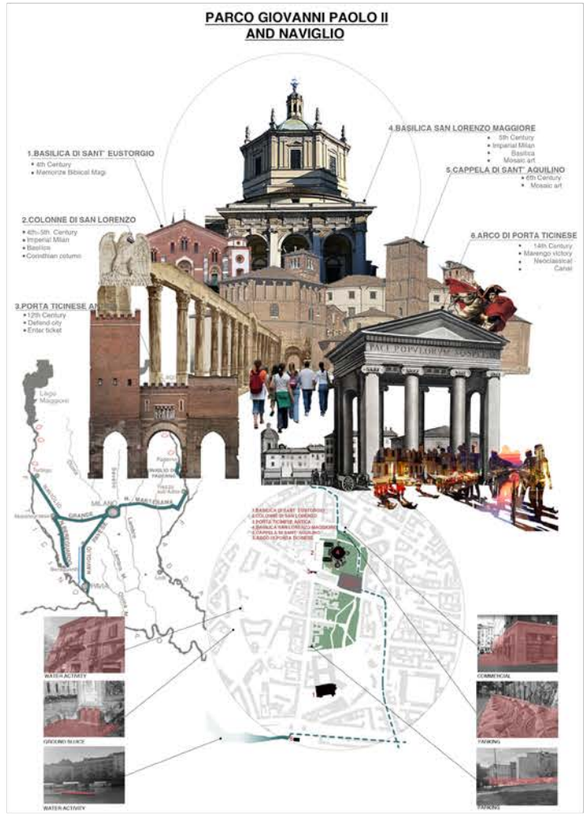
Architecture



Transportation

Stakeholder map





Parco Giovanni Paolo II Analysis

Student:
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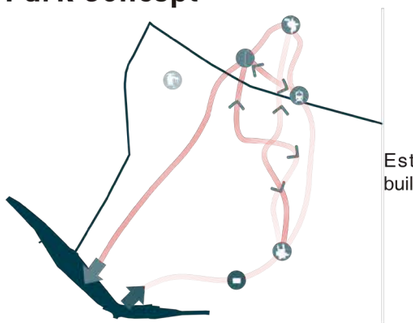
Mellano Paolo

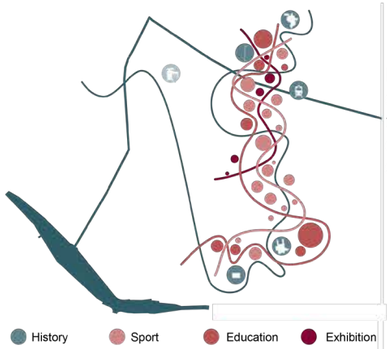
Parco Giovanni Paolo II Design Proposal

Park Concept



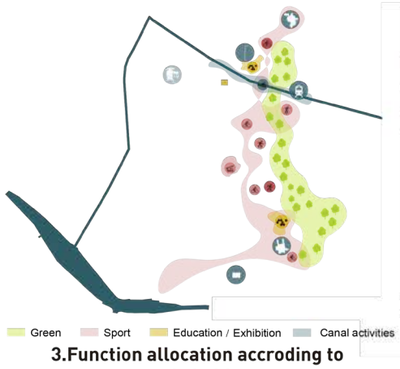
Establishing links between important buildings and the canal

1.Connections between important spots



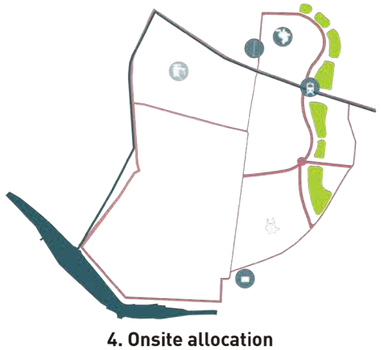
It has the advantage of next to archaeological park and the university, there will be historical, sporting and educational activities taking place on the site

2. Activities Penetration in park



The design elements are taken from the curved form of the river and the range of activities is set according to the distribution of activities

3.Function allocation accroding to stakeholder

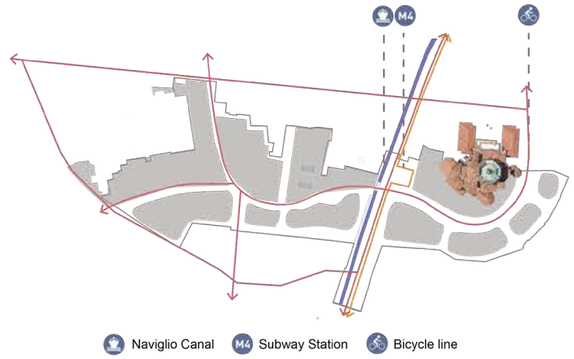


A cycle path will run through both parks, strengthening the connection between the public spaces and regulating the use of the footpaths and cycle paths, meanwhile according to the bike path make the specific function area. Make the users visit the whole park easily.

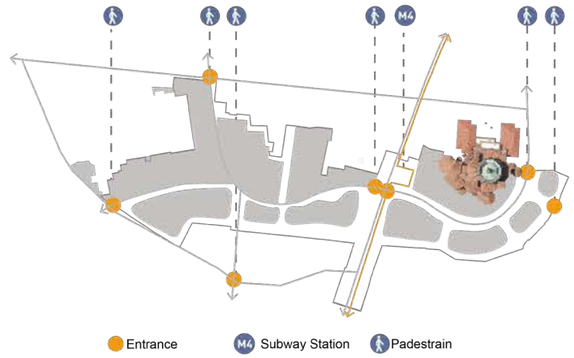
4. Onsite allocation

Master plan

Mobility lines



Access



General Zoning

Programming

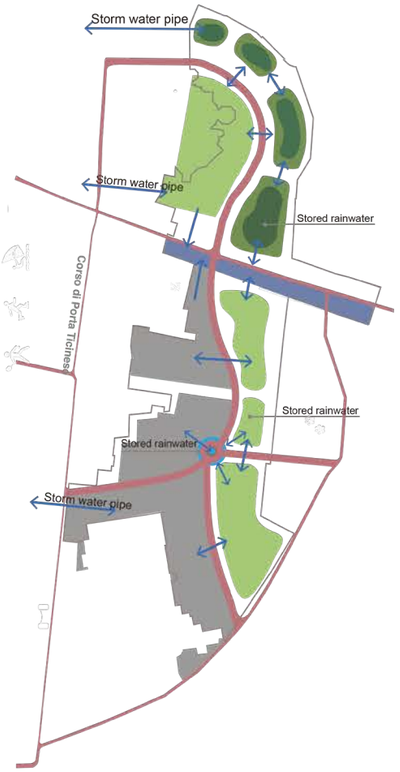
Student:
Mao Jingtian
Yang Xiaoyu
Supervisor:
Artuso Mario
Mellano Paolo

Sponge City

Master plan

Why sponge city?

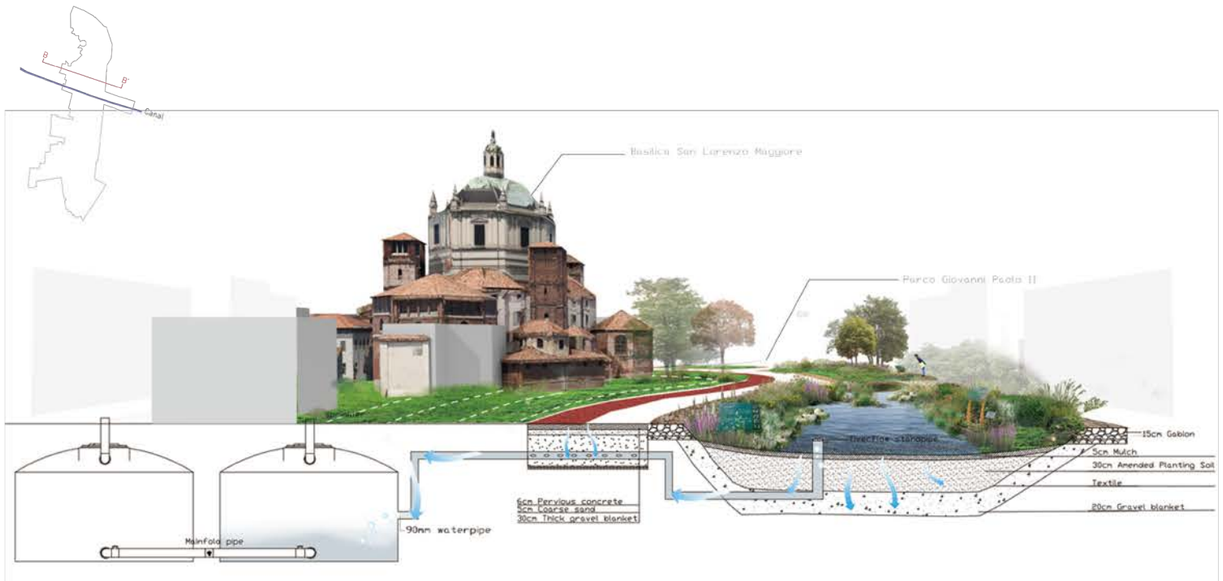
Water flow



There are 407 properties in Milan that have greater than a 26% chance of being severely affected by flooding over the next 30 years

How sponge city works

Section A-A' Drawing not in scale



Section B-B' Drawing not in scale

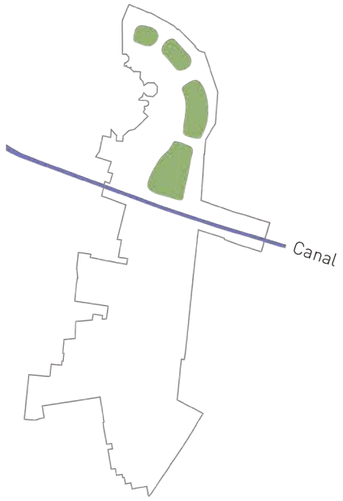
Student: Mao Jingtian, Yang Xiaoyu
Supervisor: Artuso Mario, Mellano Paolo

Educational Garden

Master plan

Why educational garden?

Park position

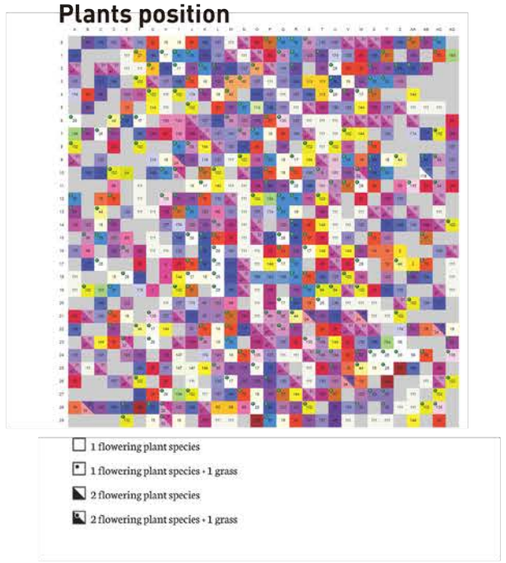


From the information research about an citizen requests vote we found out that for Milanese, the most important function of the park is educational function.

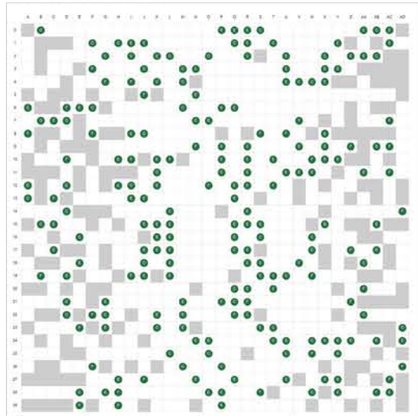
Therefore, we intend to place rain gardens with educational functions around the church to educate students and visitors in the neighborhood by showing the cycles and habits of local plants in Milan.

How the eductaional garden works?

Plants position

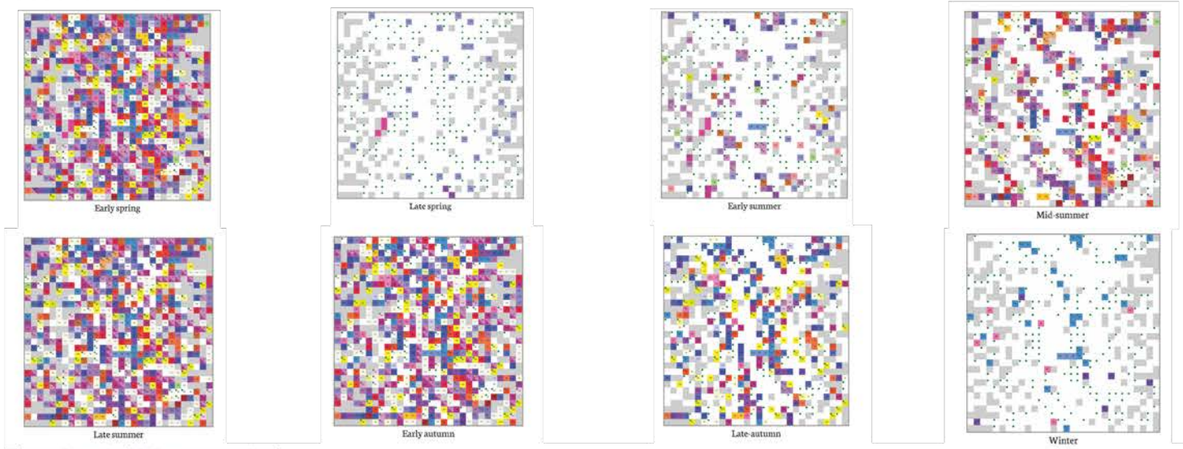


Grass matrix

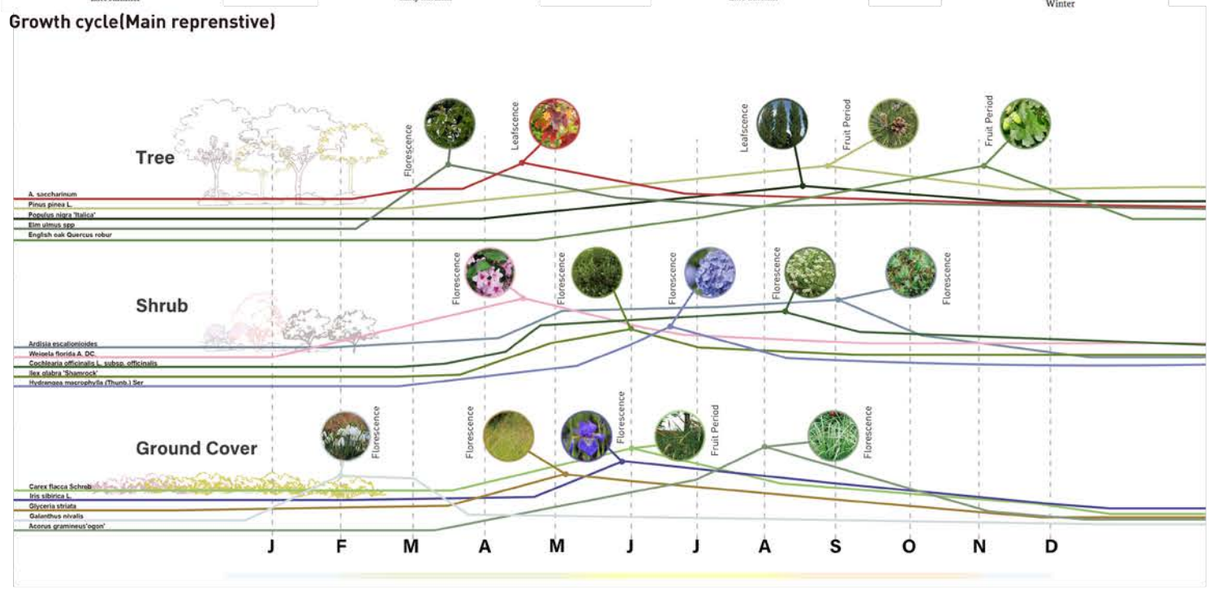


Green dots show where to place grasses. These are planted under certain plants that lose theirleaves quickly.This grassy matrix' helps to prevent weeds spreading over bare soil and provideshabitat for pollinators and other wildlife.

Sesonal views



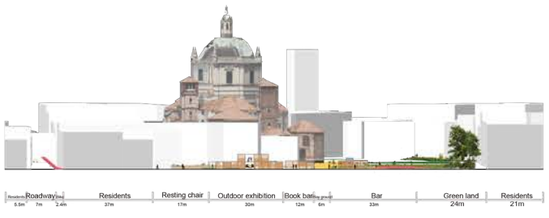
Growth cycle(Main reprenstive)



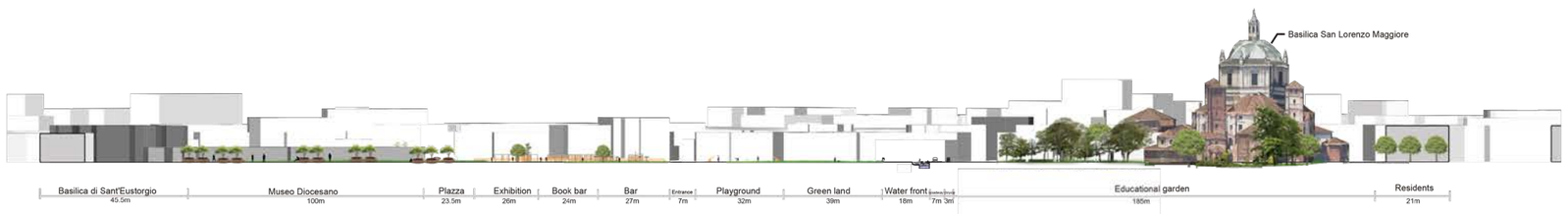
Parco Giovanni Paolo II Axonometric View

Ariel view

Section C - C' 1:500



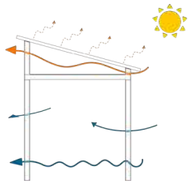
Section D - D' 1:500



Square Design Proposal

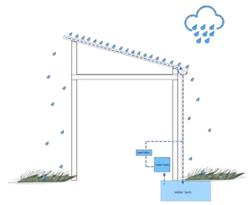
Module sustainable analysis

Ventilation



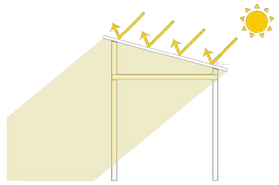
The double roof protects from direct sunlight and increment natural ventilation

Water cycle



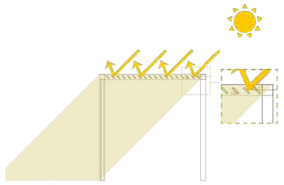
Water is collected and filtered with purifier

Shadow



module 1

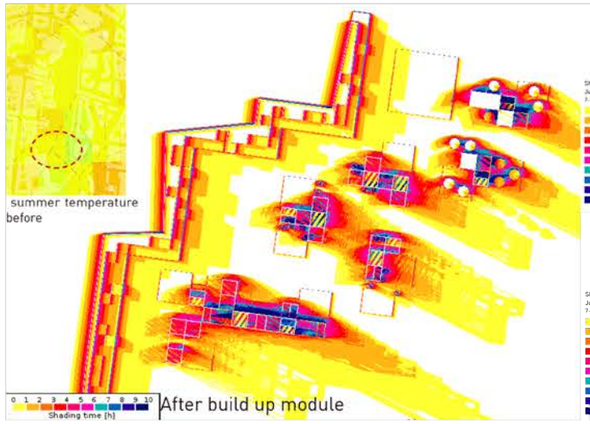
15° pitched roof to prevent direct sunlight



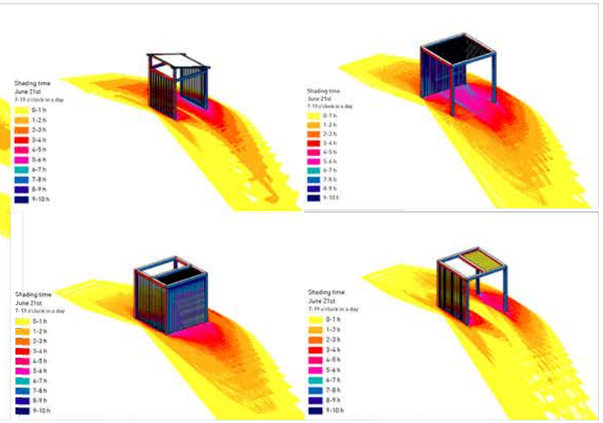
module 2

45° sloping planks prevent direct sunlight

Shading analysis



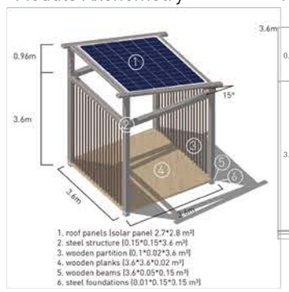
Module shading analysis



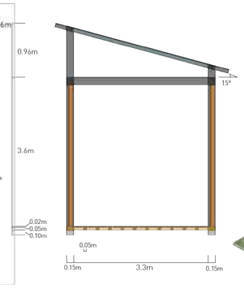
Square plan

Module 1

Module Axonometry

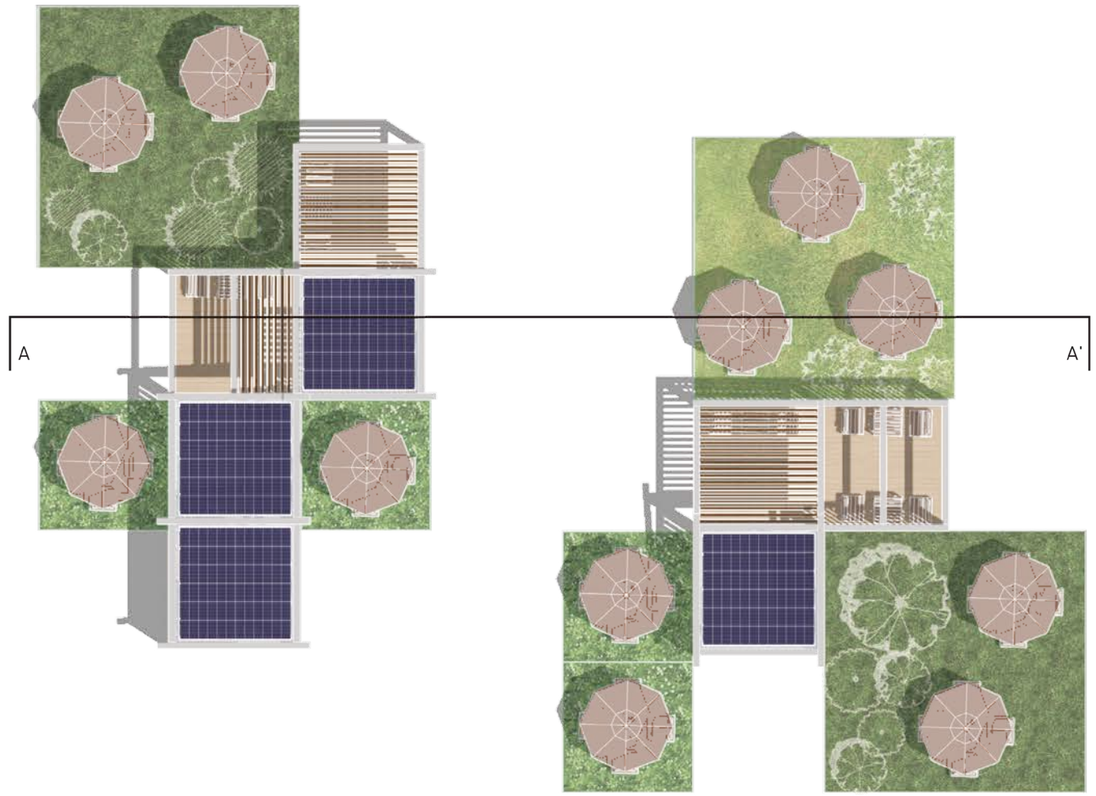


Module Section



Caffe bar Axonometry

Caffe bar Plan

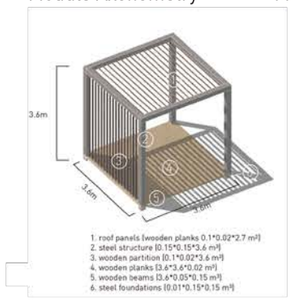


Caffe bar section A-A'

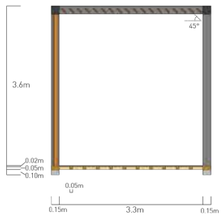
Module Design Proposal I

Module 2

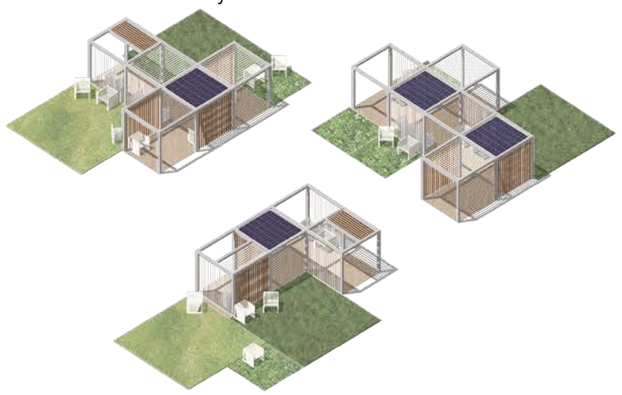
Module Axonometry



Module Section

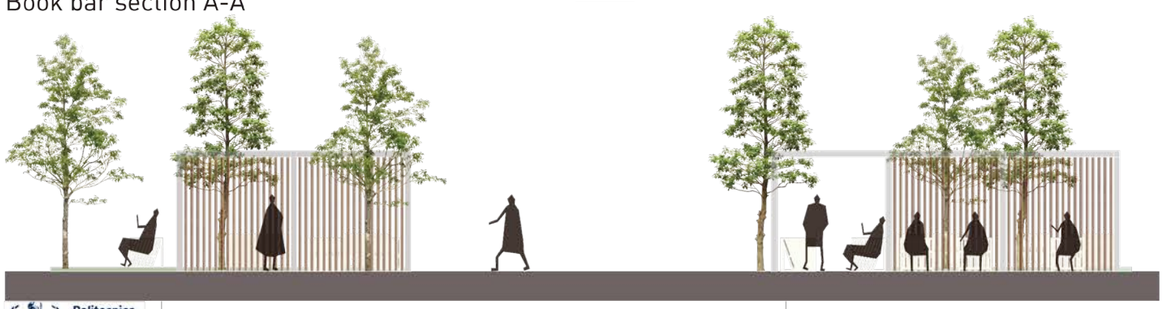


Book bar Axonometry

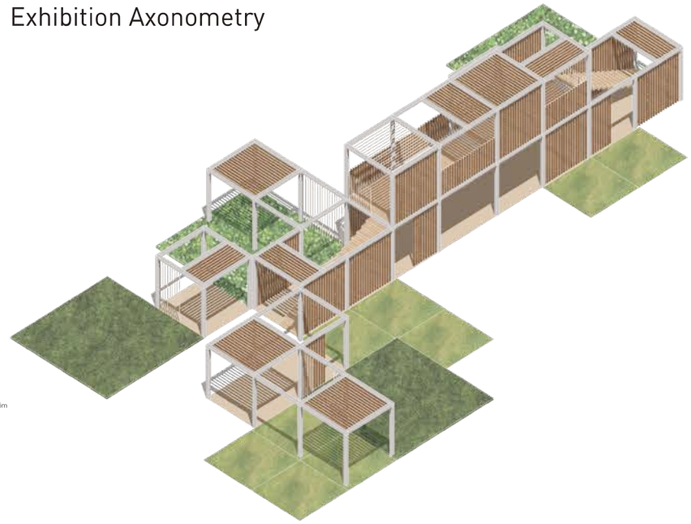


Book bar Plan

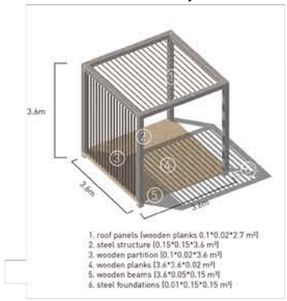
Book bar section A-A'



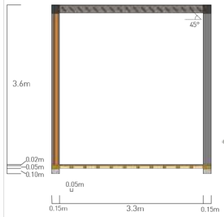
Exhibition Axonometry



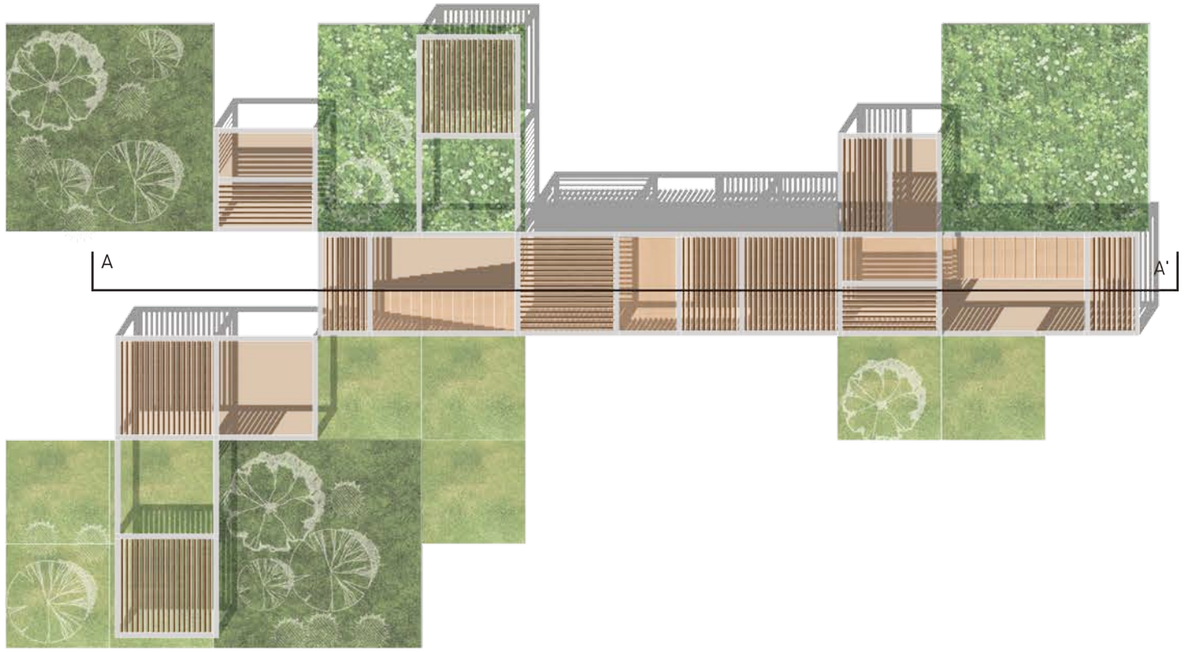
Module Axonometry



Module Section



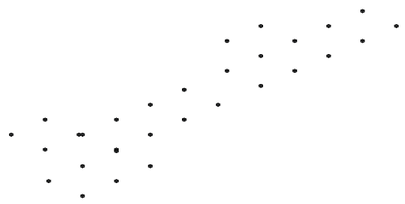
Exhibition Plan



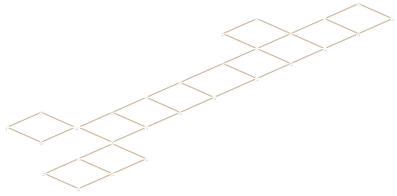
Exhibition section A-A'

Module Design Proposal II

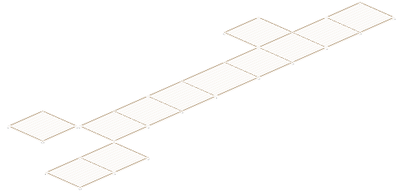
Construction Step



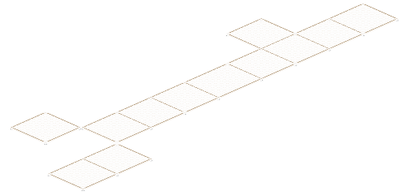
01. Positioning and installation of foundations



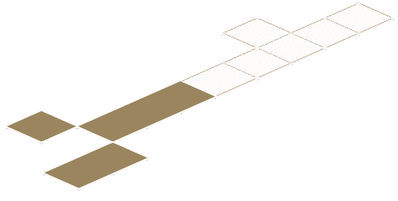
02. Placement of the main beam structure of the lower floor



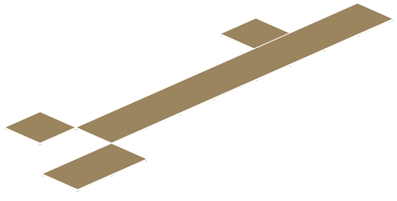
03. Placement of the secondary beam structure of the lower floor



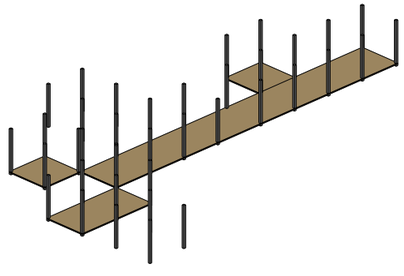
04. Placement of the secondary beam structure of the lower floor



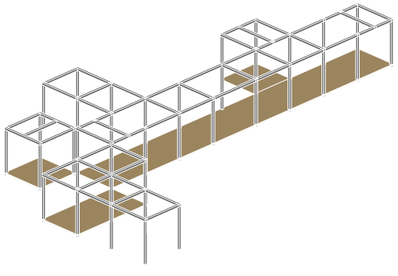
05. Fix the wooden planks on the foundation beams



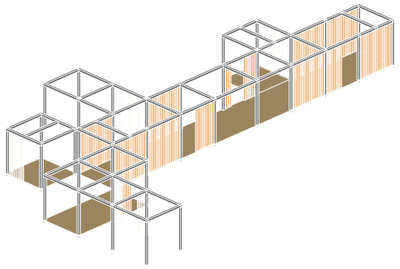
06. Fix the wooden planks on the foundation beams



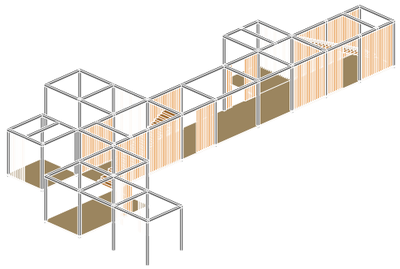
07. Fitting and fixing of composite pillars



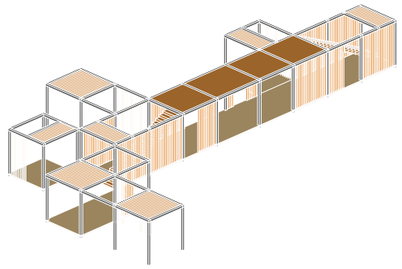
08. Assembly of beams



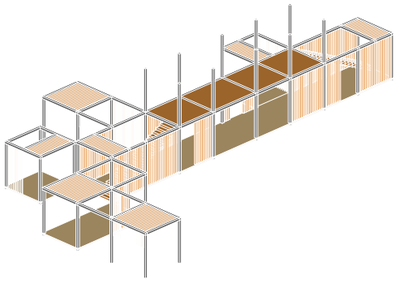
09. Place the partition and nail them to the base



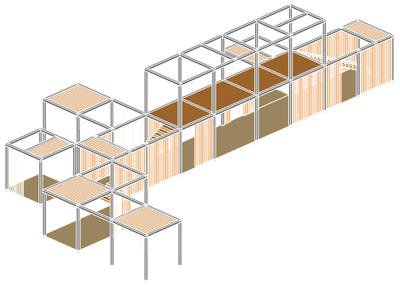
10. Place and Install Stairs



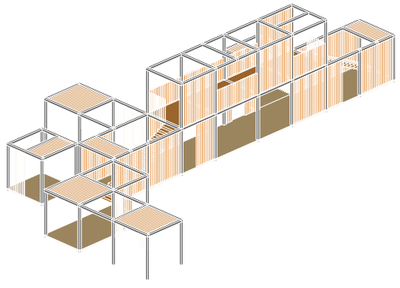
11. Adding the slabs



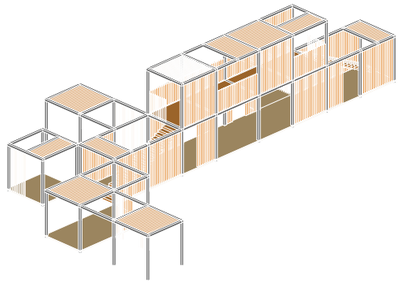
12. Fitting and fixinng pillars on the second floor



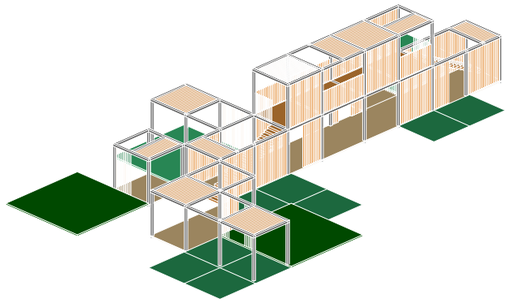
13. Assembly of beams on the second floor



14. Place the partition and nail them to the second floor



15. Adding the roof panels



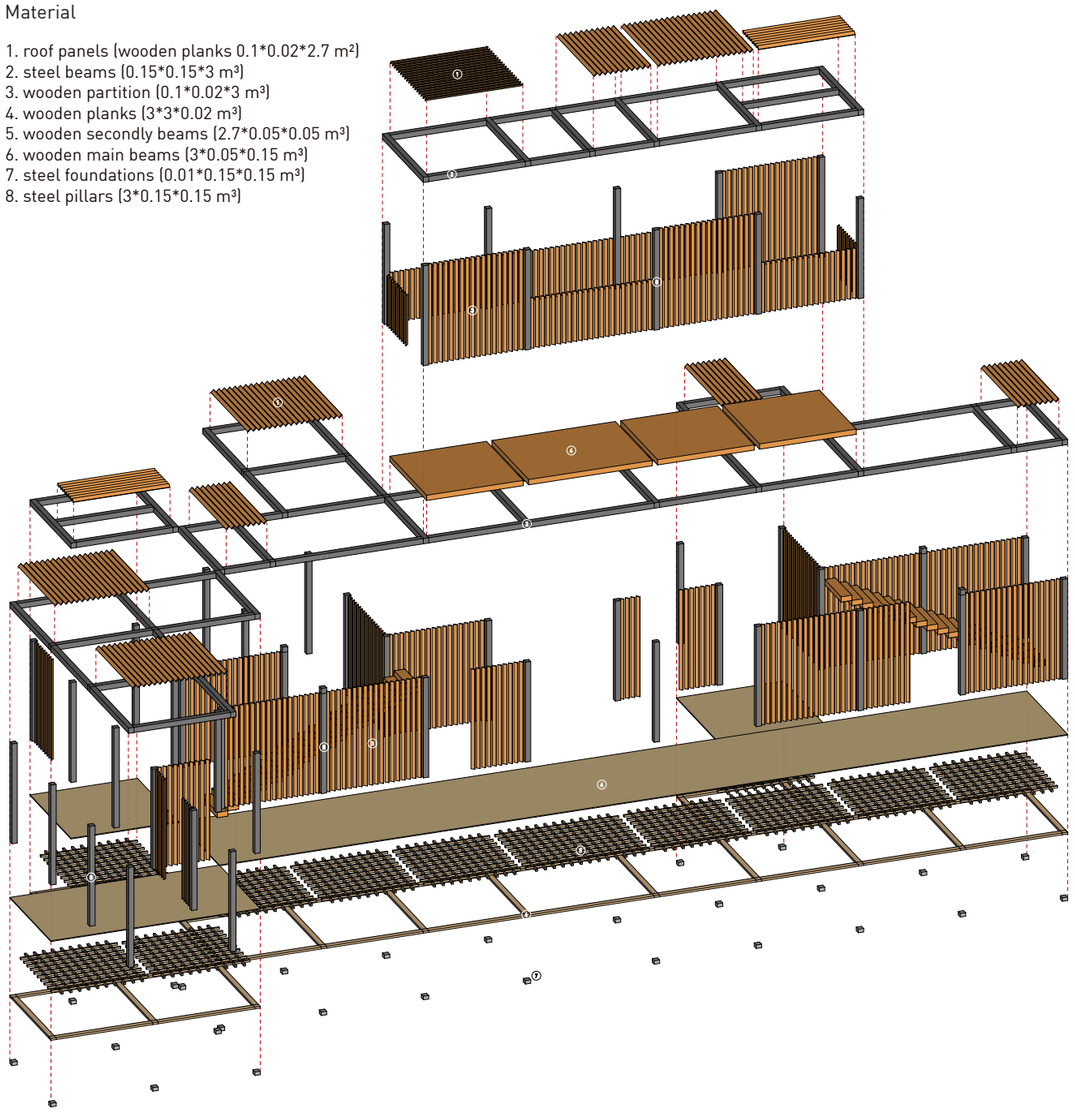
16. Place green areas around Module structures

Module Design Proposal III

Explosive view

Material

1. roof panels (wooden planks 0.1*0.02*2.7 m²)
2. steel beams (0.15*0.15*3 m³)
3. wooden partition (0.1*0.02*3 m³)
4. wooden planks (3*3*0.02 m³)
5. wooden secondly beams (2.7*0.05*0.05 m³)
6. wooden main beams (3*0.05*0.15 m³)
7. steel foundations (0.01*0.15*0.15 m³)
8. steel pillars (3*0.15*0.15 m³)



Render 1 Square

Render 2 Coffer Bar