POP OUT MILAN

Unveiling Milan's urban Renaissance through the rebirth
of the Navigli canal system as a landscape connection and social link.

Nicole Filippoli Landscape
Architecture MSc 2023

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Unveiling Milan's urban Renaissance through the rebirth of the Navigli canal system as a landscape connection and social link.

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FIG. 0.1

FIG. 0.1
The railway line surmounts the Martesana canal (Nicole Filippoli, 2022).

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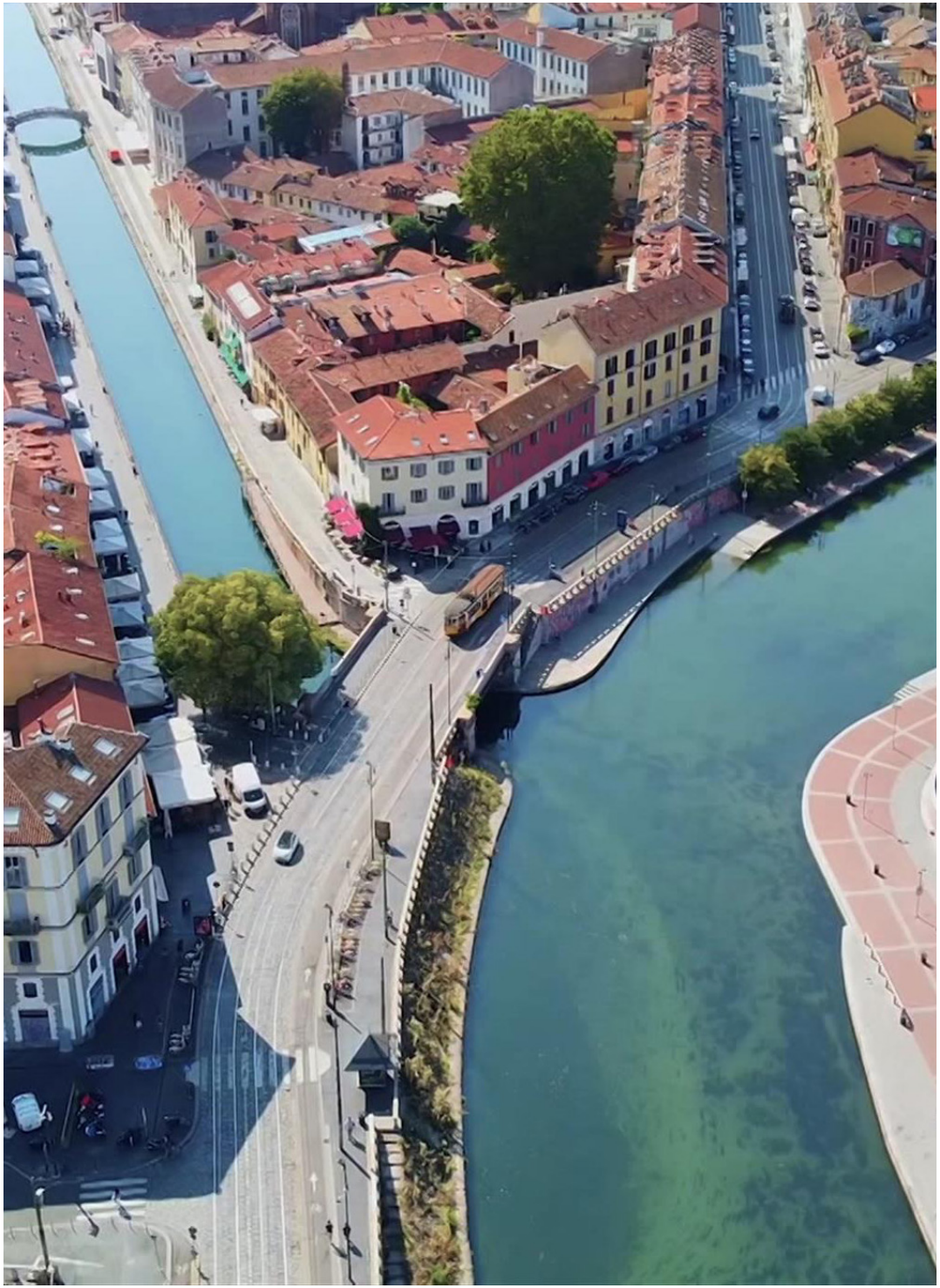


FIG. 0.2
The intersection of the Darsena and the Naviglio Grande (Viltvart, 2022).

ABSTRACT

Water in Milan has always been a founding element for civilization, especially for its urban, working, and cultural development due to the presence of rivers, water springs, and a system of artificial canals known as Navigli. Therefore, the covering of the Navigli system in 1929 in lieu of large contemporary infrastructures led to the loss of sociability at both the urban and neighbourhood scale. This change has also led to the loss of a commercial route that connected the Alpine area with the Adriatic Coast, a system that gave the city the title of Italy's third largest harbour during the XX century. Thus, covering the Navigli deprived Milan of the traditional features that enhanced the urban space and its continuity with a more complex context. In addition, the major rivers that cross the city has been covered. This choice, together with high levels of cementing and water pollution, has resulted in an urban fabric that is discontinuous from the water-related Roman and Medieval tissues and it is increasingly affected by the urgencies of climate change.

This project aims to restore the Navigli system as a replacement for some of the modern infrastructures to rehabilitate the water identity of Milan. The emergent landscape should increase urban quality by emphasizing sociability on a local scale. Attention will turn to participatory activities capable of attracting citizens to water-related spaces to create a sense of caring and belonging to the place. Through the reinterpretation of the connection between past Milanese society and water, different traditional rituals can be reinvented, or new ones introduced by virtue of a community that has profoundly changed in needs and interests. Hence, the program tailored to the city, dynamic and run by groups already active in the urban environment: schools, ecological companies, and religious communities could integrate an increasingly multi-ethnic and varied society in a broad range of activities. At the multi-regional scale, the Navigli take part in a system that connects broad distances and completely different landscapes by taking on commercial, artistic, and social significance. The historical trading route would be reinterpreted by developing different experiences with water from navigation to the historical harbours to more direct water uses that would be based in the city centre.

The project also focuses on the balance between nature and culture through an unconventional aesthetic that interact more healthily with the environment. Nowadays, the ecological network is interrupted by the infrastructure: roads define the shape of often marginalized green areas, so different ecosystems are fragmented. Thus, the linear form of canals may suggest a new ecological corridor through different urban realities. Furthermore, by taking advantage of the soil properties and the natural presence of water in the different levels of the lithosphere, the Navigli wil be no longer an anthropic product but a suture system between nature and culture. It is also a fact that several ecological events already occur spontaneously within these waterways: large-scale connectivity has led species from rivers and lakes to converge in the canals to escape predators. The improved water quality and the absence of other threats in a poorly naturalized urban context has meant that the city has spontaneously become a "safe harbor". A new vision for the urban context can be offered throughout water.

Keywords

Water infrastructure; canal daylighting; care; traditional water system; urban ecology; green and blue network; urban urgencies; participation; connection.

FIG. 0.3

FIG. 0.3
Life along the Naviglio Grande (Nicolò Begnini, 2022)

AKNOWLEDGEMENT

The realization of this project has been a long and intense journey, and it would not have achieved the same result if it were not for the people who have been by my side throughout the process.

First, let me thank my mentors, Inge Bobbink and Murco Lub, for guiding me academically. Although my thesis is grounded in listening, your support, knowledge, and critical thinking taught me how to stop, pay attention, and understand.

I give my special thanks to my fellow students who embarked with me on this adventure away from home as I came into contact with different cultures, personalities and points of view. A special mention goes to Giordana for being by my side even when she did not have to: may her sense of care inspire those who want to design the landscape.

To Greta, Federica and Maria as they have been taking care of me for a lifetime with loyalty, empathy and lightheartedness. It has been an intense year, but if I turn back, you have always been by my side, embracing my vision.

To Nicolò, for letting my passion for architecture and landscape fascinate you and for your love of small details. You pushed me to dream big, starting from the little things, by motivating me even on the darkest days.

I want to thank the unsuspected roommate and colleague Matteo, who has always been interested in my work and can grasp the potential of my twisted thoughts even before I can.

I thank my flatmates Francesco and Stefano for making me feel at home, even from miles away. Thank you for telling me about your hometown by enriching the quality of my work, for the lunch breaks together, and for the improvised off-key songs with your guitar.

Dulcis in fundo, I thank my family, who taught me that if you want something, you need to work hard without fearing sacrifice. To the unconditional love of my parents: it takes courage to let a daughter grow up and mature far away from home. Thank you because, for your love toward me, you have given up having me close, allowing me to undertake this experience.

Finally, I thank my grandparents, who raised me outdoors among gardens and fields: you made me passionate about the rural landscape surrounding our hometown, making me secretly approach what I wanted to do when I grew up.

Introduction

FIG. 1.1

FIG. 1.1

Unicredit Tower in Porta Nuova District (Author, 2021).

FASCINATION

Milan, the world capital of fashion and design, is a metropolis in northern Italy and the capital of Lombardy. This financial hub boasts the headquarters of the Borsa Italiana and its exclusive restaurants and stores. The Gothic-style Duomo and Santa Maria delle Grazie convent, where it's possible to stare at Leonardo da Vinci's fresco "The Last Supper," testify to the city's artistic and cultural heritage. The vision of Milan as a major European city in terms of vibrancy, richness and accessibility of cultural offerings seems to be linked to the site's avant-gardist and dynamic essence. If it took five centuries to build the Duomo, Milan needs only a decade to change its appearance. Since the early XX century, the Lombard capital has been the most active laboratory of architecture in Italy: the appointment with modernity, to experiment with new ways of inhabiting the city, develops the themes such as dynamism, metamorphosis, and adaptability: these are all properties that besides characterizing historic Milan can also be attributed to water and civilization.

Human life has always been linked to the presence of water. All the first urban agglomerations destined to last for a long time developed in the adjacence of waterways that still influence the quality of life of every people. Due to water agriculture was born, the first input for the lifestyle transition from nomadic to sedentary. It is no small change, as settling means having resources at one's disposal, expanding and forming agglomerations, and giving oneself an organization. In a nutshell, transforming from village to city coincides with the beginning of civilization, which brings a multitude of customs, habits, and lifestyles typical of a people.

Milan's history is also inextricably linked to civilization and water. Since Celtic and then, Roman times, Milan has had to deal with the massive presence of water and has developed a critical knowledge of hydraulic management over the centuries. For instance, the world's first navigable canal and the first navigation lock are just two emblematic cases that witness this water heritage. But the history of the relationship with water is not only about canals and transportation. In the late 1800s, Milan appeared more like Venice and Amsterdam than the city of today. It condensed an intricate network with irrigation ditches, floodways, and the Navigli. Stendhal, fascinated by this landscape, wrote:

«[…] The territory that stretches from Milan to Pavia is the richest in Europe. Everywhere you see the canals of running water that give it fertility: you sail along the navigable canal by which you can go by boat from Milan to Venice or America! […]»

The tabula rasa of the past identity during the 20th century disrupted the water identity of the city. Today, to remind us of how it was, there remain the Darsena and the Navigli, a few miraculous springs, and the memory of a past that survives in the many place names.

FIG. 1.2.1

FIG. 1.2.2

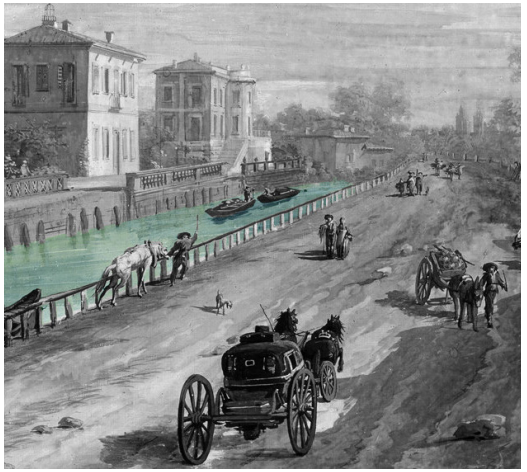


FIG. 1.2.3

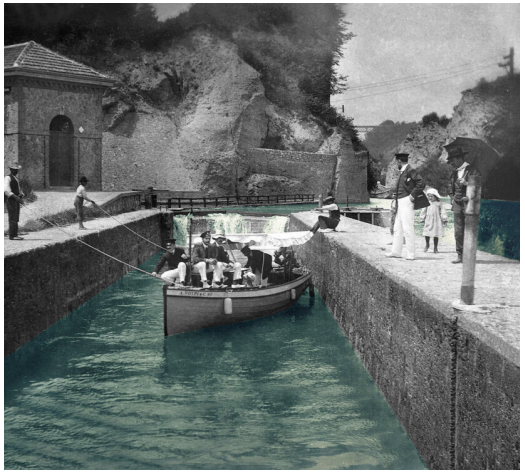


FIG. 1.2.4

FIG. 1.2.5

FIG. 1.2.6

FIG. 1.2

The Navigli in and around Milan:

1. Laghetto San Marco in the Cerchia Interna.
2. Naviglio della Martesana.
3. one of the sluices in the Naviglio di Paderno.
4. The Viarenna Sluice, junction point between the Cerchia Interna and the Darsena.
5. Salt transport along the Naviglio Pavese.
6. Naviglio di Bereguardo crossing the rural landscape.

(Milano sparita e da ricordare, 2020)

FIG 1.3

Timeline depicting the Navigli's changes in function and the different dominions throughout history.

(Author, 2022)

WATER HERITAGE

Milan rises in the midst of a complex water ensemble, to the point that its ancient name *"Medio-lanum"* might be an indication of this intermediate position between waterways. The history of Milan, ancient and modern, can be interpreted as a struggle with water by seeing the tenacity of the Milanese people in prevailing on the one hand, and the resistance of water to submit to the human will. The benefits of water have always been multiple, with one or the other prevailing in different historical eras.

However, the real protagonist in Milan is the network of navigable canals better known as Navigli. Throughout history, they have served as infrastructure by crossing the city and linking it with the other territories of the Po Valley. The main canals are five: Naviglio Grande, Naviglio Pavese, Naviglio di Bereguardo, Naviglio della Martesana and Naviglio di Paderno. In addition, the medieval centre of Milan is surrounded by a circular canal: it is the Cerchia Interna, also known as Naviglio Interno, Fossa Interna, or Cerchia dei Navigli. The canals that connect this last with the rest of the water system are the Naviglio San Marco, north of the city centre, and the Naviglio Vallone in the south. The construction lasted from the 12th to the 19th century as they were not conceived as a unified project as they were made in different time of history by different domains. Initially, the canals were conceived with an irrigation system by taking advantage of multiple water sources in the area and adapting them to domestic needs, in continuation with the reclamation operated few centuries earlier by the monks from the south of the city. From 1385 the canals turned into the means to transport marble blocks for the Duomo construction.

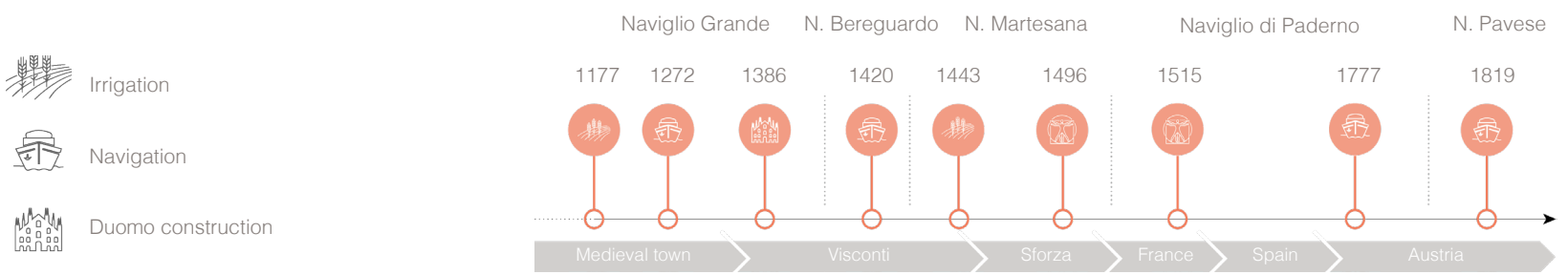
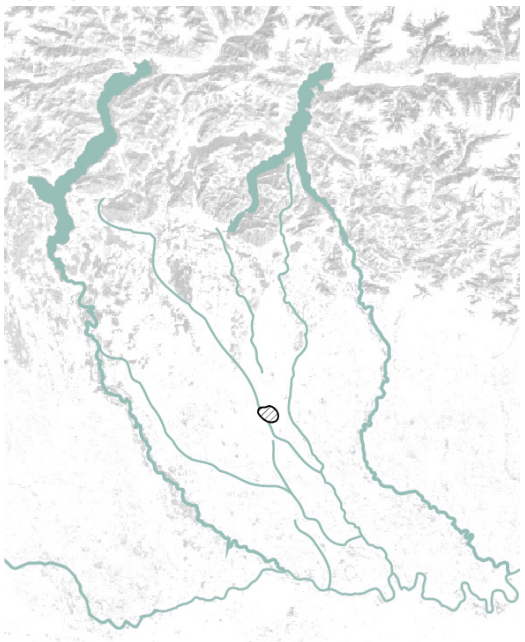
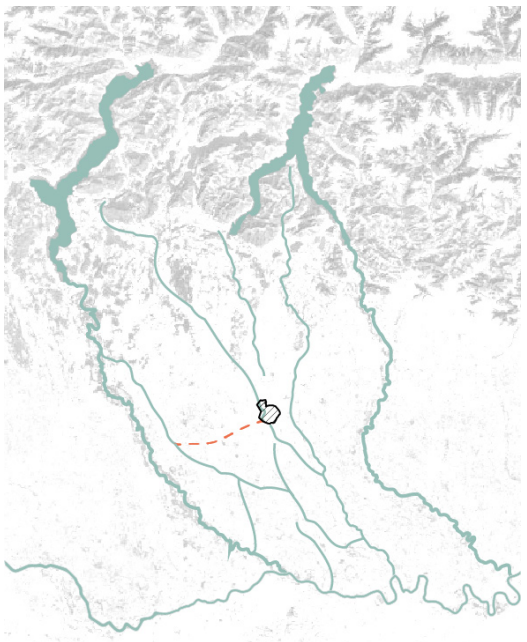


FIG. 1.3

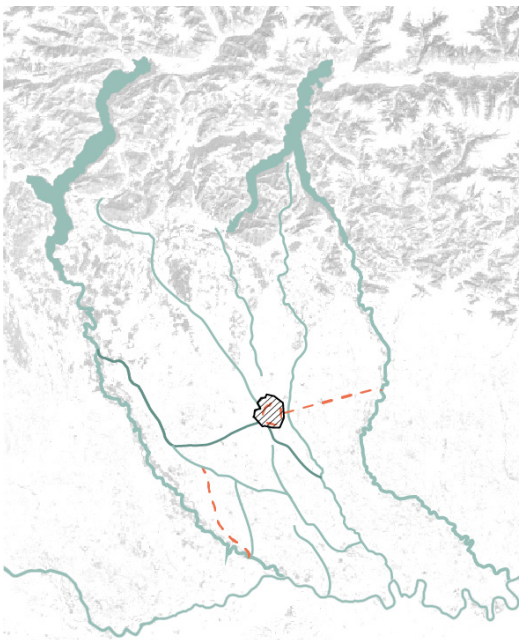
FIG. 1.3



XII century
The initial water landscape.



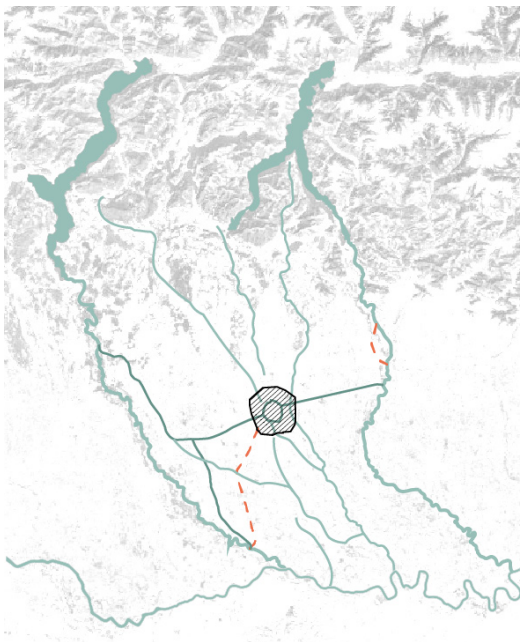
XIII century
Planning of the Naviglio Grande.



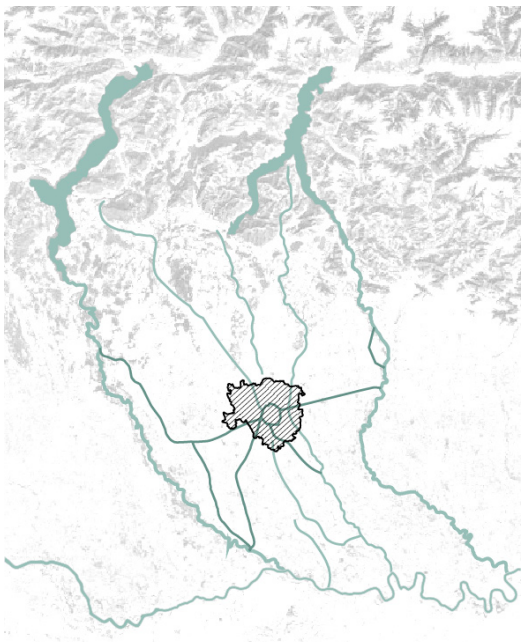
XV century
Creation of the Naviglio Grande and planning of the Naviglio della Martesana, the Cerchia Interna, and the Naviglio di Bereguardo.

FIG. 1.3

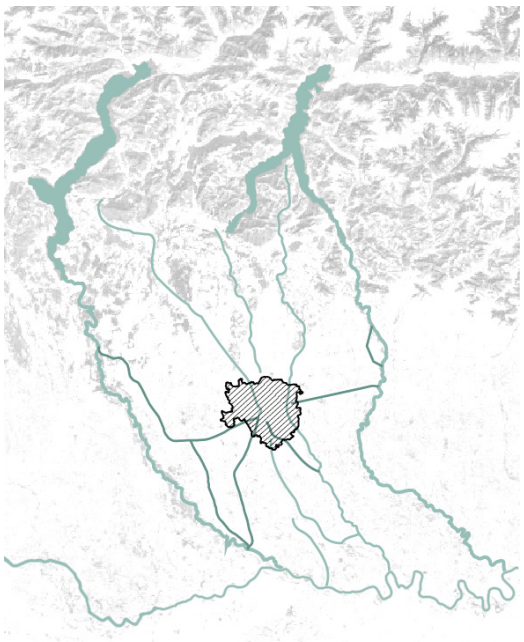
The Navigli system development from the XII to the XXI century (Author, 2023).



XVIII century
Creation of the Naviglio della Martesana, the Cerchia Interna, and the Naviglio di Bereguardo and planning of the Naviglio di Paderno and the Naviglio Pavese.



XIX century
Maximum exploit of the Navigli system with the completion of the Naviglio di Paderno and the Naviglio Pavese.



XXI century
The Navigli system after the final closure in 1929.

Geography
Milan
Water courses
Existing Naviglio
Planned Naviglio

FIG. 1.5

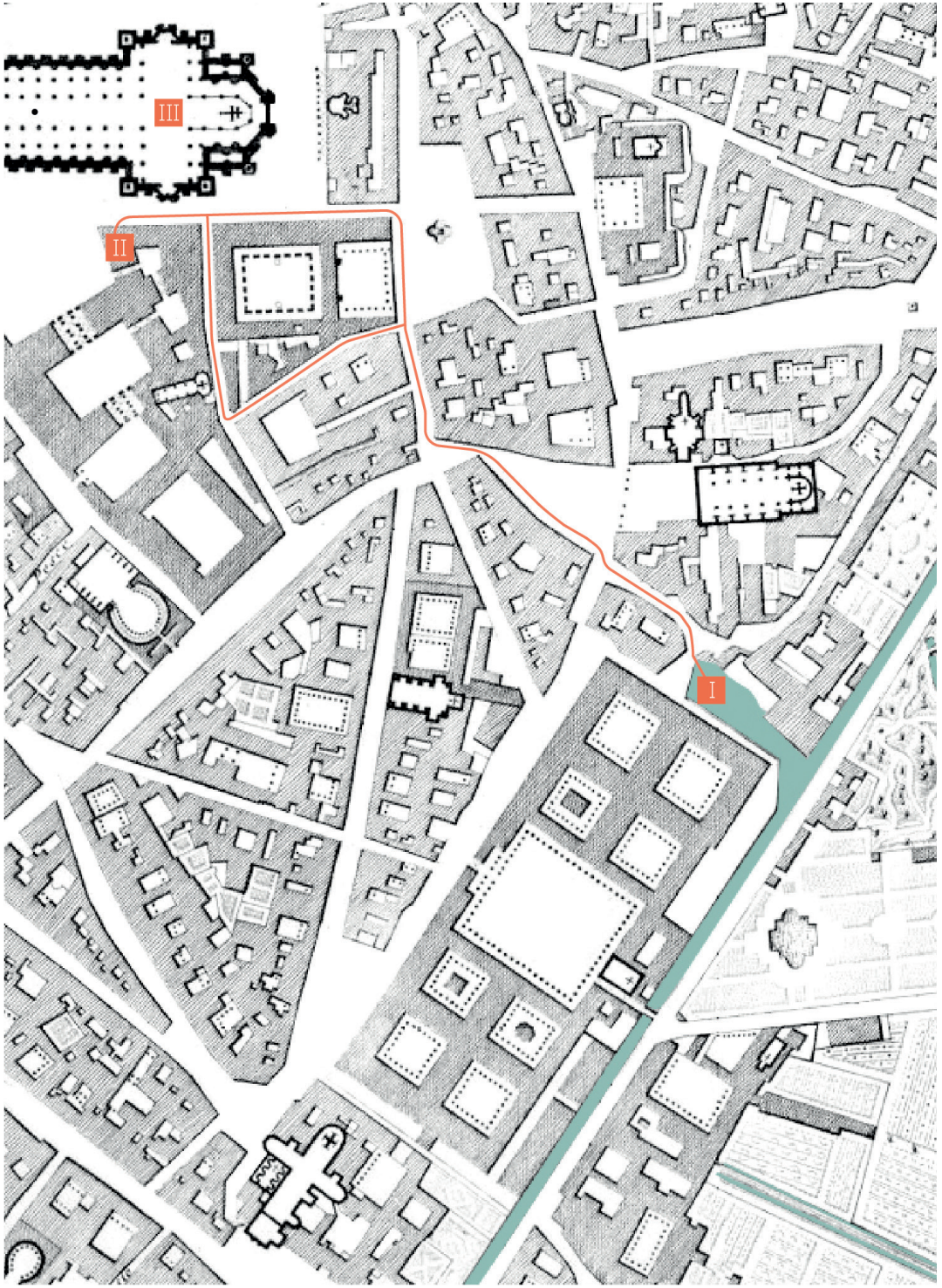


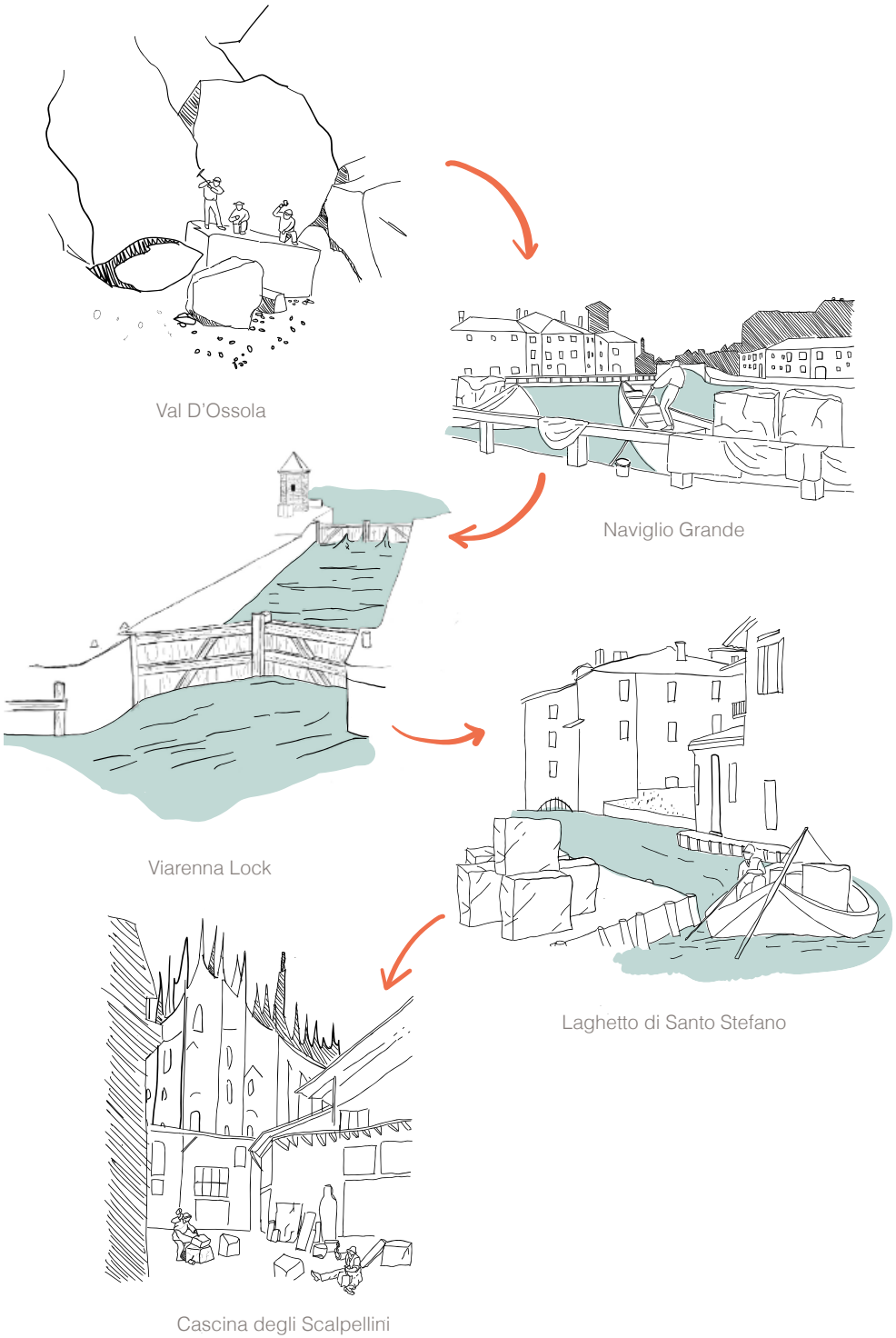
FIG. 1.5

Plan depicting the marble process from the Laghetto di Santo Stefano, to the Cascina degli Scalpellini, to Duomo (Author, 2022).

FIG.1.6

Marble process from Val d'Ossola to the historical centre of Milan (Author, 2023).

FIG. 1.6



For many centuries, the Naviglio Grande was the fastest and safest way that connected the city to the quarries in Val d'Ossola. The grandiose cathedral, according to the Lombard Gothic style, was to be made of brick. However, Gian Galeazzo Visconti wanted a superb monument for his capital conceived as the greatest European cathedral of the time.

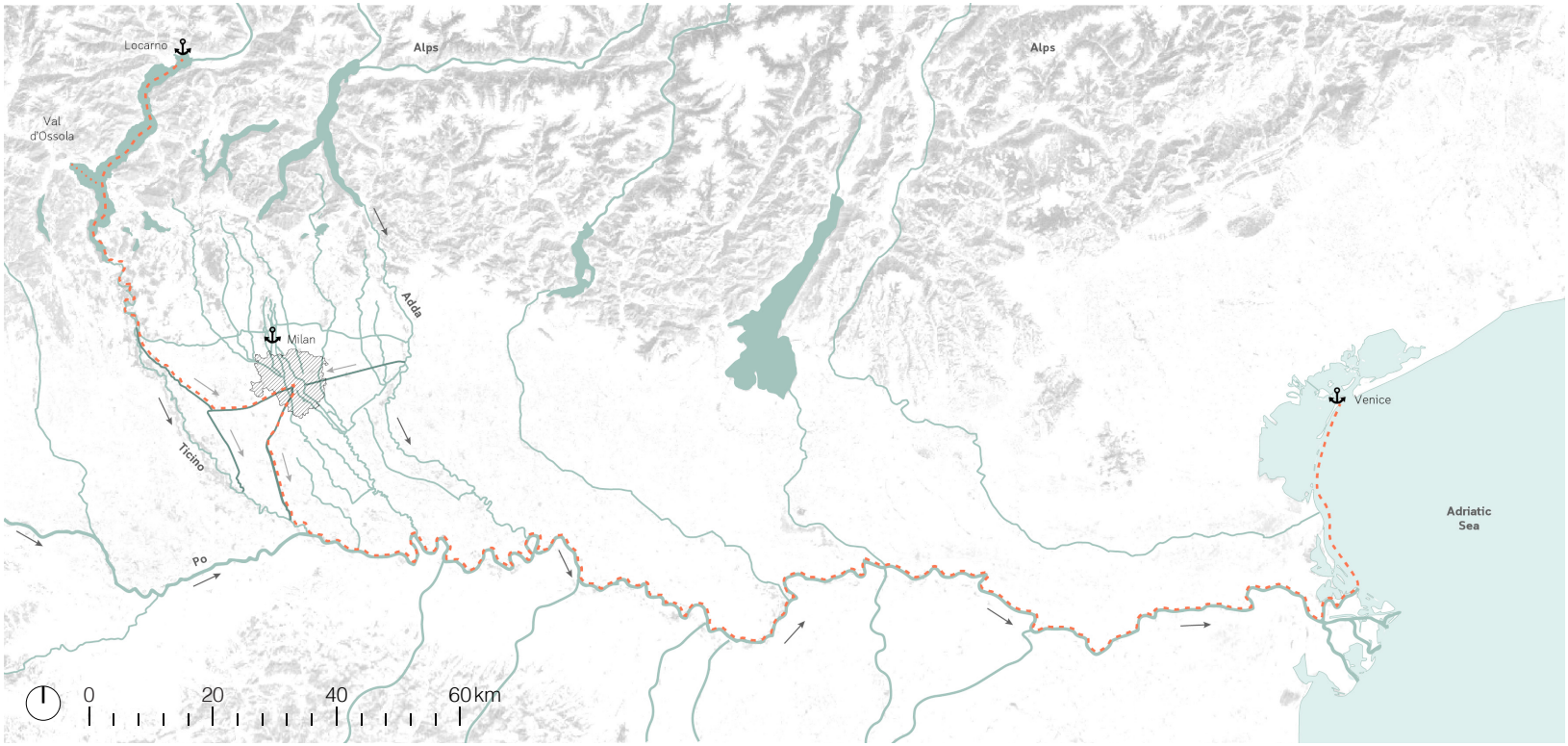
The introduction of the Cerchia dei Navigli is an intervention resulting from this constructive and artistic process. It allowed navigating, therefore, to transport the marble, down to the historic centre where it was deposited in the port known as Laghetto di Santo Stefano (I).

From there, the blocks were brought to the Cascina degli Scalpellini (II), where they were worked on by the sculptors involved in the site. The building was adjacent to the Duomo (III) and it was a strategic point for the artistic production that seemed to imitate a production line: every part of the city had its own specific role due to the water set up.

This system boasts a collateral heritage other than the Duomo. In the 15th century, the first European navigation lock was introduced in Milan: the Viarenna Lock. Its inventors were architects and engineers responsible for the Duomo construction.

Therefore, the cathedral, intended as a tangible landmark and a shared mission among the inhabitants of Milan, determined the first input for the canals' navigation and their further technological development. Their extension in the Milanese context aimed to goods and people transportation inasmuch as the main infrastructure.

FIG. 1.7.1



Geography
Lake
Sea
Milan
Waterway
Navigli
Traditional trading system
Main port

FIG. 1.8.1

FIG. 1.8.2

FIG. 1.8.3

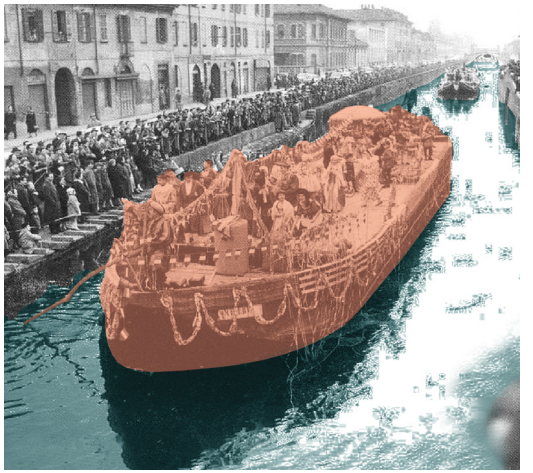


FIG. 1.7.1

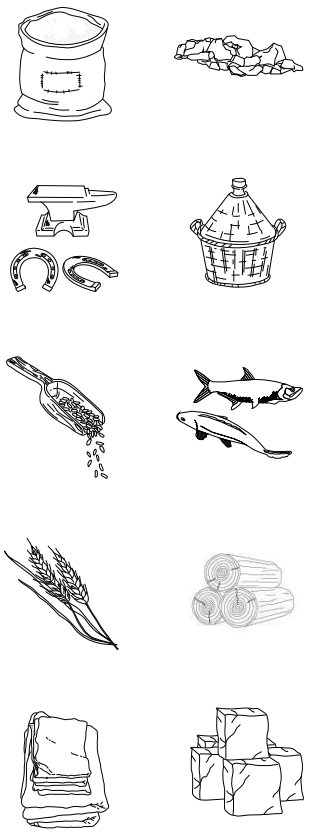


FIG. 1.7
The commercial water system in The Po Valley with:
1. The routing system and the main river ports
2. The goods that were exchanged
(Author, 2022)

FIG. 1.8
Water tradition in Milan:
1. Milan Rowing Club.
2. A group of women washing clothes along the Naviglio Martesana.
3. Carnival Parade along the Naviglio Grande.
(Milano sparita e da ricordare, 2020)

At the multiregional scale the Navigli system were the missing section that completed a large trading system based on rivers that connected the Alpine area to the river Po, to Venice and Trieste. Making this system navigable brings also to a system of synergies among Milan and the other northern cities founded next to the water. This system connected the city to the Lake Maggiore, the Como Lake, and the lower Ticino region, the Po River and even the Adriatic Sea. The water offered an opportunity to unite major cities while avoiding the risks of expensive and dangerous overland transportation, which at that time could only count on a fragmented and disjointed system.
On the other hand, Milan was the third harbour of Italy during the modern era, and, at the urban scale, a system of secondary canals animated the city's atmosphere through the interaction of people that exchanged the goods and based their lifestyles on water.
Fernand Braudel, the great French historian, describes the role city-port played by Milan in the 16th century:

« ... Milan became an important river port, which enabled it to receive at less expense grain, iron, and especially timber, and to ship to the Po and Ferrara the large pieces of artillery from its foundries: in short, to make up for the flaw of being a city in the midst of land. »

The Navigli system made Milan the core of water trading and craftsmanship production and gave urban space its own special quality. Water enlivened city life by becoming the key element of the routine of its inhabitants and their daily lives. The washermen knelt in front of the wooden ***brellin*** placed in a row under the canopy and, after rinsing their clothes in the minor canal (***el fossett***), alimented by the waters of the Naviglio Grande, they rubbed them on the stone stalls still present today. On the Naviglio Pavese, on the other hand, in addition to sand (***rena*** in Milanese), they mainly transported dairy products such as cheese or dairy products, which came to the city from Oltrepò region. Very often the sailors, in order not to pay the duty in Darsena, would stop a few meters before, in Corso San Gottardo, renamed for this reason ***Burg dei Furmagiatt***. The washerwomen and the boatmen, together with the rowers, the swimmers and fishermen are only some of the figures that enriched collective imagery of this place.
Raffaele Calzini even depicted the Navigli as a magnet for both economic-commercial activities and social interaction.

«[...] Friendships were born, markets, marriages, hunting trips, fishing trips, morra and tarot card challenges were sketched out. »

«The sailing was as smooth as can be imagined, smooth, along the bank: it seemed like sailing in the middle of meadows.»

Even the urban fabric reflects the choice to settle in a wet area, especially the historic centre: the organic shapes of the neighbourhoods, together with the tendency building next to the canals suggests an accurate knowledge on water flow and on its properties as a resource, as well as the

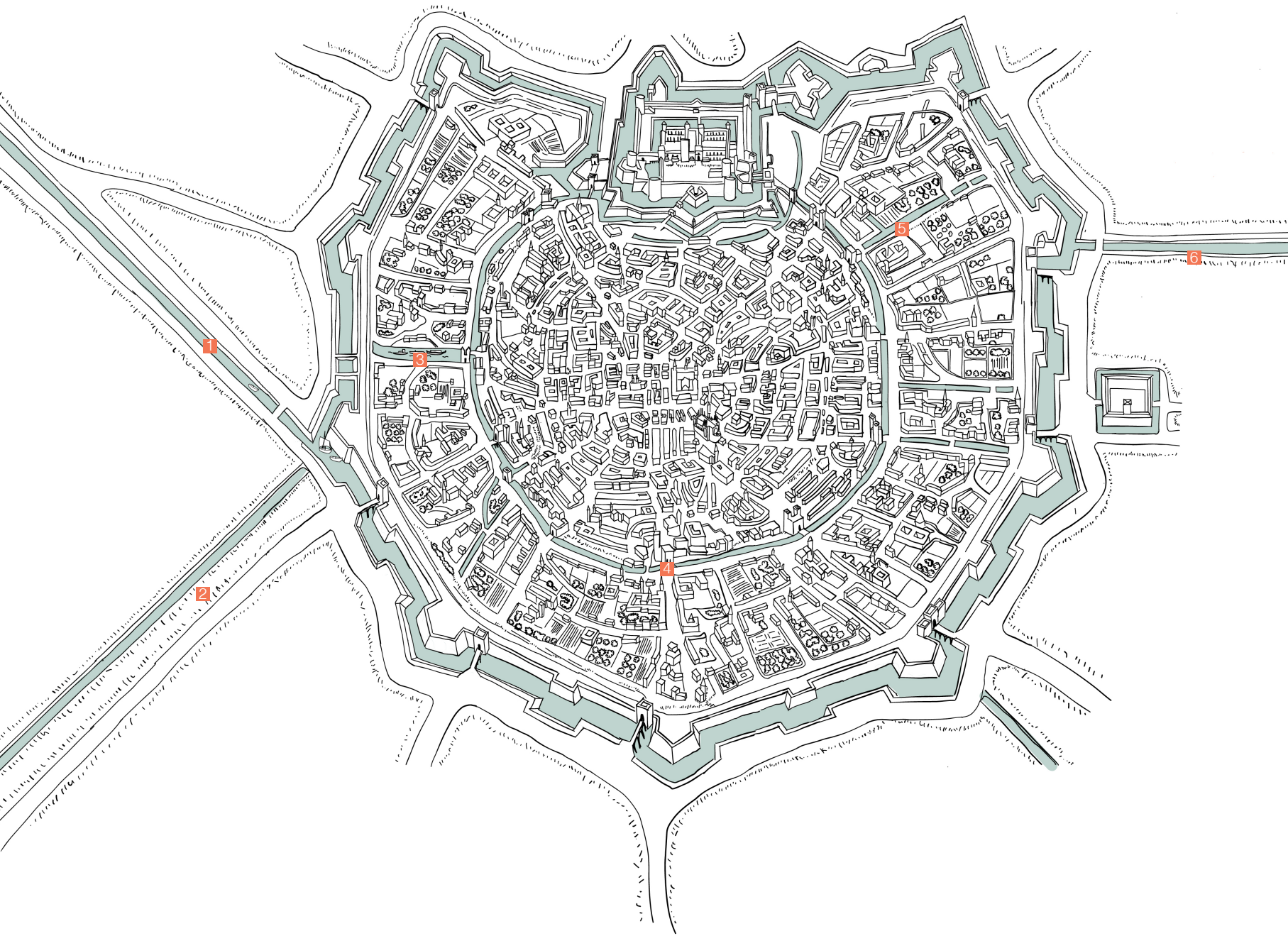
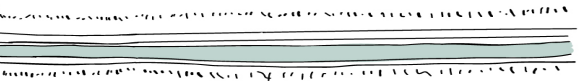


FIG. 1.9

The development of the Navigli system in Milan during the XIX century (Author, 2023).



1 Naviglio Grande
2 Naviglio Pavese
3 Naviglio Vallone
4 Cerchia Interna
5 Naviglio San Marco
6 Naviglio della Martesana

issues related to floods or unpredictable natural events.
In 1288 Bonvesin da la Riva, a Milanese writer and poet, described in his work ***De magnalibus Mediolani*** (The Wonders of Milan) the landscape grooved by the moat, or rather the canal, built as an external defence of the city walls:

«A moat of astonishing beauty and width surrounds this city on all sides and contains not a swamp or a putrid pond, but the living water of the springs, populated with fish and shrimps. It runs between an embankment on the inside and an admirable wall on the outside, the circuit of which, measured with extreme accuracy, was found to correspond to ten thousand one hundred and forty-one cubits. The width of the moat, along the entire circuit around the city, is thirty-eight cubits. Beyond the wall of the moat there are suburban dwellings so numerous that they would be eough to form a city»
(Bonvesin da la Riva, Le meraviglie di Milano, Bompiani, Milan 1997, pp. 51-52, 2).

On the one hand, the fact that the water defined the urban fabric makes the Navigli a crucial project in water management and technological development, which is important to take in mind for a future development. Certainly, in this process, Leonardo Da Vinci's genius contributed to ensure their navigability and to make impervious areas accessible by perfecting the systems of sluices. Nevertheless, Milan was the land port ***par excellence***.
On the other hand, the stories of the laundresses, of the ceremonies, and of the kids that used to swim in the canals make this system the reality out of the front door as the cultural witnesses remind us that the Milanese inhabitants had to deal with a genuine and pragmatic landscape.

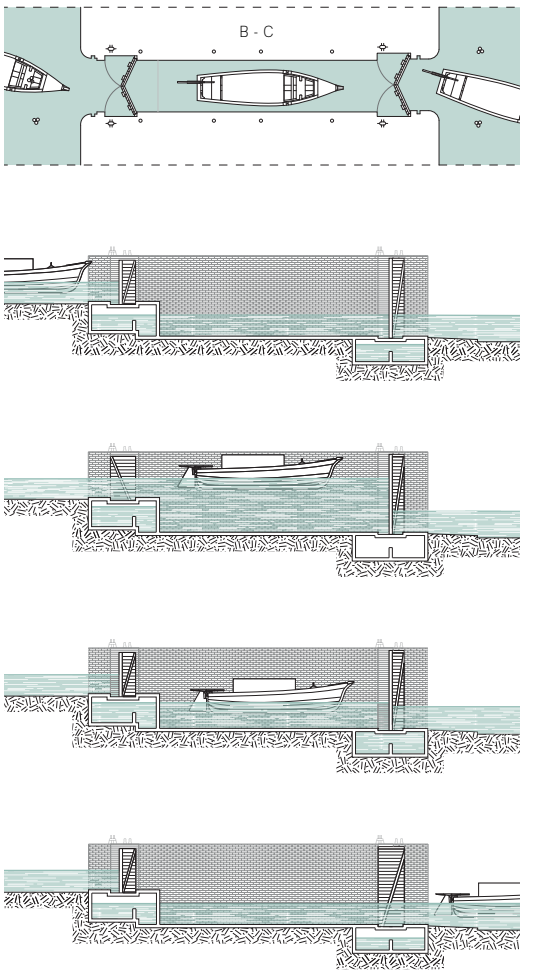


FIG. 18
The functioning of a navigation lock (Author, 2022).

FIG. 1.10.1

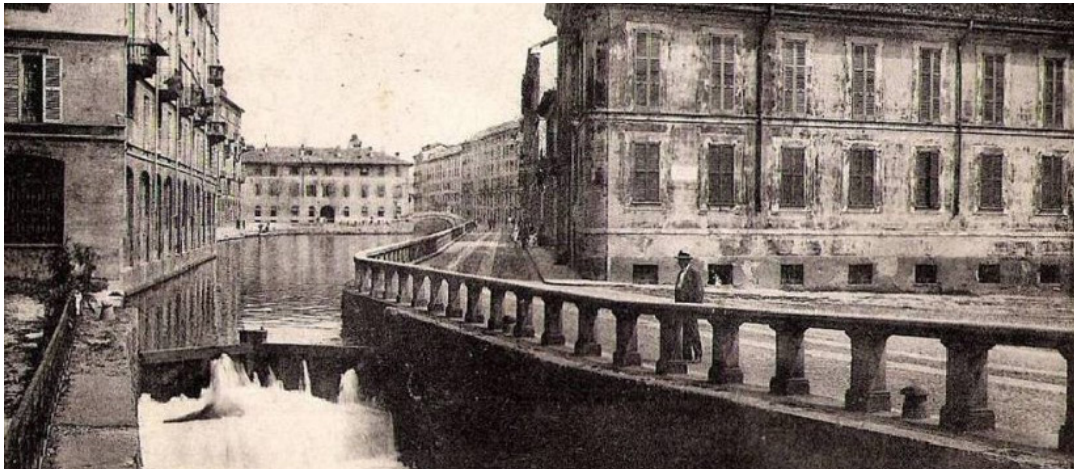


FIG. 1.10.2

FIG. 1.10.3

FIG. 1.10

The evolution of the urban fabric:

1. The canal in via San Marco (Archivio storico FCA Milano, 1910).

2. The covering of the Naviglio San Marco (Archivio storico FCA Milano, 1935).

3. Current situation after covering the canal (Author, 2022).

FIG. 1.11

Urban ugercies related to the car-oriented model:

1. Abusive parking (Author, 2023).

2. Air pollution (Luca Baresi, 2020).

3. Car traffic (Il Giornale, 2022).

PROBLEM STATEMENT

Among the arguments that led to the closure of the system, the lack of hygiene is the most significant: similarly to other cities in Europe, such as London, Utrecht and Paris, the city, in the prime of its industrial development, was evolving from the small to the metropolitan dimension. The increase in population, the industrial development and the absence of a drainage system turned the canals into open-air dumps, making them polluted and stagnant. Furthermore, the futurist movement and the widespread modern mindset, confident in the advantages of high speed, led to the cover of the canals.

Instead of a water landscape, the major car infrastructure that still defines the major routes within the city stands adjacent to the former Navigli route. Surely, the modern urban fabric is crucial for orientation and to address the increment of the population of one of the major economic hubs in Italy. However, many historical landmarks turn into desolate sceneries as illegal parking on sidewalks or improvised green spaces, as well as non-sporadic phenomena of car traffic and air and noise pollution.

The modern approach also led to the loss of sociability at both the urban and neighbourhood scale: in a mesh of well-defined infrastructures, where vehicular mobility establishes its hegemony on the form by marginalising most of the public space. As Stefano Boeri said once “Green spaces in Milan are present in two forms: they can be located in the peripherical areas or, if they are inside the city, their margins are well defined and marked by other urban features.” Differently from the rest of the city, public spaces never evolved throughout the years

FIG. 1.11.1

FIG. 1.11.2

FIG. 1.11.3

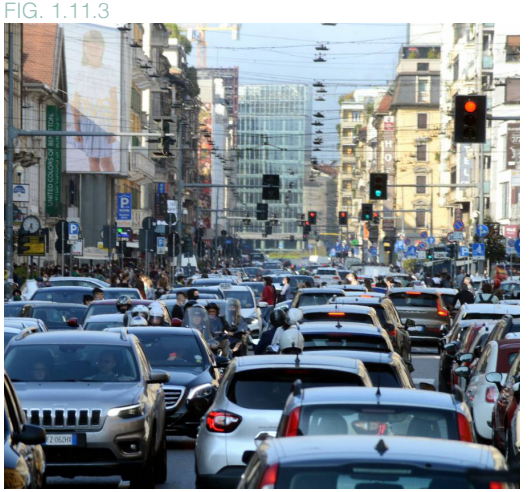
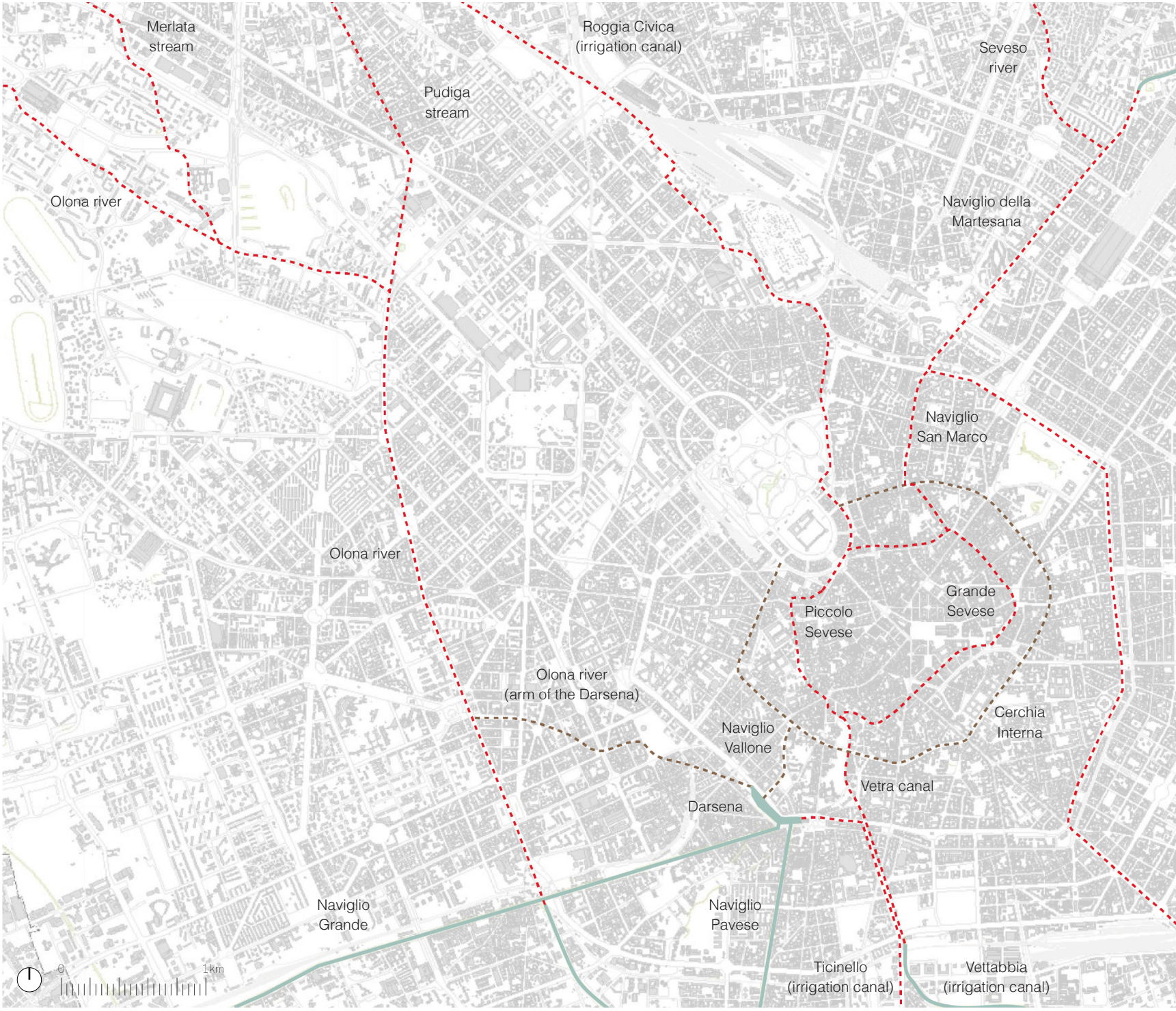
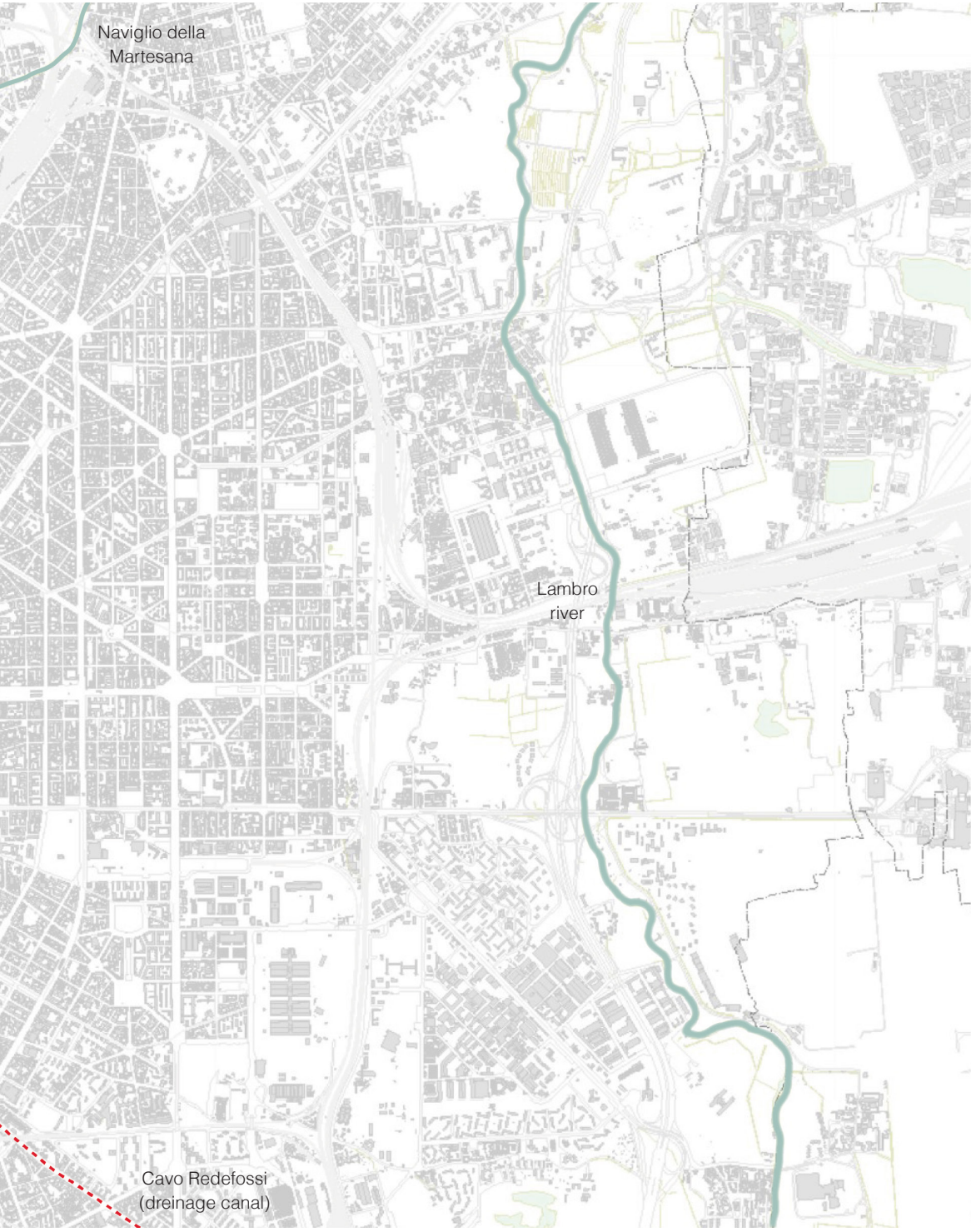


FIG. 1.12


Merlata
stream
Roggia Civica
(irrigation canal)
Seveso
river
Pudiga
stream
Olona river
Naviglio della
Martesana
Naviglio
San Marco
Olona river
Grande
Sevese
Piccolo
Sevese
Olona river
(arm of the Darsena)
Cerchia
Interna
Naviglio
Vallone
Vetra canal
Darsena
Naviglio
Grande
Naviglio
Pavese
0
1km
Ticinello
(irrigation canal)
Vettabbia
(irrigation canal)



and still maintain the traditional picturesque character without adapting in functions to the needs of modern society. Even more often, the absence of a role and meaning turn them into the core of micro criminality since they cannot fulfil the calling to the agora. It is unlikely to talk about small-scale sociability, given that in a city of over one million inhabitants, 68 % of Milanese admit not being in contact with their neighbours. The car-oriented system has also led to the loss of the historical commercial route, a system that enhanced Milan's identity as a water city.

As we know, with the Navigli phenomenon, the modern era led to covering the main waterways running through the city. This condition, the high levels of cementing and river pollution, has resulted in an urban fabric that is discontinuous from the historical water-related one, especially in a city that is increasingly affected by the urgencies of climate change.

Built environment
Visible waterway
Culverted active waterway
Culverted non-active waterway

FIG. 1.12
Map depicting the current condition of the water system (Author 2023).

FIG. 1.13

FIG. 1.14

FIG. 1.15

FIG. 1.13
The return of the Gran Fondo del Naviglio, a historic swimming race as a form of involvement of the community (Luca Lonati, 2019).

FIG. 1.14
Agriculture on water with the concluding event Cives project (Mario Sartori, 2017).

FIG. 1.15
The Darsena before its recover in 2010 (Mario Sartori, 2017)

RESEARCH OBJECTIVE

The design aims to restore the water landscape in Milan through the Navigli reinterpretation. The emergent water system is elaborated according to the character of contemporary times, thus, to the needs, the peculiarities, and the problems concerning the city and the ***civitas***.

The transformation of the Navigli from mere infrastructure to the protagonist space of the city reworks the theme of water by those early spontaneous phenomena along the washtubs on the quay, in the harbour, or on the boats that had animated the collective imagination of the past.

However, it is not a nostalgic revival of the past, but rather a reworking of the theme of water in various declinations to give a diverse proposal to its users, recreating sociality at the neighbourhood scale and a varied experience for those who walk through the entire daylighted system. Intervening in such a diverse environment as Milan means interpreting each sample of this urban patchwork by pandering to the water-built space symbiosis and providing tailored solutions.

Moreover, new research and emerging values sensitive to ecology give a way to rethink the space of the Navigli no longer as a mere anthropic feature but by the phenomena of spontaneous naturalization and urban models that accept the coexistence of nature and culture.

The canals of the future could become a hub for wilderness as a corridor in connection with today's fragmented ecological network and a model for combating climate change.

FIG. 1.16

FIG. 1.16

Recreation along the Darsena (Gloria Montagna 2022).

RESEARCH QUESTION

In which way the Navigli re-establishment can contribute to the enhancement of the inhabitants' sense of community in the public space and be a strong water link in the north of Italy?

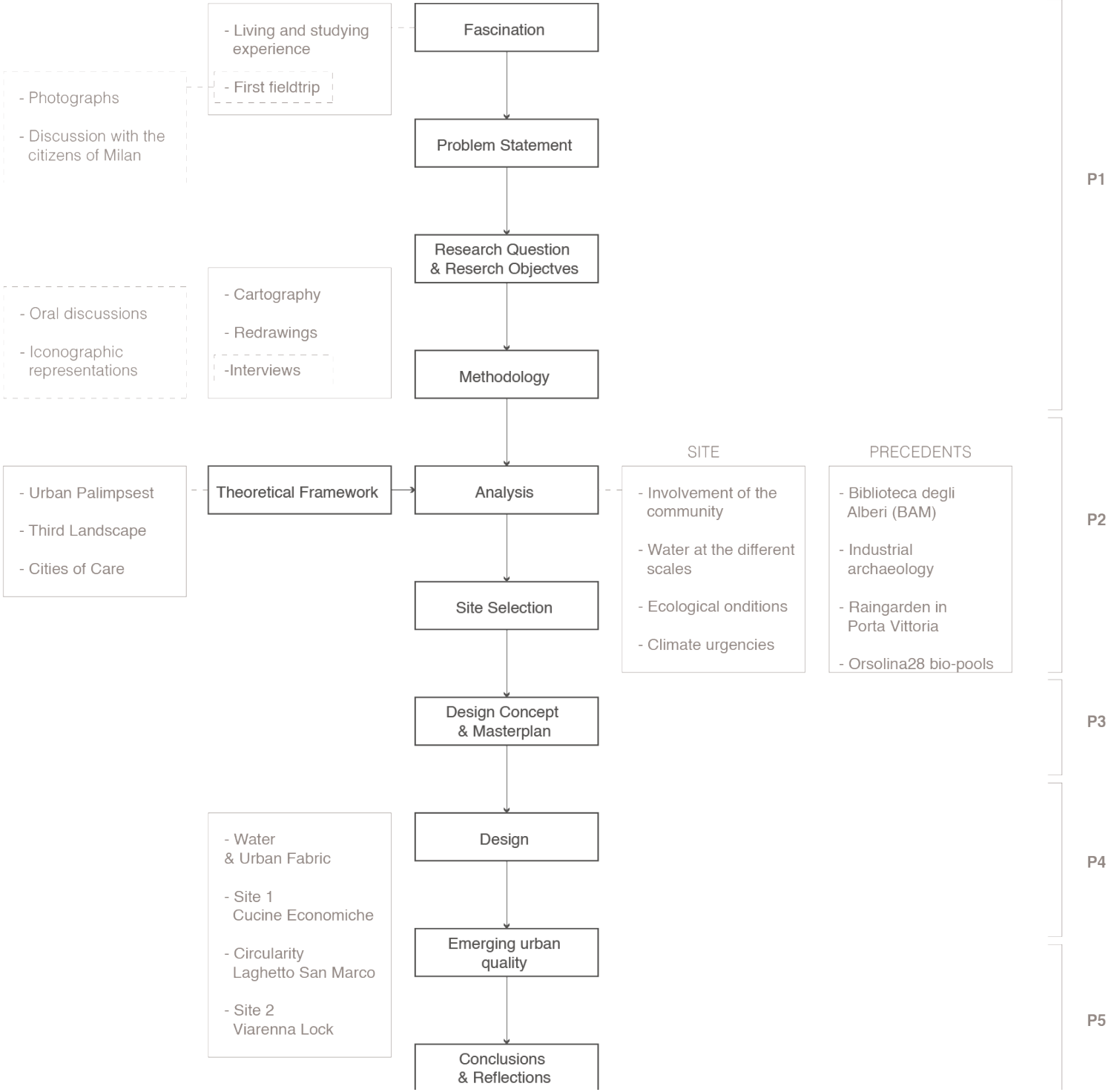
Additional sub-questions has been formulated to further explore the subject.

How does a water element interrelate the urban and the multi-regional scale by creating a landscape continuum?

Which water-based activities can be restored or introduced to enhance the the sense of care and the potentialities of Milan as a water city?

In which way does the blue system integrate ecological features in the urban space by raising awareness on the problematic modern development and offering a more genuine vision about nature and culture interrelationship?

FIG. 1.17


- Living and studying experience
- First fieldtrip
- Photographs
- Discussion with the citizens of Milan
Fascination
Problem Statement
Research Question & Reserch Objectves
Methodology
- Cartography
- Redrawings
-Interviews
- Oral discussions
- Iconographic representations
Theoretical Framework
- Urban Palimpsest
- Third Landscape
- Cities of Care
Analysis
SITE
- Involvement of the community
- Water at the different scales
- Ecological onditions
- Climate urgencies
PRECEDENTS
- Biblioteca degli Alberi (BAM)
- Industrial archaeology
- Raingarden in Porta Vittoria
- Orsolina28 bio-pools
Site Selection
Design Concept & Masterplan
Design
- Water & Urban Fabric
- Site 1 Cucine Economiche
- Circularity Laghetto San Marco
- Site 2 Viarenna Lock
Emerging urban quality
Conclusions & Reflections
P1
P2
P3
P4
P5

METHODOLOGY

To fully understand the development of my graduation thesis and the design choices that led me to rethink the city without the pretence of a nostalgic revival, it is crucial to describe my approach towards the traditional water system. As we have come to understand by now, Milan is a complex city with a history dense with events and radical transformations. Therefore, portraying the Milanese tradition by analyzing the blue mesh, the anthropogenic interventions for water management, the waterworks, and the rituals and activities along the canals has been an indispensable step. This study has been carried out by mapping the different historical periods in Milan and further redrawing iconographic sources. The objective of this research is concerned with capturing the essence of the past collective imagination, its strengths and different perceptions of water to decline them in a modern key. By this expression, I mean the dual approach that treasures both the subjective and emotional component and the objective one: the first type of investigation takes shape from my personal experience as a student, from visits to the site and interviews with the inhabitants of Milan; the other refers to a theoretical framework that together with the analysis of the site tries to give ***ad hoc*** references concerning emerging themes inherent to the city, the ***civitas*** and the environment.

The analysis part investigate the characteristic elements of the city of Milan by bringing out both strengths and drawbacks. Some precedents to be considered in addressing the design of the canals are also analysed in this section.

Maps

The maps result functional in my investigation as a form that condenses more information about space into the space. It is equally advantageous for making comparisons by becoming descriptive of a change that usually deals with the time component. Regarding the tendency to be expressive of space, it is interesting to note how this property occurs at the different drawing scales. The maps I refer to are reported for different purposes: some are sources with historical value, therefore, are present in their original version, some are redrawn with a more simplified and accessible hierarchy of elements, and some are made ***ex novo*** using QGis software.

At the conceptual level, the analysis through maps allowed me to interpret the construction of the Navigli as an artificial and gradual process. In addition, a more focused study on the urban fabric allowed me to grasp the different moments of urban expansion and to develop critical thinking about urban fragmentation. I've interpreted the forms of the various water elements and deduced their functions. Finally, mapping was indispensable in describing the relationship between the culverted Navigli and the modern infrastructure that runs a few meters above the ancient blue network.

FIG. 1.17

Project strategy planning (Author, 2023).

FIG. 1.18

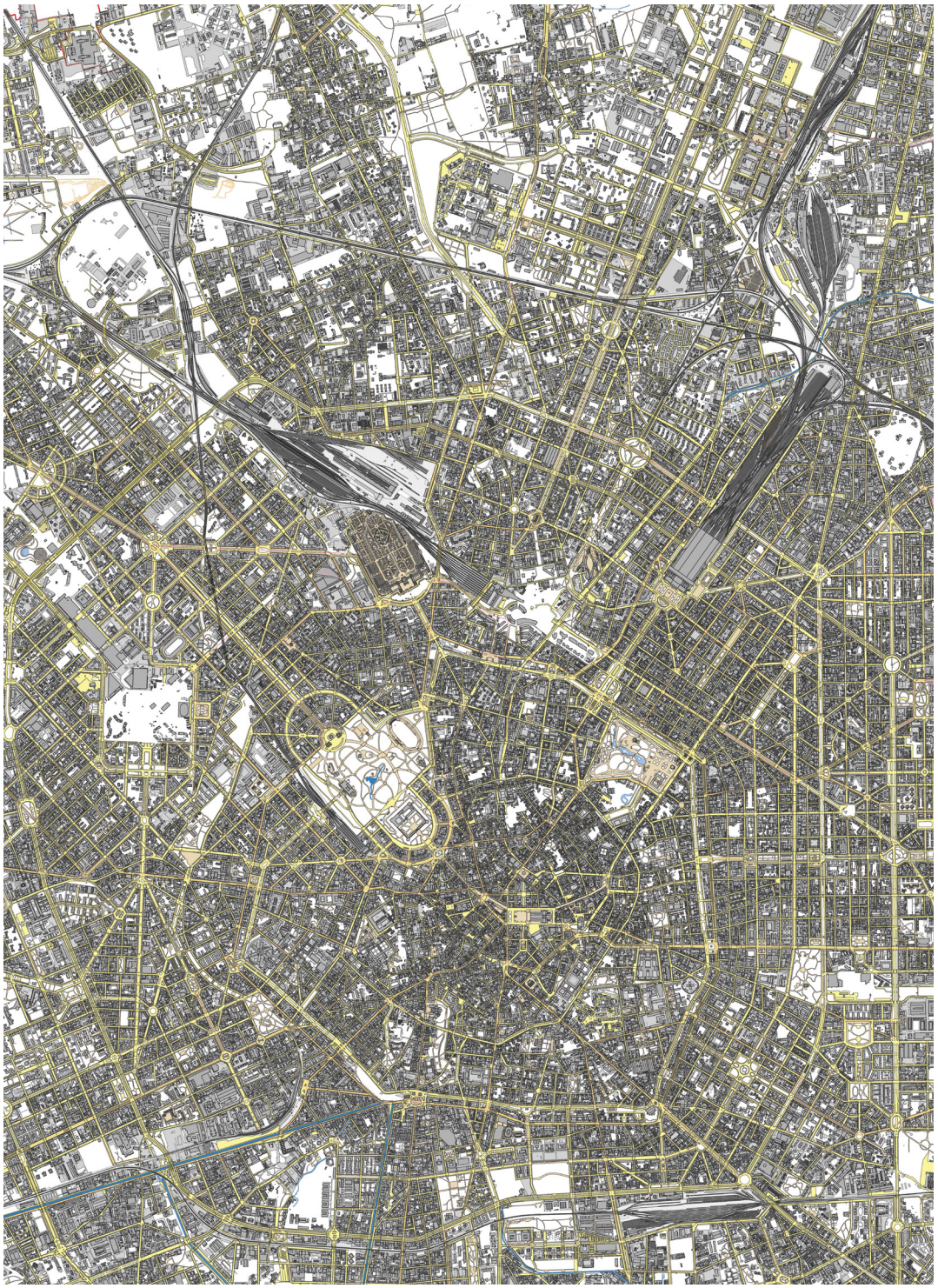


FIG. 1.18

Current urban fabric (Author, 2022)

FIG. 1.19

Ancient cartography:

1. Hydrography of the city of Milan (Emilio Bignami,1888).
2. Urban fabric in the XVIII century (Giovanni Filippini, 1722).
3. Image form of Milan (Pietro Del Massajo,1456).

FIG. 1.20

Re-drawn maps:

1. Criminality and green spaces marginalisation.
2. Infrastructure and culvert.
3. Spring area

(Author, 2022)

ANCIENT CARTOGRAPHY

FIG. 1.19.1

FIG. 1.19.2

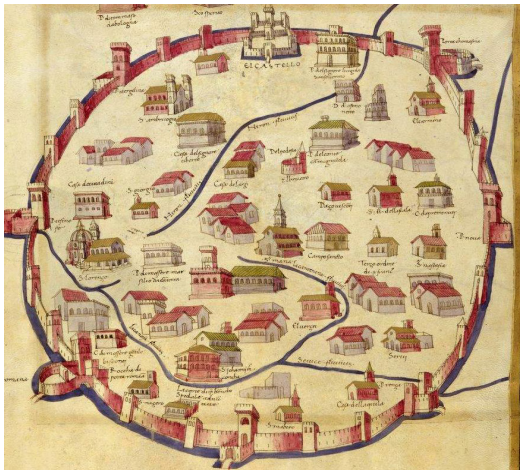


FIG. 1.19.3

RE-ELABORATED MAPS

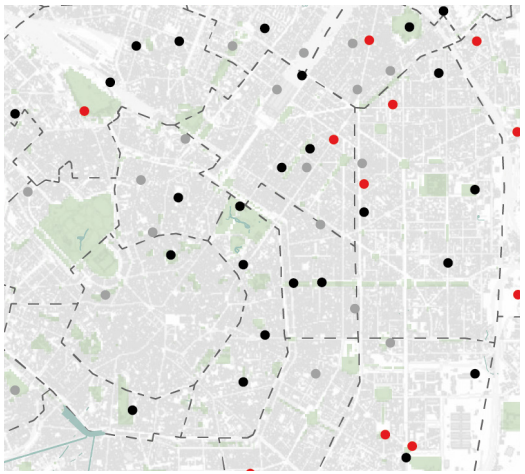


FIG. 1.20.1

- Built environment
- Green areas
- Water
- Homicides
- Thefts
- Robberies

FIG. 1.20.2

- Built environment
- Water basin
- Canal
- Covered canal
- Infrastructures

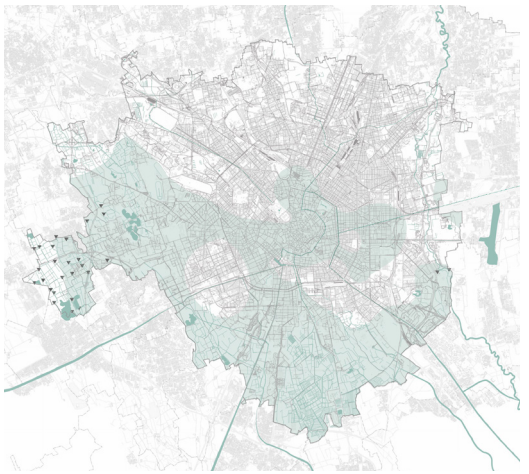


FIG. 1.20.3

- Built environment
- Water basin
- Spring area
- Waterways
- Local spring

FIG. 1.21.1

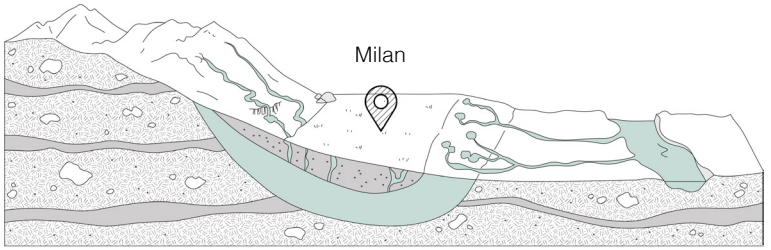


FIG. 1.21.3

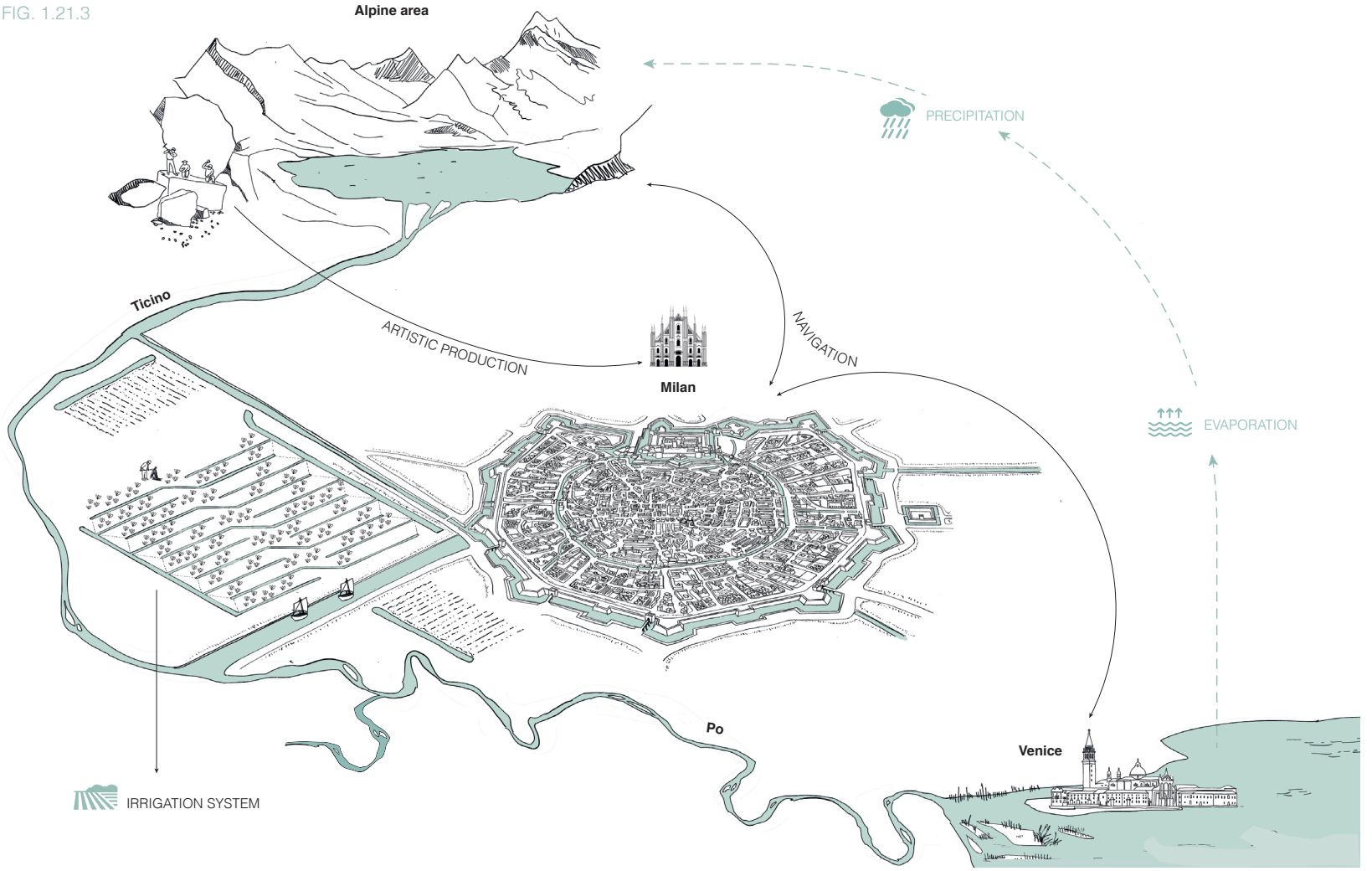


FIG. 1.22.2

Redrawings

The significance of redrawing is reproducing, imitating, interpreting and modifying the sources, like an amanuensis, when copying a work, illustrates it and inserts additions or eventually mistakes in processing its meaning.

When imitating paintings or historical sources, redrawing is a tool for understanding the components of an element or its functioning, or its meaning. When, on the other hand, it is reworked, it becomes didactic and explanatory of a complex process by condensing and prioritizing certain information.

In the thesis, this operation allowed me to understand the soil properties in the project area and to didactically illustrate the historical and cultural heritage along the blue infrastructure. By drawing, I've interpreted the circularity of the traditional water system and also understand the more technical concepts of navigation, like the locks' functioning.

FIG. 1.21

The redrawing has brought a deeper knowledge on:

1.The soil differentiation along the Po Valley.

2. The circularity of the traditional water system.

(Author, 2023)

FIG. 1.22

Children from the kindergarden Arena 21 while representing their experience with water (Author, 2023).

Interviews

Interviews have helped in developping more imprinted critical thinking from the citizen's point of view. By experiencing the limitations and advantages of living in Milan, the inhabitants' oral witness has been the most direct method of approaching the social component. In fact, citizens' interviews have revealed the issues of a car-oriented system with limited green space and even new techniques for approaching nature.

Since the reuse of the Navigli as a public space is in contrast with the lack of sociality on a small scale, it is necessary to see society not as a complex system but as a set of individuals from which to be influenced and grasp the fundaments for a design. In this sense, working according to the bottom-up approach allows to break down the problem, starting from the single components, and then reach a final complexity through reworking. Especially when we deal with complexity, starting from the details can be a valid method to get to the bigger picture. Therefore, I distanced myself from surveys and overly rigid interview approaches. Instead of collecting testimonies too general and abstract to engage the individual in a precise role in the project, I've undertaken more informal, colloquial, and unguided interviews where I left room for the interviewees, their visions, and their concerns.

For instance, I have interviewed in the form of a drawing. By addressing the children, I investigated the perception of water and the property inescapable in their collective imagination and in a possible intervention.

The potential of interviews is, if serial, they can narrow the field of inquiry and make a tailor-made project.

Theoretical framework

FIG. 2.1

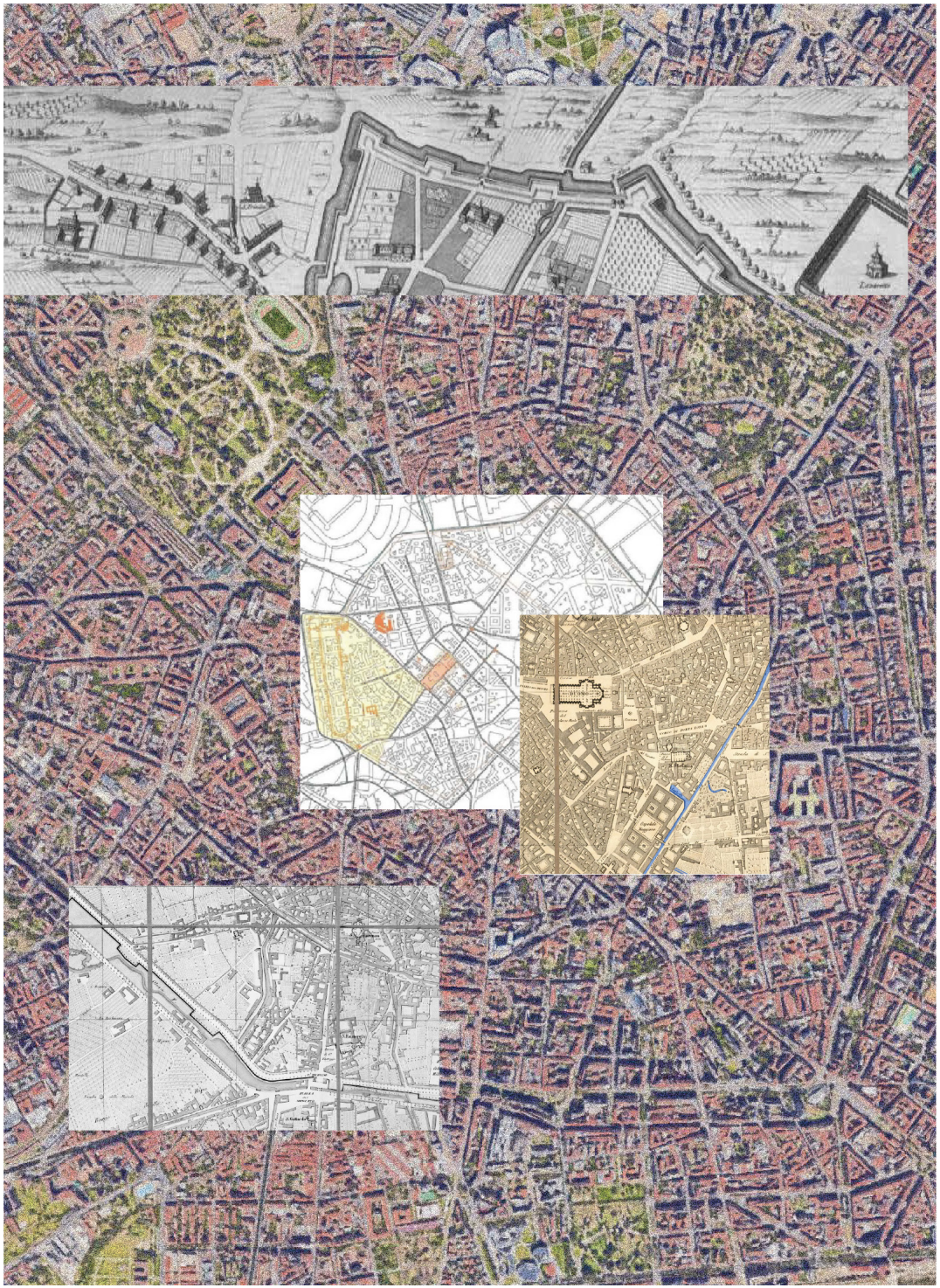


FIG. 2.1

A collage of maps from different periods show the palimpsest of Milan (Author, 2023)

URBAN PALIMPSEST

« […] the term palimpsest, is originally referred to the practice of reusing parchment or vellum by scraping or washing off existing text. As this was never a perfect process, a remnant was always left, overwritten but still visible if looked at in a particular way. Similarly, a landscape can be conceptualized as the product of successive episodes of physical change, still more or less visible as a different layer in the current landscape. These traces of different times can reinforce or contradict one another, while old and new patterns are superimposed and present at the same time. »

de Wit, S. I., & Bobbink, I. (2020). Landscape Architectural Perspectives as Agent for Generous Design.

In this sense, Milan's palimpsest narrates a complex and articulated landscape: the still-evolving urban fabric leaves room for the discerning to pick up latent clues in the residual spaces. For example, the Terme Erculee remains can be observed between Corso Vittorio and Via Europa and still narrate the symbiosis between man and water in Roman times. Although most of the building has been lost due to later urban modifications, the fact that these remains are still observable becomes, more or less intentionally, a warning, a lesson to be learned if one wants to "make Milan."

Landscape architects often work with dilated periods: in a big picture, the present is only infinitesimal when considering the density of the past and the still possible future combinations that will enrich the substance of the site; in that sense, the modern scenario of the Navigli covered by the driveways would consist of a single photography of the city's epochal history.

In different historical periods, Milan brings forth a discourse based on commerce, development, and inter-relationality that stems from the character of the place. Generally, the term ***genius loci*** describes the site's essence, which condenses a multitude of information ranging from geography to aesthetics, from history to social character. Milan chose to be such when, instead of an elevated site like the neighbouring settlements of Bergamo or Brescia, it took shape in the plain by using water as a resource for daily activities and even as a strategic physical boundary to counter invaders.

The different layers of history can become the tool to interpret and indulge the landscape in its intervention. However, approaching the past needs not be a limitation for creativity: it can be a motivation in favour of design choices or provide theses that detach from the tradition. The landscape naturally communicates its history, both in terms of natural processes and social evolution, by manifesting a range of information and qualities that are intrinsic to that space.

Just think of the modern scenario, where except for the still open sections of the Navigli and the Darsena, it is unlikely to think of Milan as a water city; however, modern infrastructure has only covered the old canal routes, not made the water disappear. Therefore, cases such as the flooding in the Niguarda district make the landscape speak for itself spontaneously, showing how in the modern age, the march to progress broke with the past by triggering a series of geophysical problems easily avoided with a

FIG. 2.2.1

FIG. 2.2.2

FIG. 2.2.3

FIG. 2.2.5

FIG. 2.2.6

FIG. 2.2.7

FIG. 2.2.9

FIG. 2.2.10

FIG. 2.2.11

FIG. 2.2.4

FIG. 2.2.8

FIG. 2.2.12

FIG. 2.2

Examples of palimpsest in Milan:

1. Roman arena (Corriere della Sera, 2019).
2. The Herculean Baths (Giovanni dall'Orto, 2008).
3. The Colonne di San Lorenzo (Trip Advisor, 2020).
4. Porta Romana (Author, 2022)
5. Ancient Spanish walls become the setting for private wellness (Viator, 2019).
6. The Conca dell'Incoronata today (Author, 2022).
7. The Vicolo dei lavandai, the oldest washhouse still existing in Milan, at which many women until the 1950s washed the laundry (Danilo Rossi, 2007).
8. The Duomo (Steffen Schmitz, 2023)
9. The medieval moat of the Castello Sforzesco (La Repubblica, 2011).
10. The Archi di Porta Nuova and the overlap of different architectural styles (Author, 2022).
11. Aeral view of the Porta Nuova district (Corriere dell Sera, 2020).
12. Centro Diaz (Italy.com, 2019).

proper interpretation of the Milanese genius loci. Instead, one should approach the palimpsest of a landscape by critically interpreting layer by layer, trying to bring to light "conditions, possibilities, and processes" currently fossilized in the city and breaking away from the condition of accepting the current sedimentation of characters.

The multitude of information that can be extracted from the landscape acts as an input for an articulated landscape design that takes care of the social component at least as much as the environmental and technological aspects. A palimpsest-based design is flexible and can consciously integrate past interventions and accept their valence in history.

FIG. 2.3.1

FIG. 2.3.2

FIG. 2.3.3

FIG. 2.3

The Third Landscape in Milan:

1. Vegetation colonises and shapes the banks of the Naviglio della Martesana (Author, 2023)

2. Nature spontaneously repopulates places that have remained unused by man, as is the case of the Darsena before its recover (Gruppo di Intervento Giuridico, 2008).

3. Wild species colonise a residual space close to Naviglio Vallone (Author, 2023).

THE THIRD LANDSCAPE

In modernity, thinking about “city” and “nature” as two antithetical concepts has been consolidated through invasive human interventions. Milan and the hyper-cementation that characterizes at least one-third of the urban fabric is a clear example, as is the closure of the canals in the city centre and the neglection of still visible segments. However, the city remains part of nature, as an anthropic product that arises from the landscape and its character. Nature and, more specifically, the presence of water have provided humans with the prerequisite to settle and the resources to exploit for survival, development, and well-being. Therefore, it is essential to recover a healthier and more environmentally conscious relationship and to provide new visions to reconcile anthropic and natural space. Gilles Clement developed an excellent compromise through the Manifesto of the Third Landscape.

« [...] the Third Landscape is made up of all the places neglected by human beings. These margins bring together a biological diversity that has not yet been classified as richness. »
Clément, G. (2016) Manifesto of the Third Landscape.

From this point of view, nature shows a possible way for the wild species colonization and the reconquest of spaces no longer functional for humans: it is a different conception of nature in the city. In a set of locations abandoned by humans, spontaneously, biological species that would not be able to establish themselves are welcomed as an inheritance. As Gilles Clément has reported, this process denotes “imprecision, inconstancy and unruliness”, all signs of nature’s independence from culture.
Starting from the interruption of human activity, “undecided spaces” are configured, sometimes marginal, and evolve into dynamic green environments. These spaces do not have a unique form, as the regulated exchanges among the settled beings and the connections with the surrounding environment define the character of the place. Less dated spaces tend to host more new species, as they pose “as a territory of refuge, a passive situation, and as a place of possible invention, an active situation.”

« The variety of behaviours depends on the latitude offered to each species (freedom of action) but also on the biological amplitude of each species (capacity to adapt). »
Clément, G. (2016) Manifesto of the Third Landscape.

Thus, evolving biological diversity post-settlement modifications and new species shapes a scenario with ethical value.
The interruption of the exploitation of waterways as industrial canals, sewers, and infrastructure, has turned them into residual spaces, as they no longer take on their past value. Even nowadays, the Navigli are still uniquely perceived for their picturesque character; however, the canals are already configured as a revival space guaranteed by the proliferation of species in adjacence with water and the variety in their behaviours. As Gilles Clement states, it is a milieu ambient, a space of inclusion and

FIG. 2.4.1

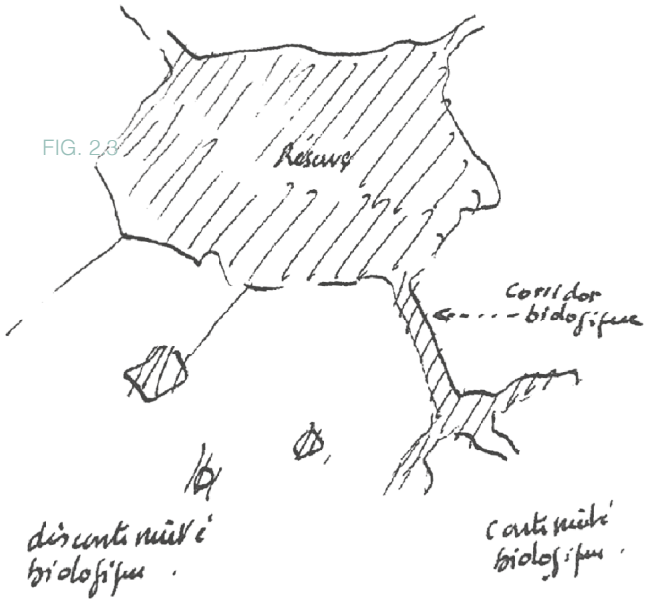


FIG. 2.4.2

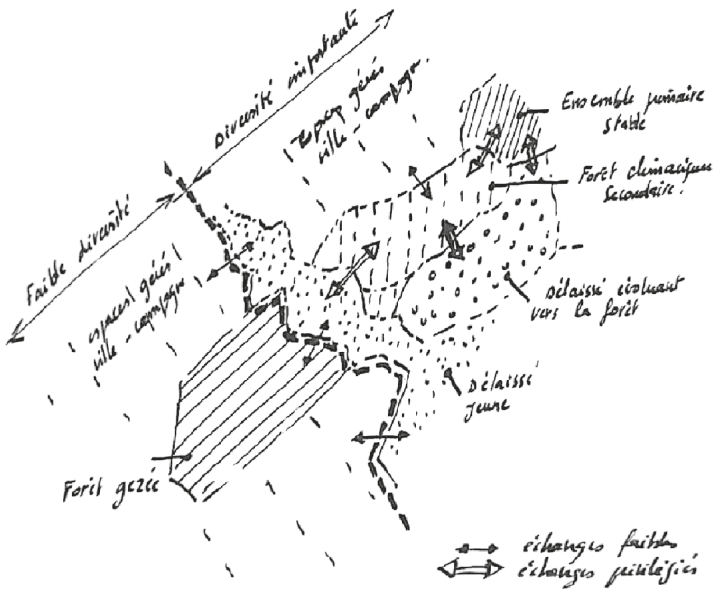


FIG. 2.4.3

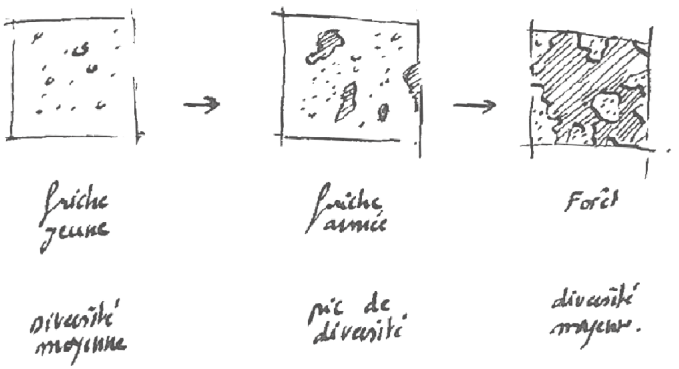
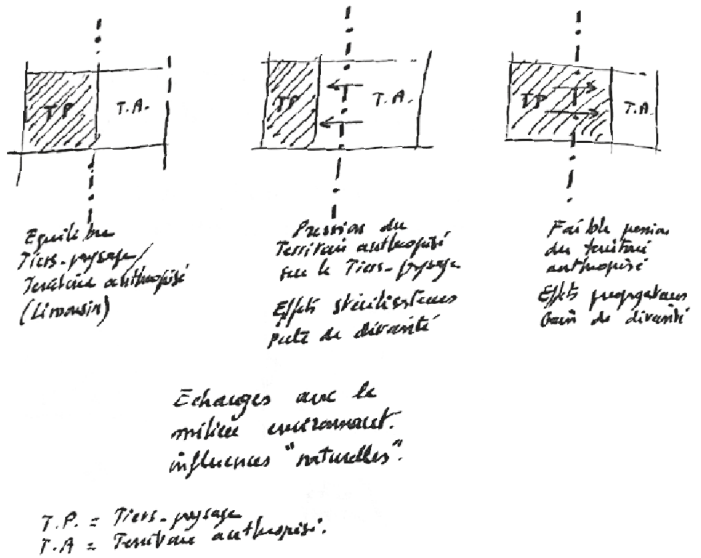


FIG. 2.4.4



symbiosis.
Another inherent characteristic of the Third Landscape is the perpetuation of its evolution, even at the territorial scale, thorugh adaptation and resistance.

« While animals and humans react to transformations in the environment (e.g., drought, melting ice) by moving, plants, linked to the environment, respond with adaptation by developing the ability to perceive and produce correct solutions such as modulating development (reducing size, creeping, rising in height). »
Mancuso, S. (2017) Plant revolution

From this point of view humans become fundamental characters. Mild human actions can ensure balanced biological diversity. As Gilles Clément argues, one is the role man should assume in contemporary society: the 'gardener.' The latter term is not intended in its conventional sense: it is a shared vocation engaged in caring for the landscape through simple everyday actions.

« He [the gardener] sums up in himself the complexity of functions performed separately by the landscaper and the technician, but first and foremost he deals with the living.»
Clément, G. (2013) Gardens, Landscape and Nature's Genius

This vision has entailed a change of mindset on the part of man himself, no longer a dominator but a part of the world on par with other species. Milan, as a city of water, could be configured as the laboratory of man and other species where the gardener witnesses the inventive power of nature and stimulates its growth and variety.

« This predisposition to listen does not exclude intervention and is, in fact, a prerequisite for it. The gardener introduces new species. He cuts (or chooses not to cut). He removes (or chooses not to remove). Every observation he makes brings with it an action. »
Clément, G. (2016) Manifesto of the Third Landscape.

Gilles Clément even recognizes an authentic aesthetic value in the harmonious relationship between living beings. Natural genius, in fact, is associated with gardeners capable of proposing non-invasive designs with delineated but subtle boundaries, the result of continuous observation of the landscape.
It is equally important to point out that this new understanding of the landscape also confronts us with a new sociocultural conception of the canals.
If, from an environmental point of view, the canals become the habitat of new species, on the other hand, the gardeners' activity reinforces the awareness of the benefits of a water landscape that serves as an infrastructure for the species of the lower Po Valley.
The rediscovery of a serene and healthy relationship with nature sanctions the reappropriation by the human species of a milieu from which it had distanced itself, thus recognizing it as a place of possible evolution and diversity.

FIG. 2.4
Some sketches by Gilles clemet concerning the third landscape that depict:
1. biological continuity and discontinuity.
2. Boundaries and interactions between areas that are either managed or unmanaged by humans.
3. Evolution of an uncultivated space and variation in biodiversity.
4. Exchanges between anthropized territory reality and the third landscape.
(Gilles Clément, 2013)

FIG. 2.5

FIG. 2.5

A citizen while practicing amateur fishing at the Darsena (Nicolò Begnini, 2023).

CITIES OF CARE

After the closure of the canals, the driveways have socially restructured the city. If before the canal system was a shared space where people could relate, today's street is no longer a place to experience small-scale social aggregation phenomena: it is a non-place, as Marc Augé defines it.

« Non-places are defined [...] as all spaces in which millions of individualities intersect without ever entering into a relationship, driven by the frenzied desire to consume, to accelerate daily operations or considered as a gateway to change (real and symbolic). »

In the writing *Cities of Care: A Platform for urban geographical care research*, Emma R. Power and Miriam J. Williams develop a broad conceptualization of urban care through geographic investigation. The resulting agenda stems from an interest in caring, particularly the pragmatic, political, and ethical aspects that increasingly recur in urban theory. Given the inequalities that persist in cities, we can intuit that care is not a phenomenon that occurs in a homogeneous and widespread form throughout the urban fabric: disparities regulated by several factors can be circumscribed into three domains. These are the spaces of care, the materialities of care, and the subjects of care.
In 2003, Conradson described spaces of care as:

« [...] a socio-spatial field disclosed through the practices of care that take place between individuals. Given the inextricably relational nature of care, the emergence and endurance of such spaces depend upon the willingness of some individuals to move toward others and, among those being engaged in this way, upon receptivity to such initiatives. »

As can already be guessed from the name, spaces of care have to do with the physical-spatial component, in this case, circumscribed; however, the temporal aspect is equally fundamental since the endurance of this vocation varies according to the willingness of people to make themselves available and the receptivity of care by others. In Milan, the social issues seem to be related to the tangible loss of spaces and modes of care that once characterized the canal bank.
Spaces of care are organizational spaces aimed at ennobling in practical terms care and its propagation by involving both the "human" and the "non-human." Emma R. Power and Miriam J. Williams recount the engagement in care as "the caring labour and intentions of users, including staff, residents, and visitors in conjunction with the material environment within which they are located".
In a scenario where care is introduced, space and material environments can foster engagement in imparting and receiving care. The Navigli daylight would enshrine the recovery of care through spaces designed to awaken the interrelationship between people and a more empathic vision towards the public green space.
Phenomena of care occur in multiple forms and more or less spontaneous but still in

FIG. 2.6.1

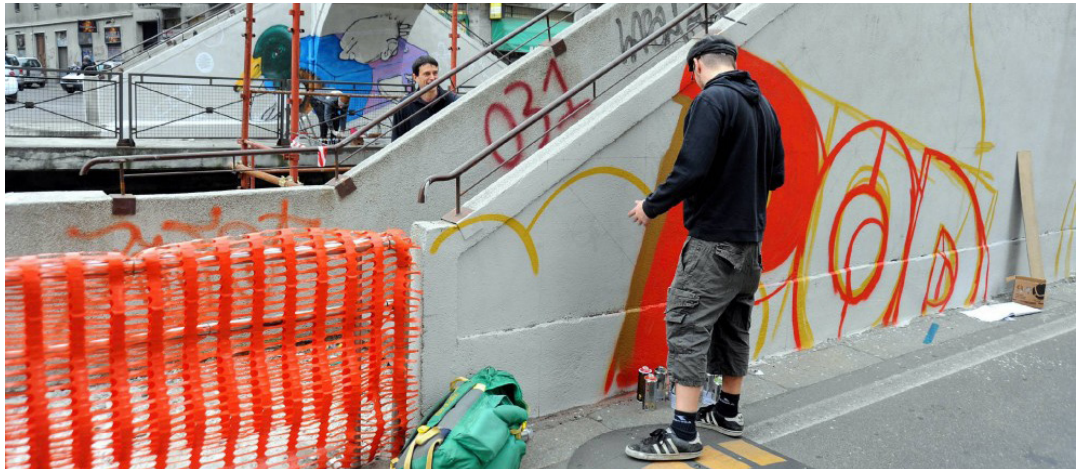


FIG. 2.6.2

FIG. 2.6.3

FIG. 2.6

The forms of care in Milan:

1. Street artists color the bridges over the Naviglio Grande (Author, 2023)

2. Social aggregation by the water (Enrica Tancioni, 2022).

3. Abusive kitchen garden along the Naviglio della Martesana (Milano Today, 2012).

discontinuous ways. Nowadays, along the Navigli, one can observe how caring has led to an authentic reclamation of the canalside, such as abusive gardening, street art or aggregation next to the water. Especially in shared spaces, the surfaces are visibly contended among multiple individuals, and shared space stimulates relationality.

The materialities of care refer to "objects, bodies, buildings, or materials" and how they encourage caring. Again, the non-human component enlarges the field of research, as the non-animated (e.g., pavements) can stimulate the attention and care of those who come into contact with it. It considers how "things facilitate, foster, mediate, and co-constitute caring relationships."

Conventionally, when we think about care, we immediately address the human sphere; however, the space can conceptually be intended as the sender and addressee of caring due to its particular properties and peculiarities. Part of the site's character is embodied in the materialities of the place. Unlike today's scenario, a park design along the Navigli could approach this theme because of the mitigating properties of greenery and its ethical and aesthetic component. Relaxing in a park while feeling attuned to the place is a first input to care for the society, the site and the environment, which we would always like to be welcoming, diverse, and intriguing.

Usually, the subjects of care are the actors at the core of relationality in shared spaces. The neglection of care in urban policies underlies episodes of care inequality, as well as non-sporadic phenomena of privatization of care within the home.

One need only think of the Naviglio Grande and the Naviglio Pavese in Milan and the social role of eating places: even though they serve as social condensers, the economic function of bars and restaurants excludes certain age and income groups from relationality and provides no stimulus concerning care.

A subject can freely manifest and receive care, responding to the context with a sometimes active, sometimes passive stance. In this sense, children are perceived as "passive recipients of adult care"; in any case, their curiosity and unawareness make them emitters of care. Other examples show how the engagement of the actors can depend on negative and traumatic experiences: the act of care becomes the suturing element of compromised spaces. As we have already seen, many of the neglected green spaces in Milan are the scene of micro-criminality; although politics must take steps to deal with this problem, it is equally true that caring for a place by starting from the bottom, can attribute value to it through simple activities such as maintenance and idaection of initiatives. The interchangeability between active and passive positions of caring in a subject and the wide range of actors per se makes this domain fluid and dynamic. In this sense, the first spontaneous phenomena of caring for the canals (active position) led to a rethink of the system as a space capable of infusing care into its users (passive condition).

The emergent green spaces, within the materialities of care, will be interpreted as a scene of pragmatic and ethical care where the citizens feel involved.

Analysis

FIG. 3.1

FIG. 3.1
The traditional water system *in auge* during the XIX century (Emilio Bignami, 1888)

FIG. 3.2
Form of involvement of the society in Milan:
1. “Introverted” recreation along the Darsena (Riaprire i Navigli, 2020).
2. The Pixel-Picnic, a 1km-long tablecloth stretched out in the greenery of Sempione Park, to be filled pixel by pixel with home-made treats to be brought from home, just like at a classic picnic (Zero Milano, 2017).
3. Parade of newlyweds along the Naviglio Grande (Riaprire the Navigli, 2020).

PARTICIPATION IN THE URBAN CONTEXT

After the closure of most of Navigli, the driveways brought to the decrease of small-scale relationality in the public space, intended as the fruitful interaction between individuals in an informal context. For sure we are not talking about small-scale sociality given that in a city of one million inhabitants 68 percent of Milanese admit not to be in contact with their neighbours. Contemporary society no longer has contact and does not interact in public spaces driven by a sense of community and belonging to place as in the past.

In the current situation, several social migrations to the larger, controlled and maintained parks occur in Milan to enjoy their own restricted company without further interaction. It would be better to have a place near home to spend leisure time.

Spaces of care

The idea of establishing spaces of care whose imprint takes shape from the traditional water system and urban development thanks to water. Only caring and awareness towards water can laugh life to the landscape and sociality. The best way to interact and develop care do not confine the canals to an open air museum and renews the system to increase urban quality by emphasizing sociability on a local scale. It means introducing new functions and new meanings as the traditional ones are no more compatible with the needs of modern society.

Subjects of care

The increment in sociability in public spaces requires to analyse the subjects of care that already more or less spontaneously take chage of the city:

FIG. 3.2.1

FIG. 3.2.2

FIG. 3.2.3

FIG. 3.3.1

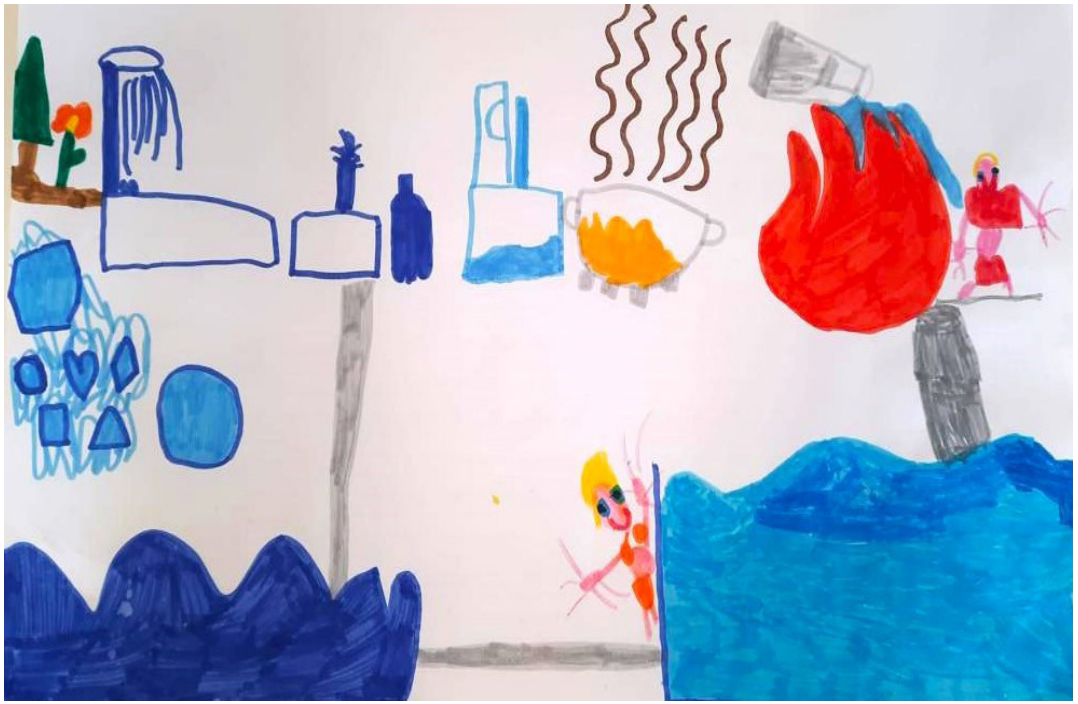


FIG. 3.3.2

FIG. 3.3

Enea and Nicolas from Kindergarden Arena 21 drew the different water uses:

1. Water is employed to flowers and trees alive, to drink from drinking fountains, for our hygiene, for cooking, and for extinguishing fires. Nicolas represented him and his mom diving into the pool.

Knowing that the water we use comes from nature, the two children connected their subjects to a lake with pipes

2. Diana, Arizona, and Ilaria has represented themselves siphoning water from one container to another. (Author, 2023).

• Children and schools, as already expressed in the theoretical framework, are unexpected subjects of emitters of care. Curiosity drives younger people to be more sensitive concerning water.
I interviewed a group of children from the school Bastioni di Porta Nuova Alberto Da Giussano, which is based next to the old Naviglio della Martesana bed.
In order not to suggest to the children, I followed my informal approach by asking them to create a drawing in which they tried to remind adults of the everyday uses of water as they play and relate to it.
The drawings they produced to depict their perception showed that even in a childhood background, children are aware of water as a resource and its uses (1), that the water comes from nature (2) and is part of a complex and interconnected system (3); finally, that water can shape a landscape for recreation (4), where to interact (5) and where nature finds it dwell (6).
In this sense, the educational context can enhance this feeling of care toward landscape and society. Site lectures, recreation, and simple maintenance activities can be developed to restore awareness on water.

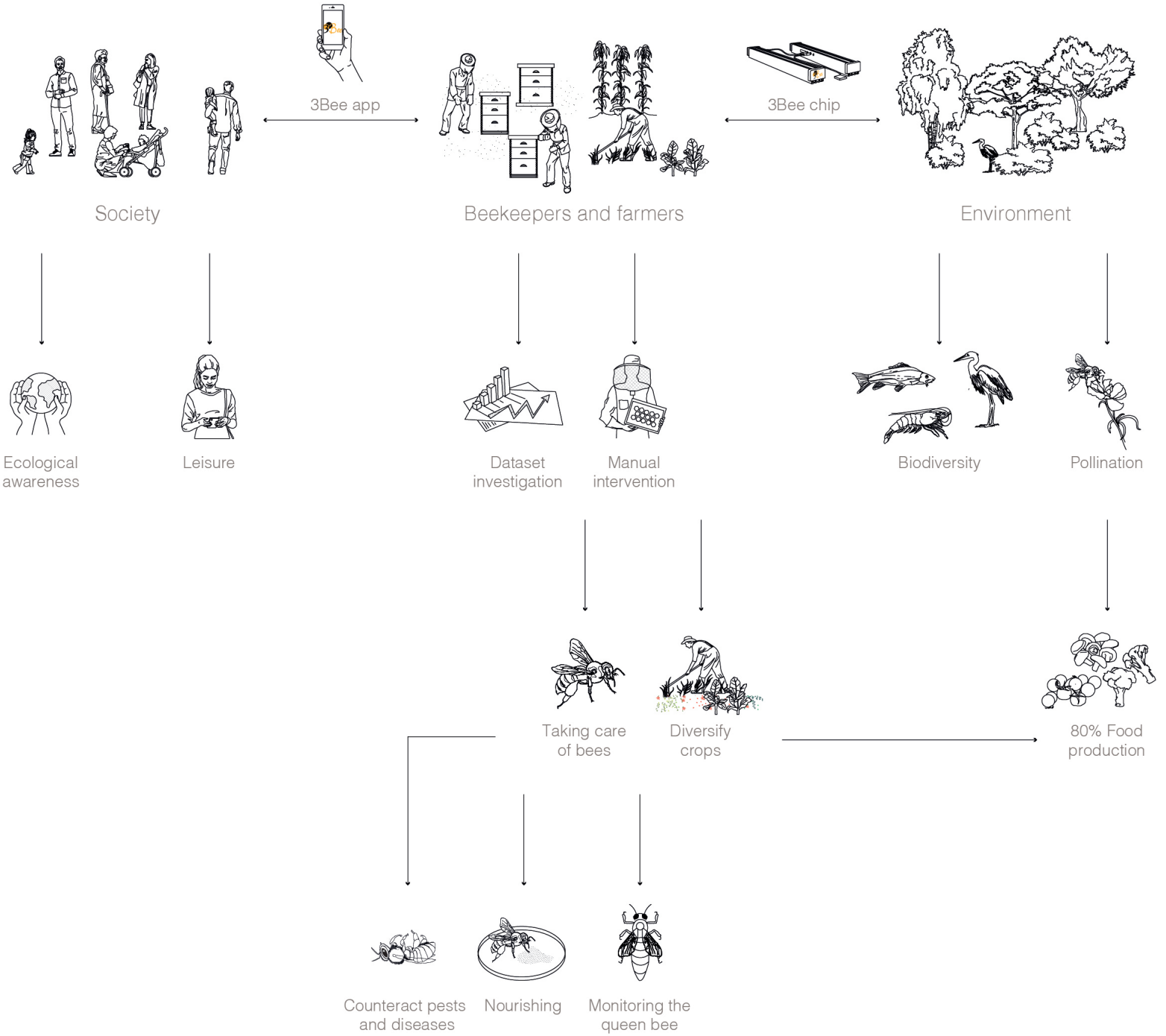
• Religious groups with their communities develop initiatives within the city aimed at sharing, cooperation, and social integration, especially, due to the city's multi-ethnic character. Beyond the institution itself, it is interesting to mention that the oratories in Italy work similarly to the community centres by presenting collateral spaces for sports and recreational activities.

• Ecological footprint companies already acting in the city involve part of the community and target landscape care initiatives.
The interview with Niccolò Calandri, CEO of 3Bee, proposes a vision in which the company is involved in safeguarding the environment and protecting bees. In fact, this is a company and agri-tech startup which monitors bees and it diagnostics systems for their health.

What is the contribution of bees to the environment?
They seem seemingly useless and apparently such small animals that they don't seem to make a difference: however, bees are the basis of the pollination process. Because of their presence, we benefit from at least 80 per cent of the fruits and vegetables we grow. If we take bees out of the equation, we break down the food chain, coming short of the species that even feed farm animals.

Is the bee industry in crisis? What are the emerging problems of bees?
Although bees are not disappearing these days, some conditions are disfavouring their survival.
In recent years the loss of biodiversity, monocultures, and agricultural deserts have ruined the ecosystem. One of the most consistent problems nowadays is monocultures. If I realise a monoculture, I get little nectar because the short-time process is related to the seasonality of the fruit or vegetable; therefore, the bees extract nectar from that crop for approximately a month.

FIG. 3.4


3Bee app
3Bee chip
Society
Beekeepers and farmers
Environment
Ecological awareness
Leisure
Dataset investigation
Manual intervention
Biodiversity
Pollination
Taking care of bees
Diversify crops
80% Food production
Counteract pests and diseases
Nourishing
Monitoring the queen bee

How does your vision take care of the environment by involving society?

Through technology, we enable anyone to adopt a digital hive, monitor it, see it in its growing moments, and protect it. Information is collected in an app for hive adopters and digital beekeepers and is the product of sensors installed inside the hive. Beekeepers, who can protect bees, receive this technology and practical information with which to act.

With 3Bee, we are thinking about regenerative solutions by collaborating with those who do monoculture by starting to plant nectariferous essences (and we are doing that together). After all, even the farmers need bees to pollinate their crops. To achieve this goal, we redistribute biodiversity by diversifying crops, subdividing the field plots, and introducing local wild species to regenerate the land. Those who adopt a beehive monitor bees and unexpectedly help in natural regeneration.

Agronomists and environmental engineers follow us in planning. We are very engineering in this regard. The microchips listen to the bees though microphones and monitor humidity and temperature. Once in the hives, they report the frequency (around 400 Hz) and derive the various data; we digitalize them, and the engineers reprocess the data into a strategy with which to intervene through beekeeper interventions.

The beekeeper visualizes the data from the app and understands if there is a need to feed the bees, if the hive weight is regular, if the queen is doing well, if there is a nectar shortage and, most importantly, how the environment is.

We monitor about a billion bees in 53 towns through our sensors, mainly in Italy. We know which areas are the best for biodiversity, therefore, beneficial for us and food production.

By founding 3Bee in Italy, we have established a circle of trust with beekeepers and our community who believe in our vision of regeneration of the environment. The human hand intervenes only to ensure the well-being of the bees. From the social point of view, we try to make the app interactive by selling honey and pollen and ranking productivity among different hives. Learning from animals is still strange to me; however, the truth is that we are the ones who must figure out how to interact with nature.

How do you see the introduction of bees and the care for them in Milan?

Milan is particularly problematic. In general, beekeeping is doable in the city, even putting a hive on the terrace of your apartment; however, it is fundamental to figure out the location as the green network is particularly underdeveloped. In Paris, bees were introduced into the city and, for a time, became a trend; however, now there are so many that they bother the local bees by stealing nectar. If you want to intervene in a space like Milan with few parks, it would be a problem; you would have to think of a green design that would fit in as a habitat for bees. Our collaboration with ESA (European Space Agency) employs satellites to interpret the various types of vegetation in the area, whether they are nectar or pollen. Then, we determine whether it is the ideal place to put a hive.

FIG. 3.4
Diagram of the synergies between 3Bee and the landscape (Author, 2023).

FIG. 3.5.1

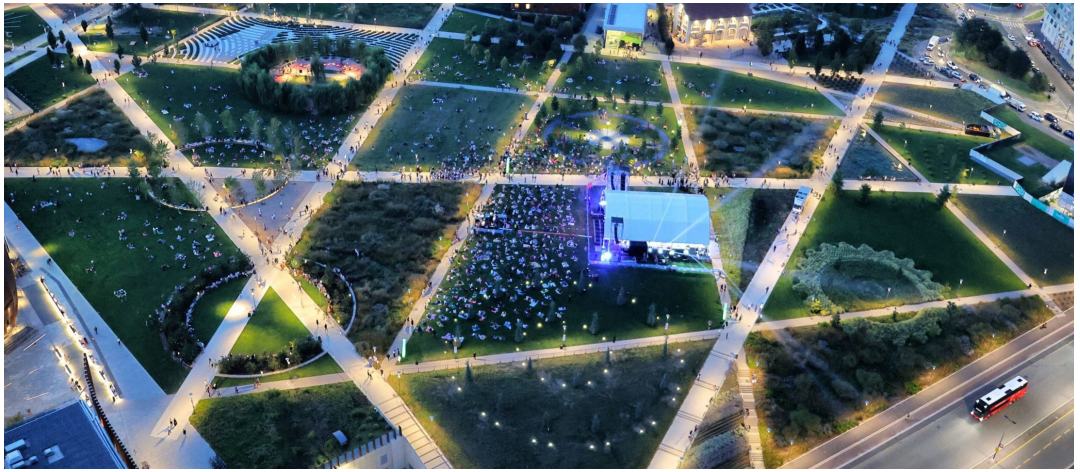


FIG. 3.5.2

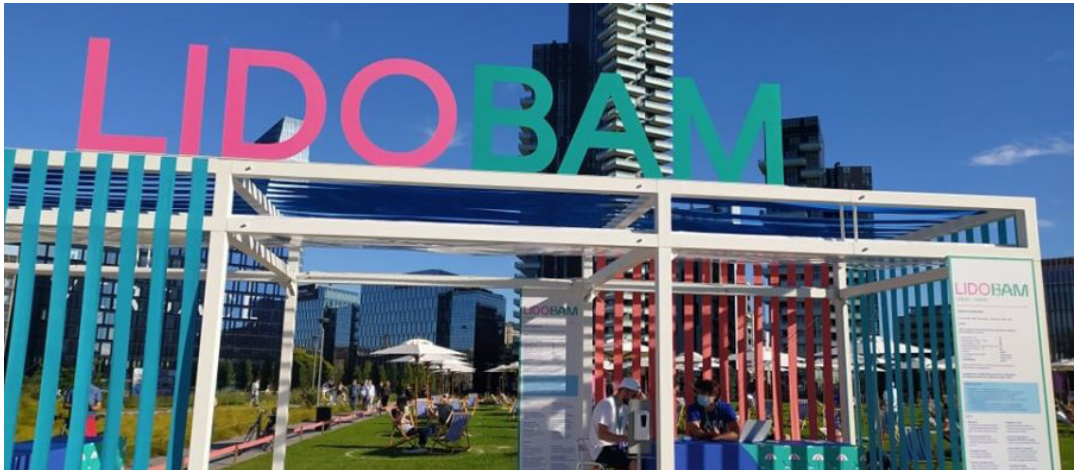


FIG. 3.5.3

FIG. 3.5

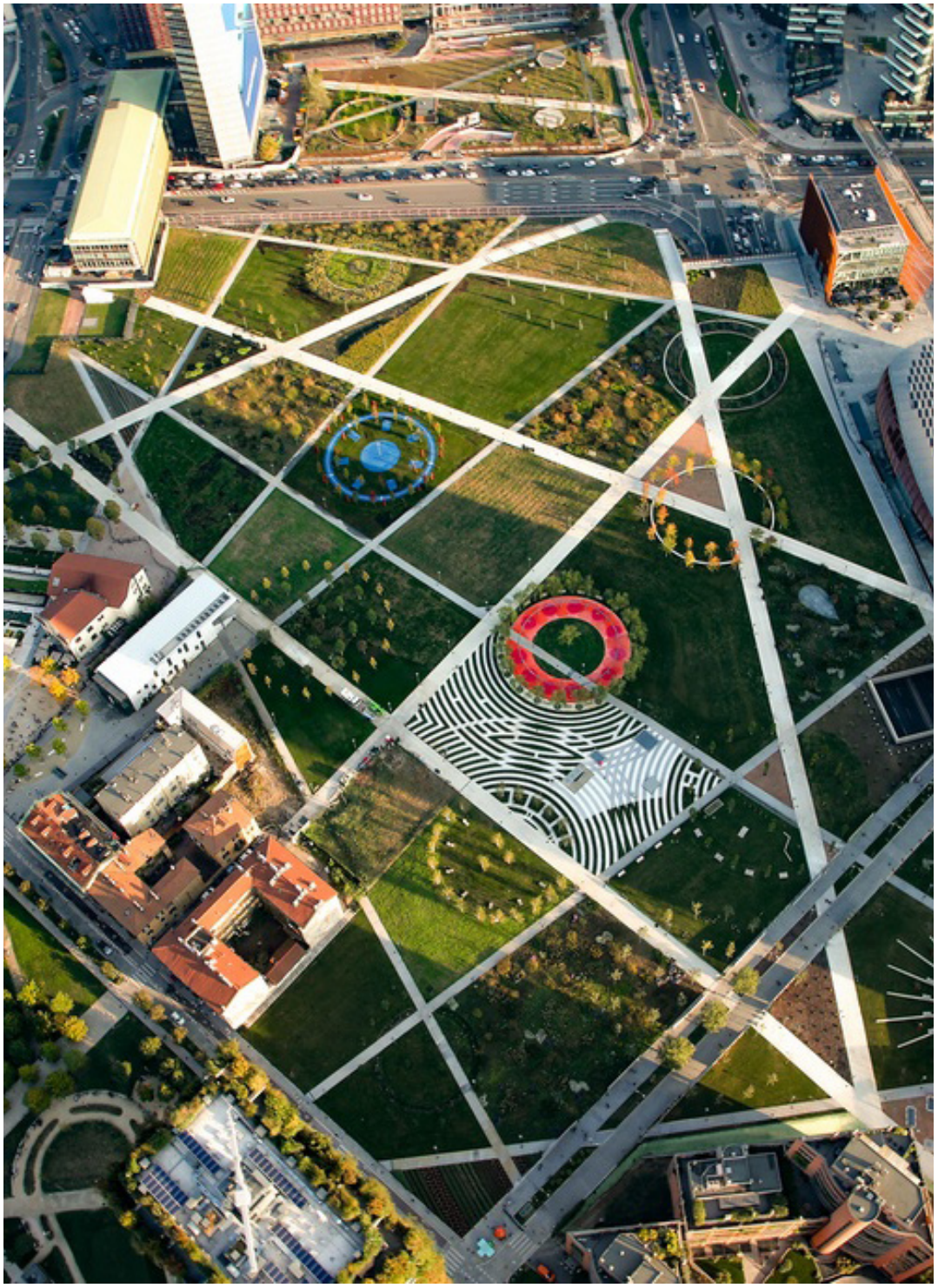
The park Biblioteca degli Alberi (BAM) located in the new part of the Porta nuova district:

1. About 3 thousand people attended BAM's grand opening event on September 8, 2019: the first free open-air concert by the La Scala Philharmonic (BAM, 2019).
2. An initiative of the BAM's community in times of coronavirus. A lido is recreated in the park by adhering to spacing regulations with drawings on the lawn to ensure proper spacing between the various umbrellas and deck chairs (BAM, 2020).
3. The symbiosis of nature, culture, and the built environment in the Biblioteca degli alberi (Ansa 2020).

FIG 3.6

Top view of the Biblioteca degli Alberi (BAM, 2019).

FIG. 3.6



Case study: Biblioteca degli Alberi (BAM)

These subjects of care could develop a new program along the waterscape, just like other emergent green spaces in Milan. For example, Biblioteca degli Alberi is a project in the Porta Nuova district, a particularly strategic location when considering the flows of people who daily move through this working, mixed residential fabric. Workers who intersect this park on their home-work route are attracted to it and take advantage of it during work and after-work breaks, often taking part in initiatives. The community that organises the program takes care of:

- Site maintenance;
- Public relations;
- Events management;
- The preservation of the environment;
- The definition of new services for the neighbourhood;
- Collaborating with public administration.

It is essential to create a program tailored to the city, dynamic and run by groups already active in the urban environment. By defining a ray of action, we can see that the Navigli system could be a linear space of care. Considering the subjects of care in Milan, children will have a smaller radius of action in terms of movement and safety, while the religious communities that count more adults can move and act more widely in the area. In the case of footprint companies, the space of action includes the entire urban dimension. By mapping the different radii of action, the whole canal system, depending on people's willingness to interest in the area, can be managed and cared for by the groups concerned to its entire extent.

FIG. 3.7.1

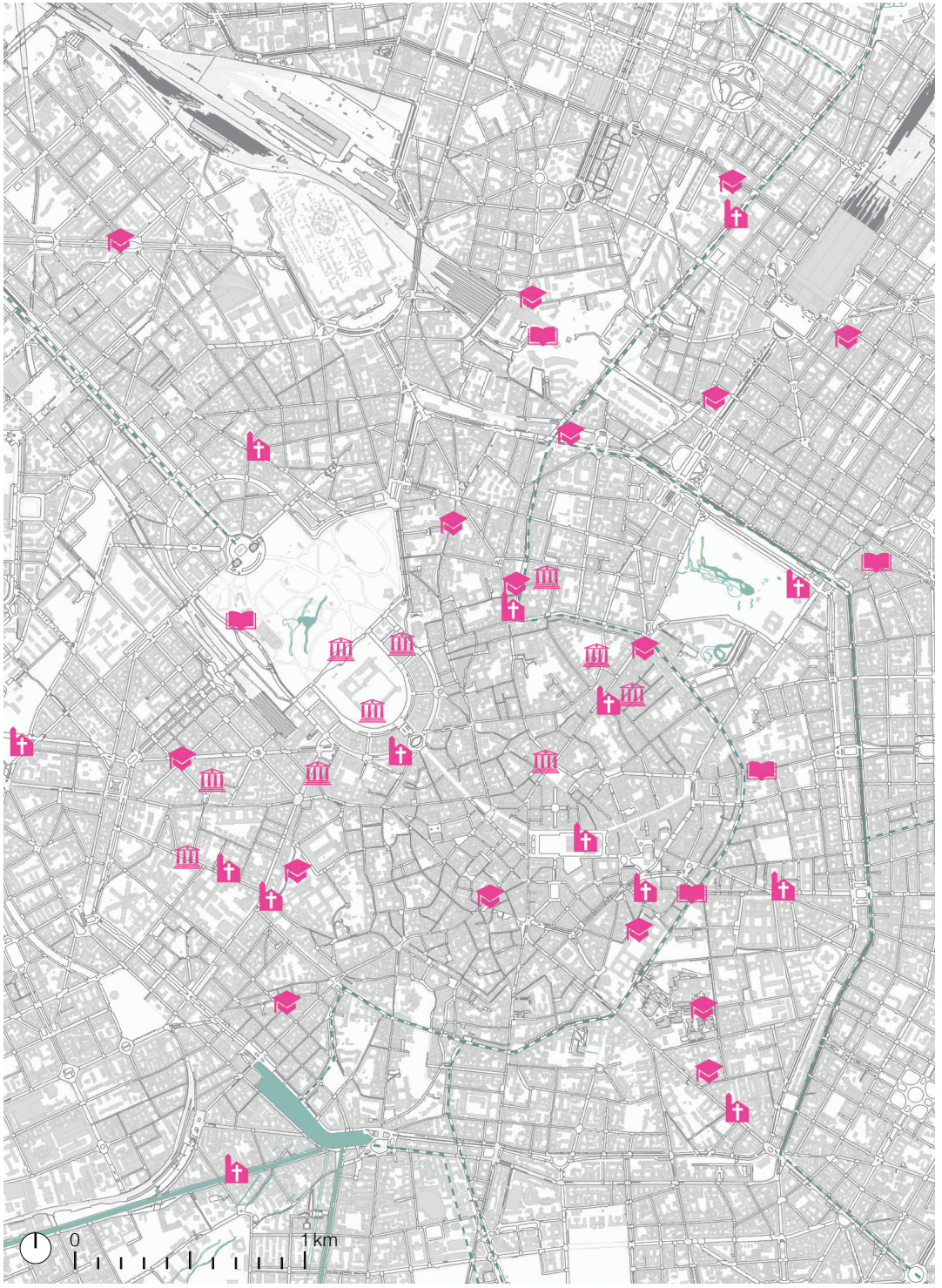


FIG. 3.7.2

FIG. 3.8

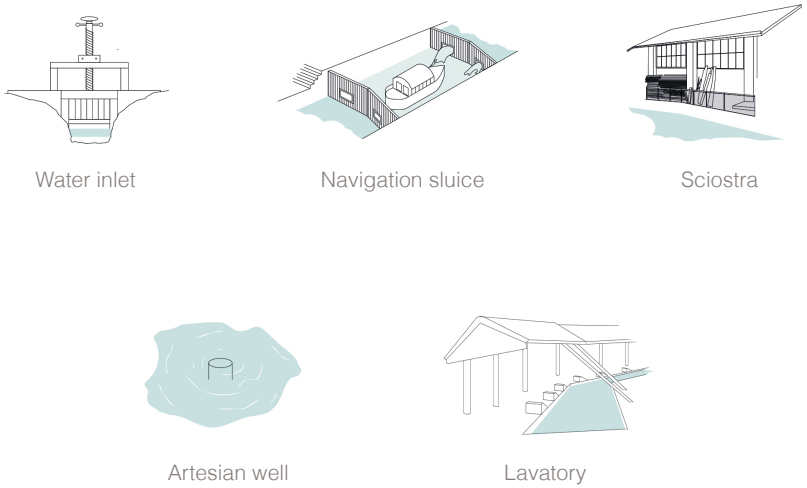


FIG. 3.7

Map of the social groups that could participate in the recovery of the Navigli and study on the range of each social component (Author, 2023).

FIG 3.8

A set of waterworks related to the traditional water system that might be re-thinked as interactive features in the landscape (Author, 2023).

Materialities of care

Nowadays, it is hard to relate to the modern street as it offers private services and not public spaces where to develop a sense of community, which is why daylighting the Navigli as a social condenser par excellence in Milan's history. The recovery of the Navigli is not a nostalgic revival of the past: it aims to recover the lively atmosphere along the canals by involving new materials, new forms, and new visions.

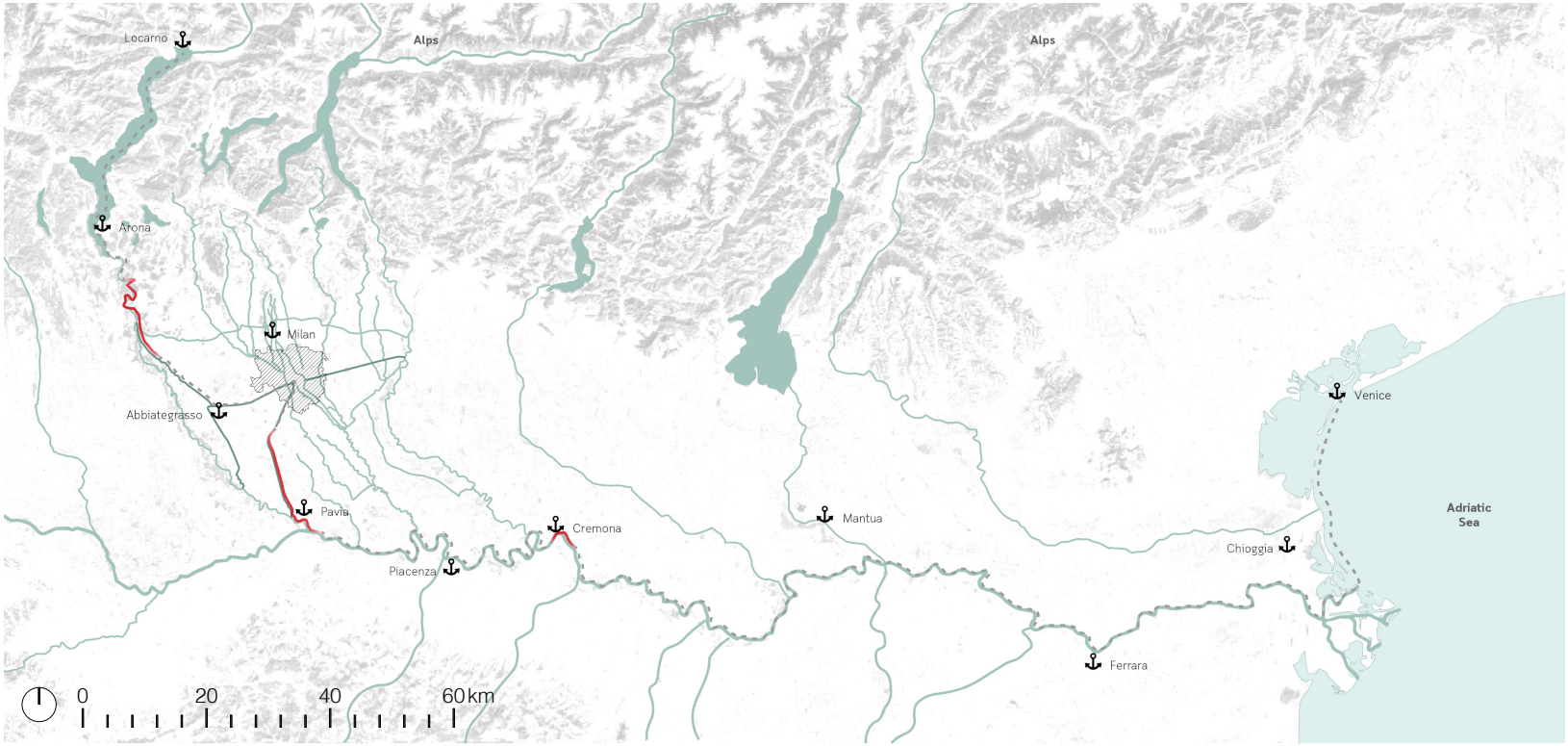
By distancing myself from the conventional canal daylighting, it has been possible to investigate the framework of the emerging designs to recover industrial archaeology. A set of precedents pointed out different potentialities: those projects are direct interventions that manipulate an already anthropic space, it rethinks the historical site through adaptable spaces and it reworks the meaning of historical features.

From this type of operation, a triad of approaches can be deduced and re-interpreted in the urban tissue:

- Adapting is understood as the adaptation of space for modern needs to modern ambitions;
- Reusing in the sense of using the traditional structures that are still useful for site management;
- Re-earning, or rather, developing a sense of belonging and familiarity with the place and its elements.

This framework fits with the water landscape considering the waterworks that characterize it, and they can be reinvented to awaken citizens' care.

FIG. 3.9



- Geography
- Lake
- Sea
- Milan
- Main port
- Waterway
- Navigli
- Non-navigable section
- Possible routing system

FIG. 3.9
Map of the ancient commercial system and parts currently unusable (Author, 2023).

FIG 3.10
Model representing the possible synergies among the sites along the water system (Author, 2023).

FIG 3.11
Tecnical drawing of the Incoronata navigation sluice designed by Leonardo da Vinci (Vinciana, 2015).

SCALE CONTINUUM

Blue network

As we can see from the map, Milan was one of the ports along a multiregional water system that includes :

• The Alpine area with the glacial lakes;
• The Po Valley and its settlements;
• The Adriatic Sea with the Venetian lagoon.

It is a route through numerous landscapes, starting with the lake landscape and then moving on to river valleys and natural reserves, then the urbanized northern Po Valley with its productive hubs, the southern plain with its rural character, and, finally, the historical centres on the Po River banks and the Venetian lagoon.

Some parts of the traditional trading system are not navigable anymore due to the state of maintenance of waterworks designed to safeguard navigation. In addition to their functional value, these artefacts, also take on a singular aesthetic-landscape value, such as Leonardo's designs of locks, locks and dams.

In this sense it is an imperative to take advantage of those studies on locks and dams that have made the Navigli such an efficient masterpiece of water design and technology.

During the last centuries the trading system has been substituted by the system of highways along the Po Valley, therefore it could result useless.

However, if we consider that a new landscape in Milan will be enriched by the emerging public spaces, the city would be once again part of the whole as a socioeconomical hub in the multiregional water system and it would attract tourists through its water identity.

FIG. 3.10

FIG. 3.11.1

FIG. 3.11.2

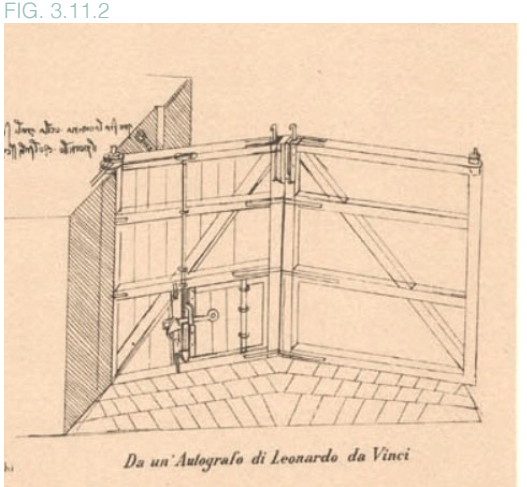


FIG. 3.12.1

FIG. 3.12.2

FIG. 3.12.3

FIG. 3.12.6

FIG. 3.12.7

FIG. 3.12.8

FIG. 3.12.11

FIG. 3.12.12

FIG. 3.12.13

FIG. 3.12.4

FIG. 3.12.5

FIG. 3.12.9

FIG. 3.12.10

FIG. 3.12.14

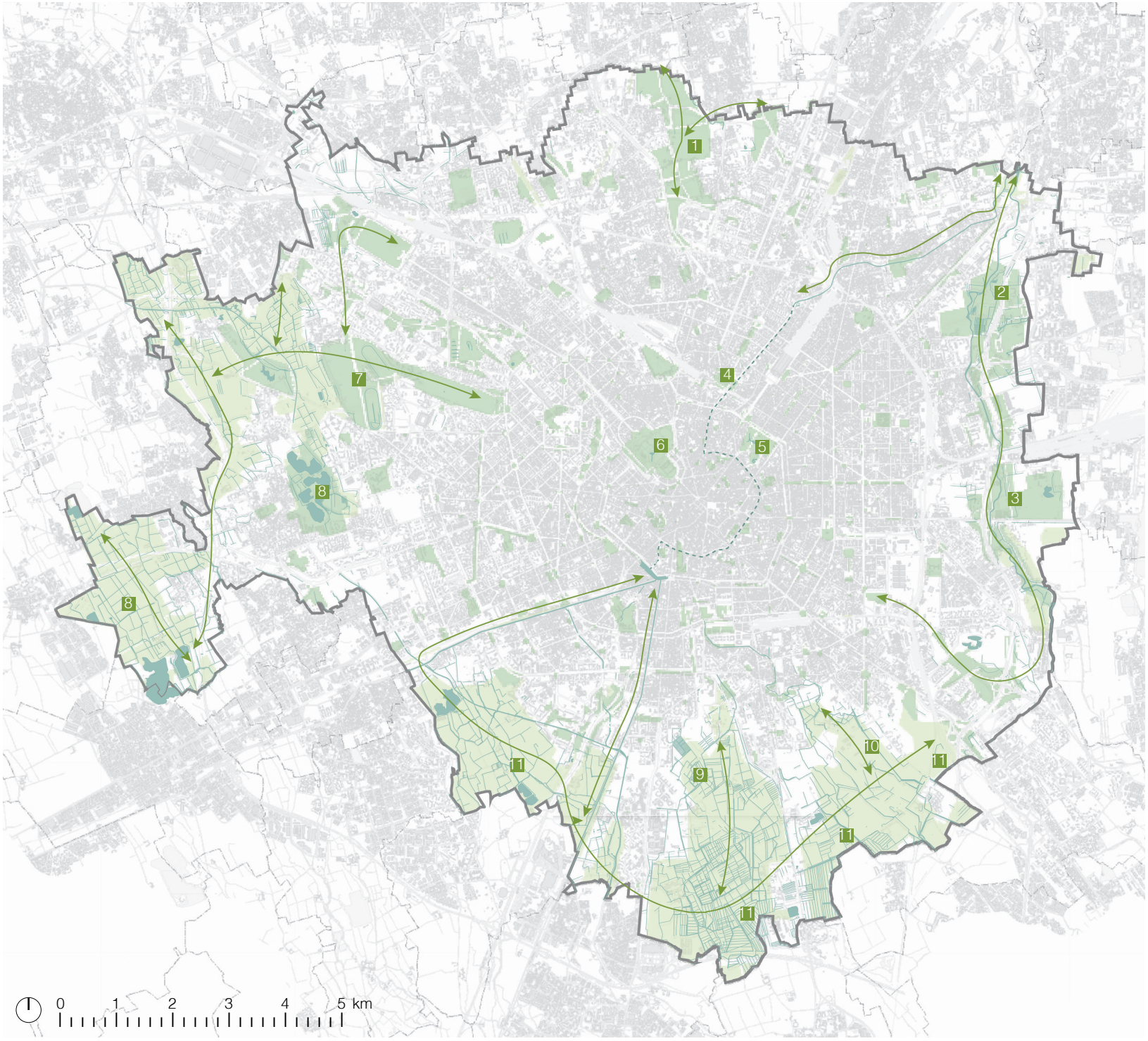
FIG. 3.12.15

FIG. 3.12

Serovision of the landscape trasition through the large scale system:

1. Locarno Harbour (Minusio, 2019).
2. Panperduto dam (Citta di Somma Lombardo, 2021).
3. Villoresi canal (ET Villoresi, 2018).
4. Turbigo sluice (Mapio, 2020).
5. Historical residential area in Bernate (Gite in Lombardia, 2021).
6. Harbour located in the Darsena of Milan (Navigami, 2017).
7. The industrial landscape in Certosa di Pavia (Silvia Adorno, 2011) .
8. Porta Garibaldi double sluice in Pavia (Navigli Reloading, 2017).
9. The outlet of the Ticino River, which turns into a tributary of the Po River (Dipartimento del Territorio, 2023).
10. Po River in proximity of Piacenza (Szeder László, 2007).
11. The skyline of Cremona visible during the navigation (Wikipedia, 2010).
12. A docking place close to Ferrara (Visit Ferrara, 2023).
13. Venetian lagoon (Viaggi per famiglie, 2023).
14. Canals in Chioggia (Houseboat, 2020)
15. The final stop in Venice (Author, 2015).

FIG. 3.13



Built environment
Accessible green areas
Non-accessible green areas
Ecological corridors
Waterway
Culverted Naviglio
Municipality of Milan

1 Parco Nord
2 Parco Lambro
3 Parco Forlanini
4 Biblioteca degli Alberi
5 Giardini di Indro Montanelli
6 Parco Sempione
7 Bosco in Città
8 Parco delle Cave
9 Parco Agricolo del Ticinello
10 Parco della Vettabbia
11 Parco Agricolo Sud Milano

FIG. 3.13
The map of green spaces within the City of Milan shows the discontinuity of the ecological system (Author, 2023).
FIG 3.14
Cementification percentage in the city (Author, 2023).

Green network

The excessive anthropization has caused an ecological impoverishment of natural and para-natural areas by increasing their fragmentation, undermining the continuity of the urban ecological network, and inducing a precarious balance of urban habitats.

Increased fragmentation, caused by increased urbanization and the presence of infrastructure, has disfavoured interchanges between native species and has, at the same time, led to a relentless spread of invasive alien species.

Despite the low value from a naturalistic point of view, para-natural areas can play a crucial role as a link between different natural territories. The areas richest in ecosystem units are in the southern part of the city in the shape of a "green belt." In contrast, the greater industrialization in the north has resulted in a discontinuous and uneven situation, forming a poorly connected "island" structure.

In the historical centre, the para-natural areas are better structured despite the smaller size: private and public gardens provide an efficient connection with the ecosystem units such as the Parco Sempione, Parco delle Basiliche and Parco Solari.

Moreover, Milan witnesses active urbanization, the phenomenon whereby wild animals themselves choose to occupy the "niches" made available in the so-called urban "eco-mosaic" made up of streets, houses and city gardens, ideal places to "colonize" as:

• It is possible to take advantage of the opportunities provided by human food scraps (especially for "opportunistic" species such as rats, doves, turtle doves, sparrows, etc.);
• The city presents ideal habitats for rupicolous animals and towers, steeples and skyscrapers, substitutes for nesting habitats such as steeper rocks;
• Today, especially for many insect species, cities represent more desirable habitats than the countryside because they are less affected by pesticides; conversely, the presence of insects underlies the food chain of hedgehogs, swallows and bats;
• For many species, the city, in terms of predation, is safer than forests and mountains, partly because of the absence of the hunting season.

The phenomenon mainly affects birds that, thanks to flight, manage to adapt and live in an environment that, in fact, turns out to be full of obstacles and barriers.

FIG. 3.14

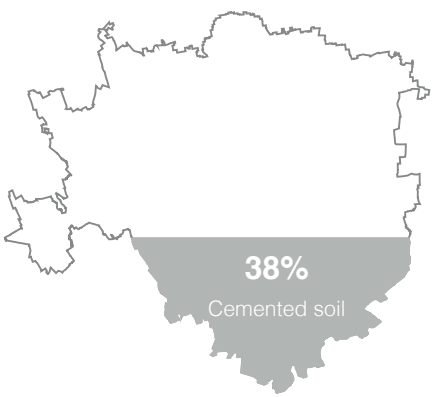


FIG. 3.15

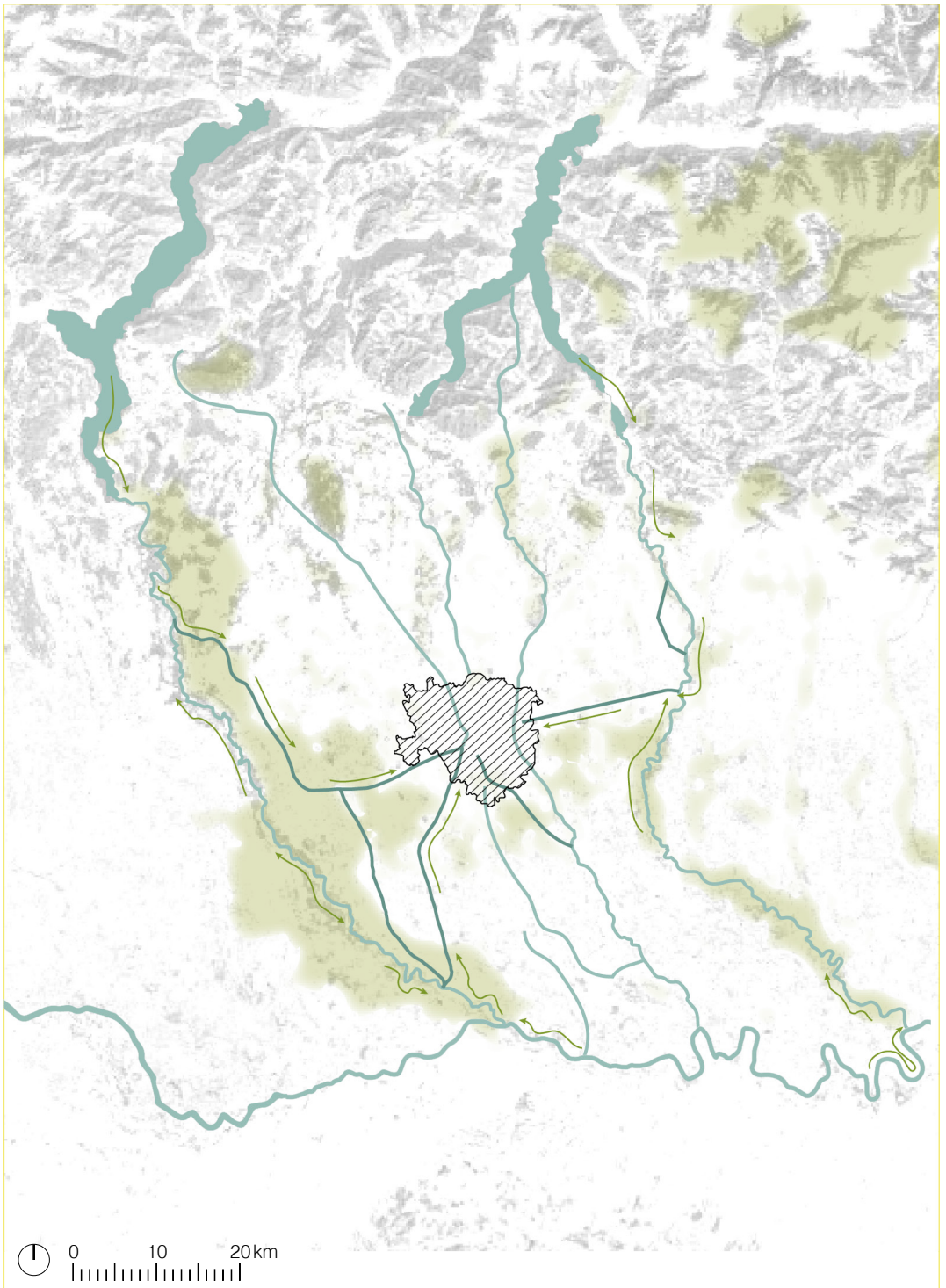


FIG. 3.15

Territorial map of green spaces depicting species migration via water (Author, 2023).

FIG 3.16

Matrix depicting the local flora and fauna (Author, 2023).

LOCAL FLORA

Quercus
robur

Cornus
sanguinea

Alnus
glutinosa

Corylus
avellana

Acer
campestre

Euonymus
europaeus

Salix
alba

Convallaria
majalis

Sambucus
nigra

Scilla
bifolia

Crataegus
monogyna

Anemone
nemorosa

LOCAL FAUNA

Anax
imperator

Rana sync.
esculenta

Bufo
viridis

Erinaceus
europaeus

Myocastor
coypus

Pipistrellus
pipistrellus

Natrix
natrix

Passer
domesticus italiae

Anas
platyrhynchos

Hirundo
rustica

Ardea
cinerea

Streptopelia
decaocto

FIG. 3.16

FIG. 3.17.1

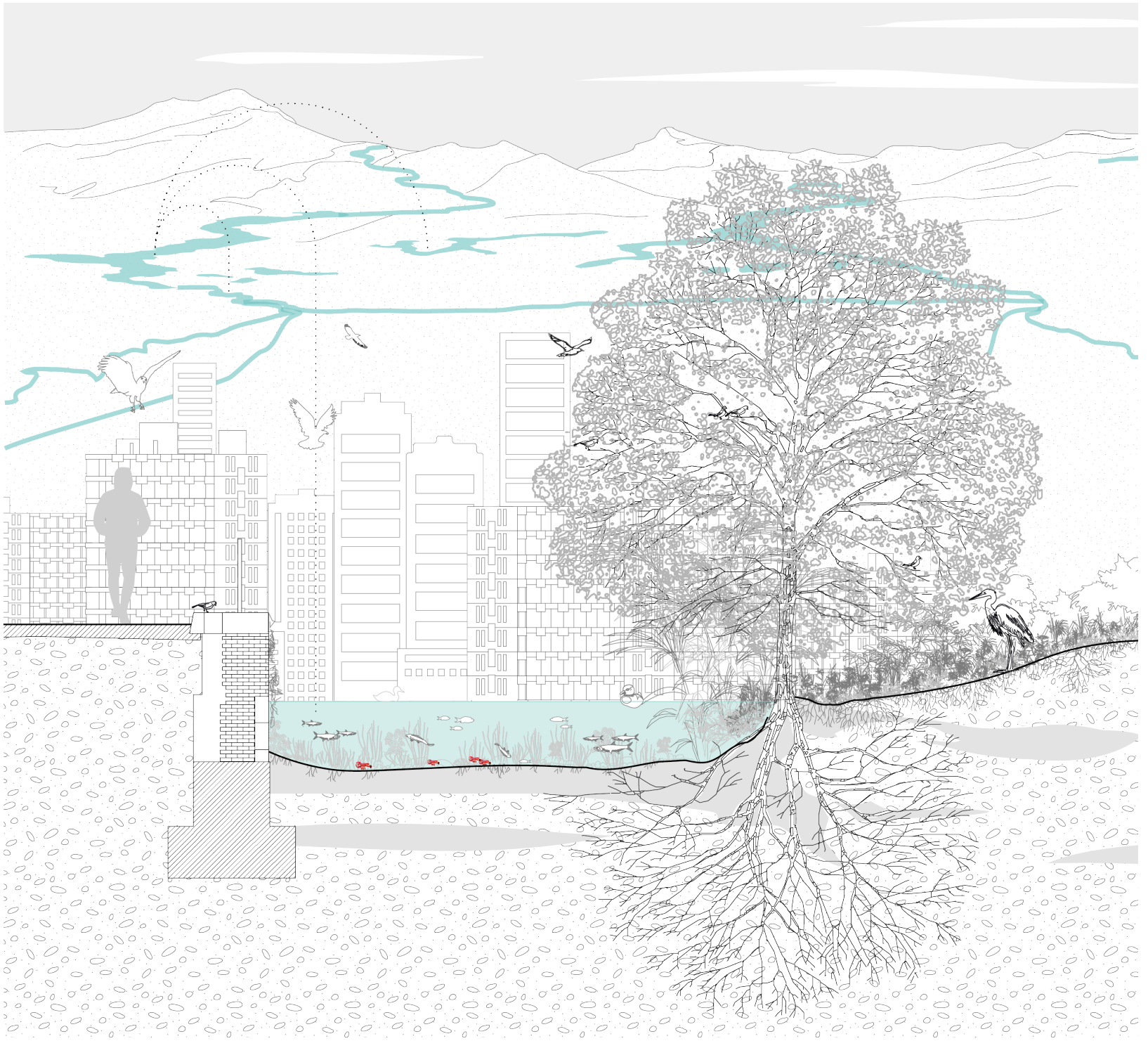
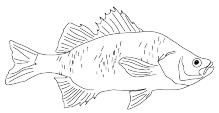


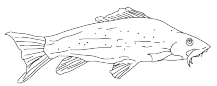
FIG. 3.17.2

Squalius squalus



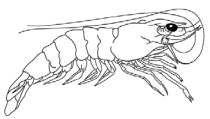
Perca fluviatilis

Tinca tinca



Barbus barbus

Esox lucius



Austropotamobius pallipes

Furthermore, several ecological events already occur spontaneously within the Navigli: large-scale connectivity has led species from rivers and lakes to converge in the parts of canals that are still visible to escape predators. This, together with the improved water quality and the absence of other threats in a poorly naturalized urban context, made the city a “safe port” also in ecological terms.

Since their construction, the canals are made dry to perform cleaning and maintenance of the canal bed and the banks. An operation that occurs twice a year, in the spring and fall, and which does not fail to raise the ire of environmentalists for the slaughter of fish. In addition, amphibious fauna also suffers from the artificial system, whose containing walls hinder migration from humid to wet environments. Nowadays, some independent volunteers or those belonging to associations such as LAC have been carrying out wildlife protection operations since 2005 and prevail from the canals the endangered animals and then introduce them to safer habitats.

FIG. 3.17
Conceptual section of the migration of riverine species to the Navigli via water and catalogue of fish fauna (Author, 2022).

FIG. 3.18
LAC volunteers while rescuing wildlife during the scheduled dry period (ALI, 2013).

FIG. 3.18.1

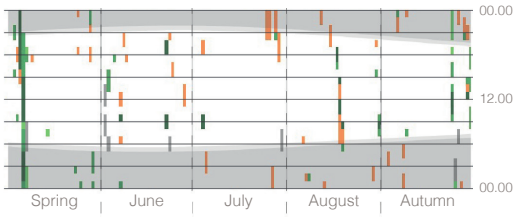
FIG. 3.18.2

FIG. 3.18.3

FIG. 3.19.1

Built environment
Flood
Naviglio
Seveso
Culverted canal
Culverted Seveso
Starting point of the culvert

FIG. 3.19.2



Fog
Drizzle
Light rain
Moderate rain
Heavy rain
Hailstorm
Thunderstorm

FIG. 3.20

FIG. 3.19
Map of the Seveso and the flooding in north Milan; Graph of the increment of unpredictable weather conditions (Author, 2023)

FIG. 3.20
The Seveso River north of Milan gets culverted (Interris, 2020)

ENVIRONMENTAL URGENCIES

Floods

The iper-cementification of the city, which affects one third of the city, has led to various liveability inconveniences such as floods in the northern area with the neighbourhood of Niguarda which is crossed by the river Seveso.

Similarly to the canals, this last has also been culverted and its waters convey into Naviglio della Martesana by flowing in a network that is analogous to a sewage. Because of the non-permeability of the concrete, the system does not support the radical increment of water torrential rain together with the precipitation of the city and pours the water in excess directly on the street.

Due to climate change, these phenomena are set to worsen and to address the ecological sphere because it seems the most genuine and effective way to reclaim the land.

By taking advantage of draining properties of the soil in the northern area of Milan it is possible to experiment with the rain garden typology as it has already been a successful intervention in porta Vittoria. Rain gardens are green retention areas to accommodate temporary accumulations of rainwater. This system tolerates short periods of flooding, as well as drought.

Case study: Porta Vittoria raingardens

The precedent located in Porta Vittoria replaces a lamination reservoir, a large underground tank which stores and then slowly releases stormwater, which a 2017 Lombardy Region law requires in the case of building interventions that reduce the permeability of the area.

The main goal is to slow down the inflow of surface runoff water, allowing it to percolate into the soil without taking up space at depth, as would have happened with cisterns, while shaping a green space rich in biodiversity, which, in the city, is increasingly necessary.

The case study in Milan is also a multifunctional system as it even helps to purify water thanks to the plants' roots, the buffering effect of the soil and the activity of the microflora and microfauna.

The project has required detailed studies about soil, climate, rainfall and local vegetation. In fact the rain garden can also act as a mechanism to recharge the existing aquifer below the city.

In terms of vegetation, the species selected typically grow along rivers and in wet grasslands, which precisely withstand both periods of submergence and drought. Mostly these are herbaceous plants, but as in the case of Milan, shrubs and trees can also be included, depending on the different degrees of moisture along the banks.

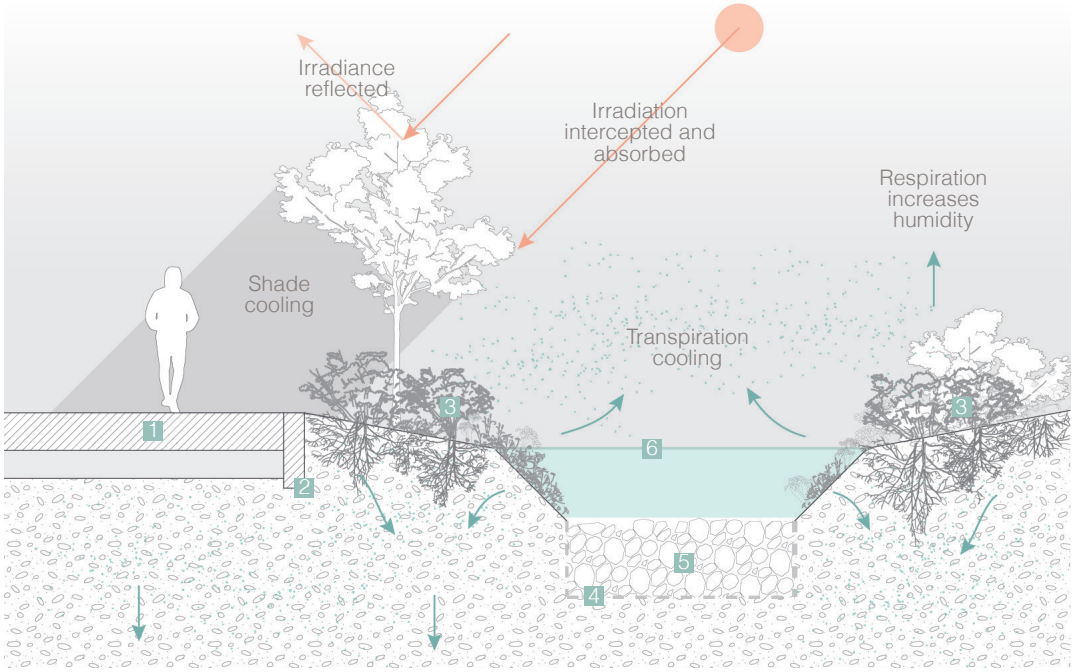
A possible extension not only next to the Seveso but also at the neighbourhood scale can make this experimentation evolve in to a sponge city as it's already happening in Berlin and it will bring a new urban quality in terms of atmosphere and liveability because of its cooling properties.

FIG. 3.21.1

FIG. 3.21.2

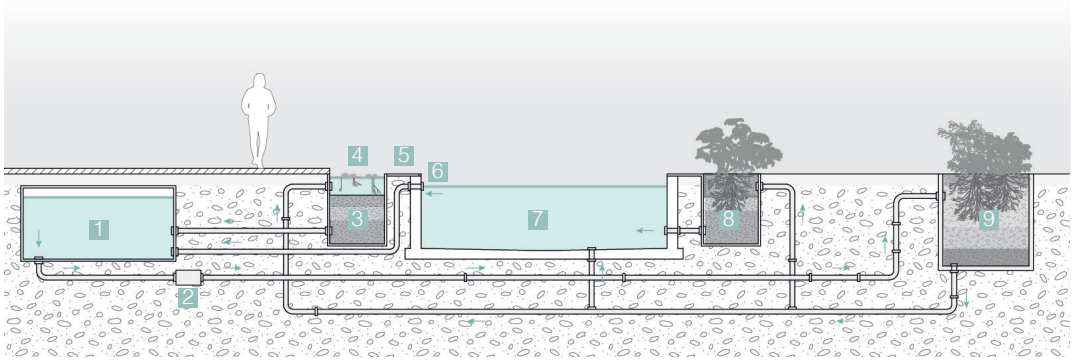
FIG. 3.21.3

FIG. 3.22



1 Walkway covered with drainage pavement
2 Concrete curb to retain the “dune” soil
3 Bank vegetation
4 Geotextile
5 Water-collecting ditch with pebbles and gravel.
6 Flood level

FIG. 3.23



1 Tank of compensation
2 Booster pump and UV lamps
3 Draining gravel
4 Tank of regeneration with water lilies
5 Plank
6 Skimmer
7 Swimming pool
8 Pool of regeneration with marsh plants
9 Biofilter with gravel and plants marsh

FIG. 3.24

Topography
Lake
Catchment area
Seveso's catchment area

Water quality
Excellent
Adequate
Sufficient
Scarce
Bad

Water pollution

It is also a fact that the river Seveso has been the theatre of one of the most significant Italian environmental catastrophes in 1976 as massive quantities of dioxide conveyed in its bed. The area of the disaster has been bonified, but some pollutants still remain in its waters together with the industrial wastewater and further illegal waste.

Case study: Orsolina28

Orsolina28's bio-pool project is a system of phytoremediation that can guarantee the increase of fresh water through a space usable by society for recreation. The two swimming pools, measuring 25m long, 5m wide and with a variable depth from 130 to 220cm, are frequented year-round by dancers, artists and guests staying, for work or rest, at the facility in the Monferrato hills.
The swimming pool consists of a biological system alternative to traditional swimming pools in which water filtration occurs naturally, without the intervention of chemicals such as chlorine, but through the use of aquatic plants that find a home within the system in spaces for filtration. In addition to the aesthetic and natural appearance, the plants maintain a correct pH and help to filter the water, transforming organic substances into usable elements for their growth.
Clean and biologically pure water guarantees bathers feelings of complete naturalness without any risk of allergies caused by chemicals. The design and use of construction materials of a predominantly ecological nature make bio-pools spaces in harmony with the surrounding environment and wonderful oases of well-being in which to immerse.

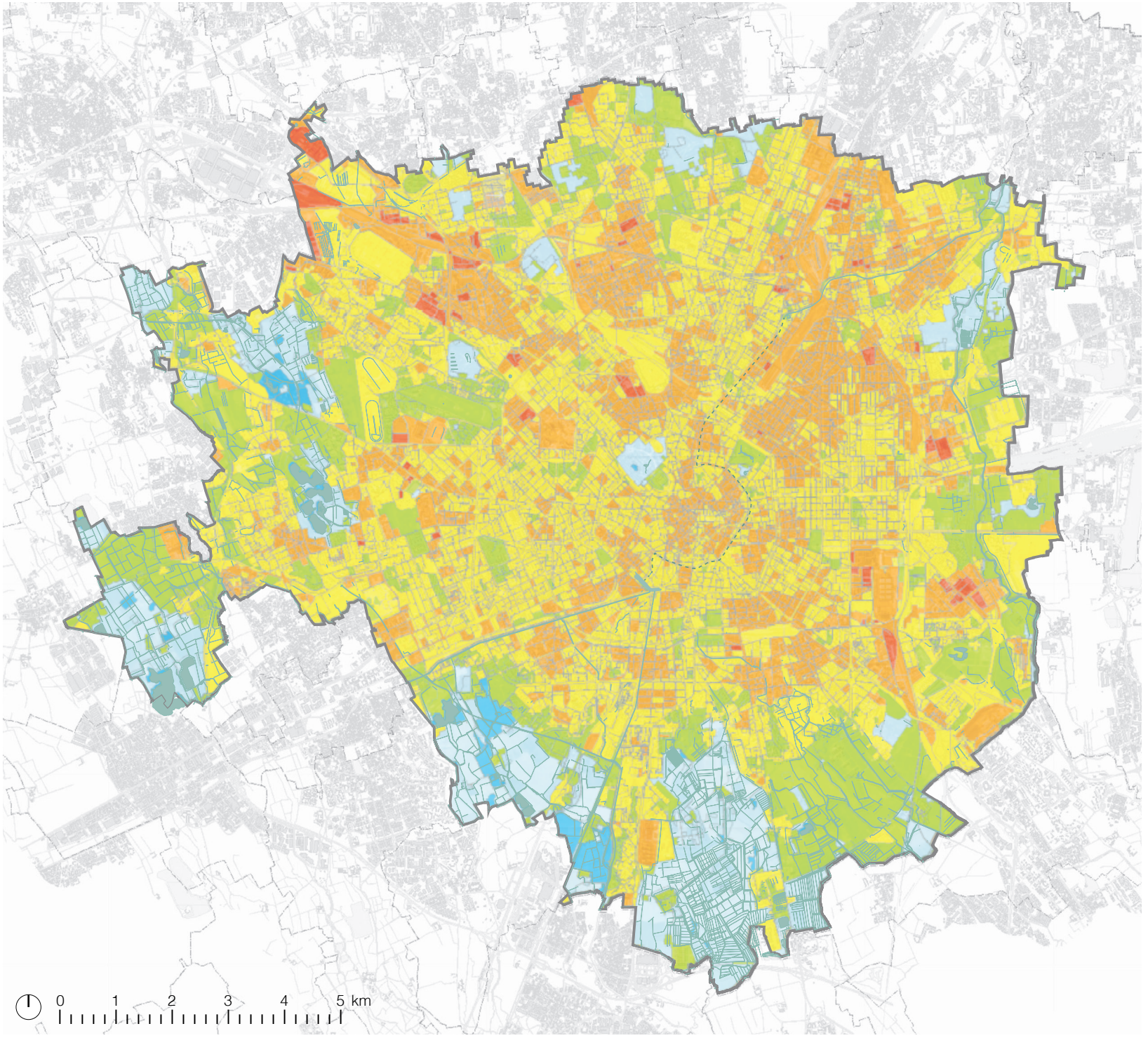
FIG. 3.21
Different solutions to address water within a urban context:
1. Porta Vittoria raingarden (Repubblica, 2023).
2. Dongan Wetland Parkas as an example of design for a sponge city (Asla 2019).
3. Species growing in a bio-pool (Bionova, 2016).

FIG. 3.22
Technical drawing of the raingarden in Porta Vittoria (Author, 2022).

FIG. 3.23
Technical drawing of Orsolina28's bio-pool (Author, 2022).

FIG. 3.24
Map of the Seveso River and water quality (Author, 2023).

FIG. 3.25.1



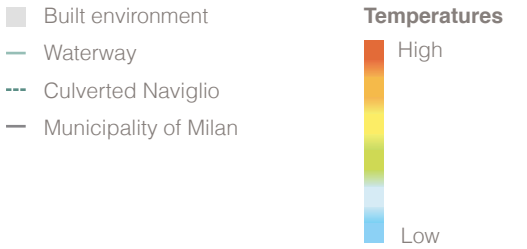


FIG. 3.25.2

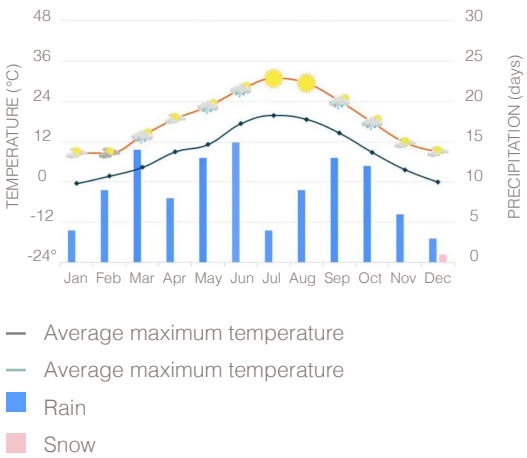


FIG. 3.25

Map depicting daytime surface temperature hotspots and 2015-2023 climate graph (Author, 2023)

FIG. 3.26

Exterme weather condition and climate change urgencies such as floods in Niguarda district (Milano Today, 2022), droughts (Repubblica 2022), and hot temperatures in the city centre (Author, 2023).

Heat islands and water scarcity

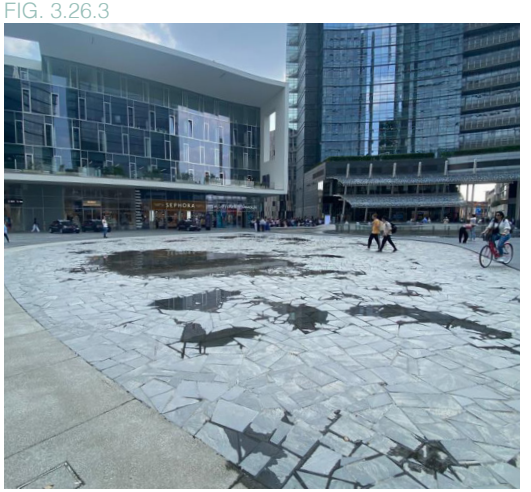
Recently, climate change has made the Po Valley dramatically “thirsty”. The first signs of water scarcity began in the fall of 2021 and continued throughout 2022. From January to October, in particular, less than half the rainfall of 2021 fell. According to data from the meteorological stations of the OMD (Osservatorio Meteo Milano Duomo) foundation, 348 mm of rain fell in Milan during the past 12 months. This average value, between the minimum of 315 mm measured at the Bocconi station and the maximum of 396 in Bovisa, is little more than a third of the rain that falls in a year, a value much lower than the annual rainfall of cities on the southern shores of the Mediterranean such as Athens, Rabat or Tunis, and equaling that of cities on the edges of the Sahara desert, such as Tripoli in Libya.

According to the report “Istat water statistics” about 2018-2020 the percentage of total water loss in the national drinking water distribution network is 42 percent: it means that we disperse about 3.4 billion cubic meters of water yearly. Rainwater harvesting was a widespread solution in southern Italy for several centuries until the late 1900s: rainwater was collected in cisterns and reused for various uses such as irrigation. Nowadays, it is clear that there is a need instead to find alternative sources of water for uses that do not require potable water, and, thus, to return to the use of diffuse storage systems. In this sense, the precedents analyzed above can also integrate the function of water reservoir and, with the introduction of greenery, could reduce water dispensation and mitigate heat islands.

FIG. 3.26.1

FIG. 3.26.2

FIG. 3.26.3



Design

FIG. 4.1.1

FIG. 4.1.2

FIG. 4.2.1

FIG. 4.2.2

FIG. 4.3.1

FIG. 4.3.2

SITE SELECTION

The most suitable site to intervene is the system from the Martesana Canal in Cassina de Pomm to the Vallone Canal. The idea is to reopen this part of the water system in the city by reconnecting it to the Darsena and the existing canals (Naviglio Grande and Naviglio Pavese).

Criteria corroborating this decision are multiple: according to its form, the Navigli system intersects different parts of the urban fabric in a transition of different scenarios and building typologies by interacting with a dense palimpsest. The branched and continuous form of the water system makes it a possible corridor that reconnects the ecosystem. Reclaiming the waterway and greening it can be a way to disrupt vehicular mobility and address global warming: the emergent green space can act as a cooling system, insinuating itself between the solids and voids of the urban grid and rejecting the elimination of buildings. Furthermore, by developing from north to south and interacting with different soil types, the canal route can be the designated place to recharge the aquifer and clean the water. From a social perspective, the system is located near the “headquarters” of different social groups that can take care of it by developing a community program.

Although the condition analysis motivates site selection, it is equally important to remember that this part of the traditional water system has been part of Milan’s collective imagination as a water city for centuries. In my opinion, it can still be a viable alternative that respects the site’s character, which revives the sense of community through public spaces appropriate to society.

FIG. 4.1
Via Melchiorre Gioia at the beginning of the XX century (Milano sparita e da ricordare, 2020) and the current situation (Author, 2023).

FIG. 4.2
Via San Marco at the beginning of the XX century (Milano sparita e da ricordare, 2020) and the current situation (Author, 2023).

FIG. 4.3
Via Conca del Naviglio at the beginning of the XX century (Milano sparita e da ricordare, 2020) and the current situation (Author, 2023).

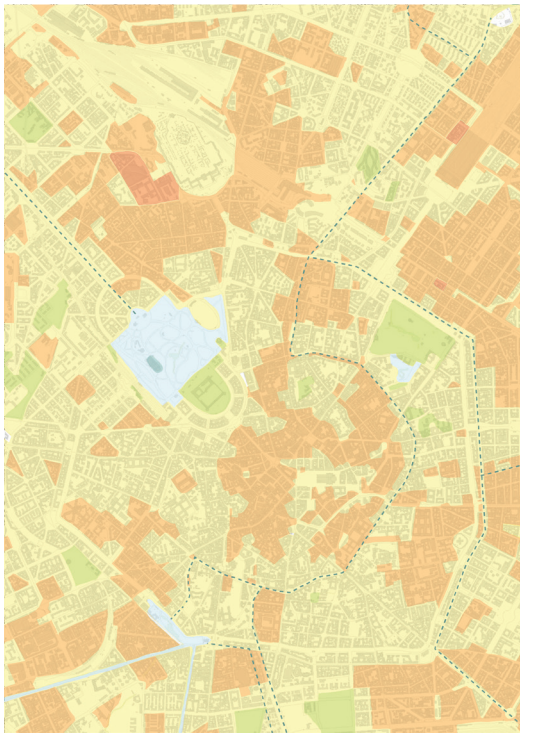
FIG. 4.4

- Infrastructure
- Water basin
- Waterway
- Culverted waterway

- Built environment
- Waterway
- Culverted Naviglio

Ecological network

- Green area
- Forest
- Species migration
- Possible ecological corridor



- Built environment
- Culverted Naviglio

Temperatures

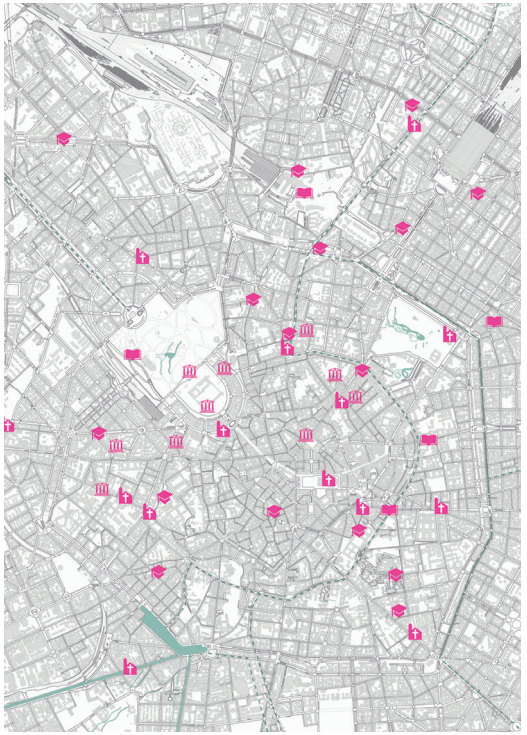
- High
- Low

FIG. 4.4

Matrix of maps depicting the traditional water system, the fragmented ecological network, the temperature, the water-related features, and the social groups in Milan (Author, 2023).

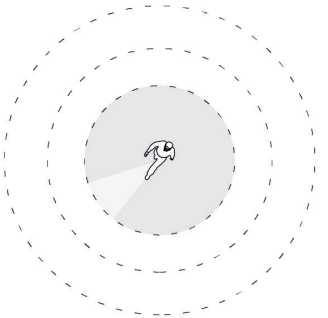
Built environment
Waterway
Culverted Naviglio

Water heritage
Bridge
Sluice
Sciostra
Port
Washhouse

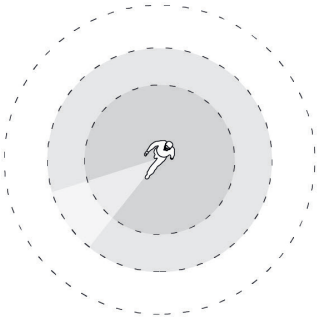


Built environment
Waterway
Culverted Naviglio

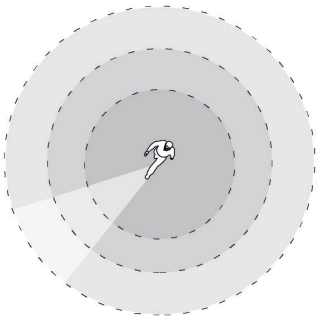
Social groups
School
Church
Library
Museum



Schools
1 Km



Religious groups
Libraries, Museums
Neighbourhood scale



Ecological companies
Urban scale

FIG. 4.5.1

FIG. 4.5.2

Città metropolitana di Milano
Comune di Milano
Regione Lombardia
Parco Nord Milano
Parco Agricolo Sud Milano
ERSAF Ente regionale per i servizi all'agricoltura e alle foreste
Fondazione di Comunità Milano Città, Sud Ovest, Sud Est, Martesana
Fondazione Comunitaria Nord Milano Onlus
FCTO Fondazione Comunitaria Ticino Olona
Politecnico Milano 1863
Università degli Studi di Milano
Università degli Studi di Milano Bicocca
Fondazione Falck
Sistemi Urbani Gruppo Ferrovie dello Stato Italiane

- Built environment
- Green areas
- Daylighted Naviglio
- Culverted Naviglio
- Culverted system with polluted water
- Bridge
- Port
- Water supply
- Reconnection with the urban tissue

DESIGN CONCEPT & MASTERPLAN

The indispensable foundaments for my design are:

• Reshaping the Navigli through the bank greening and other water forms to solve climate change urgencies.

• Declining water into different experiences, from navigation to tangible experiences.

• Designing with care, including the society and other forms of interactions like non-human ones.

• Adapting, reusing and re-earning the waterworks to enhance the site's identity and the landscape.

• Creating a lively landscape by involving nutrition, biodiversity, and activities with adaptable spaces.

• Creating a circular economy and a natural profit on navigation and water-related spaces.

The urban-scale design includes the reopened canals and the linear green space that develops on the docks. Within the city, the water in the canals flows from northeast to southwest. Thinking of reopening all the Navigli in a single intervention would be too bold a choice, especially if the project aims to reinterpret the Navigli as the landscape out of the front door by stimulating the sense of care of the citizens appealingly. To deter the use of cars in the city centre and to structure the reopening of the canals in a bottom-up approach, it is necessary to design in phases.

At first, the Naviglio della Martesana that reconnects to the existing part, the Naviglio San Marco, and the Naviglio Vallone that flows into the Darsena will be recovered. Although the Cerchia Interna is kept culverted the sediments that impeded the flow of water are removed to reconnect the blue network to the Darsena.

By including social groups, the constructon will be realised by the promoters of ecological companies (such as Forestami and 3Bee), already active in Milan and correlated with the bureaucratic system.

Adjacent to the historic port known as Laghetto di San Marco, the traditional commercial function will be restored, also taking advantage of the presence of the local street market; despite the culvert of the ports and their neglection, it is interesting how these spaces are still linked to the buying and selling of goods.

As for water supply, the Seveso can no longer be considered an acceptable source because of its polluted water. Therefore, the river will remain culverted, and it will be diverted to run parallel to the Naviglio and flow into the Redefossi drainage canal. From there, it will flow south to the existing Milano Nosedo sewage treatment plant, where the water will be purified. As the problems brought by global warming intensify, the river could be redesigned and reopened by taking advantage of the Parco Nord to create water rooms where water could be naturally purified and stored. By excluding river Seveso from the existing water supplies, we take advantage of the soil properties by introducing a new source at the intersection of Via Melchiorre Gioia and Via San Marco.

FIG. 4.5

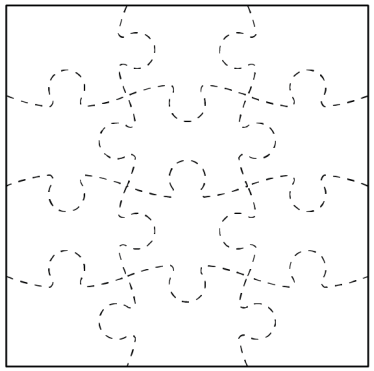
Masterplan of the first phase of the canal daylight in Milan and the actors involved in the construction (Author, 2023).

FIG. 4.6

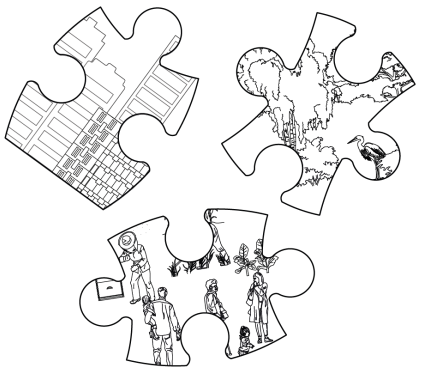
Built environment
Green areas
Daylighted Naviglio
Culverted Naviglio
Culverted system with polluted water
Bridge
Port
Water supply
Reconnection with the urban tissue
Pedestrian system

FIG. 4.6
Masterplan of the final phase of the canal daylight in Milan (Author, 2023).

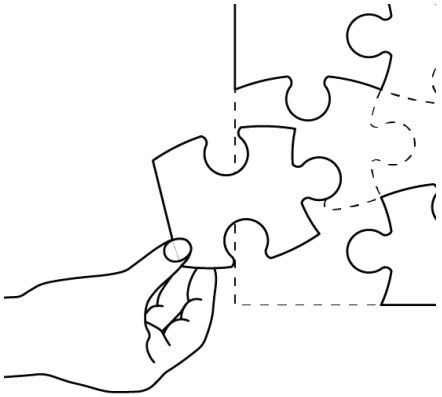
FIG. 4.7



Break the problem down into less complex ones



Focus on the details



Design piece by piece

FIG. 4.8

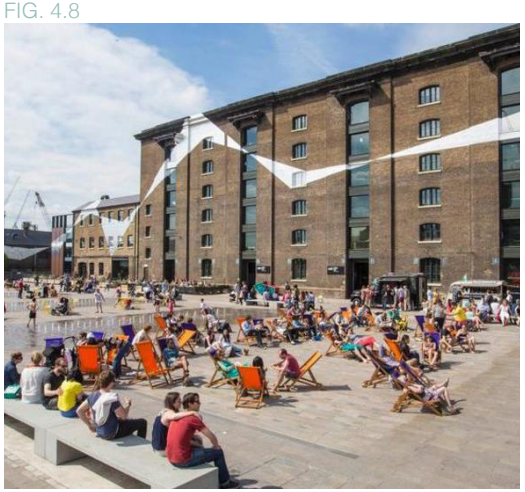


FIG. 4.7
Diagram about the bottom-up approach (Author, 2023).

FIG. 4.8
A bottom up initiative for an oasis in via Pacini, Milan (Fondazione per l'Architettura).

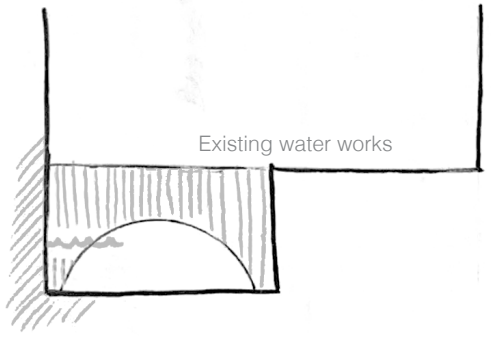
The second phase, on the other hand, envisions the daylighting of the Inner Circle. The water experience in the city centre will be slow and pedestrian-friendly, and it will seek to enhance the historical heritage and interaction with water and the new symbiosis of nature and culture. In this sense, the transitional spaces between the two canals are the most interesting, considering water flow, the built environment, social exchange, and water works.

Designing in phases is crucial to gradually shape the landscape as it analyzes and breaks down the complexity of the traditional water system and focuses on the specifics of the place by starting to design from detail. In addition, through phase planning, the design can be modified during the project by pandering to the proposals of the benefiting community.

In the project, emerging green spaces will take over semi-abandoned sites in transitional places that reflect the problems of public spaces in Milan.

FIG. 4.9.1

FIG. 4.9.2



Buildt environment
shaping the bank

FIG. 4.9.3

WATER AND URBAN FABRIC

Although the water system is continuous, the canals present different forms as they interrelate with the built-up area. For this reason, it is crucial to intervene with different strategies on the urban fabric, such as the mild, the architectonic and the hybrid approach.
Therefore, it is necessary to identify the different parts of the city intersected by the canals and their profoundly different appearance: Via Melchiorre Gioia, for instance, is a wide street that is very similar in conformation to a French boulevard and differs well from San Marco, which is part of the medieval urban fabric. In this area, the streets are narrow, and buildings lean against the former canal. Finally, the structure of the Cerchia interna and the Vallone Canal is configured as medium width, with 2/3 driveway lanes, a bicycle lane in both directions and street-side sidewalks.

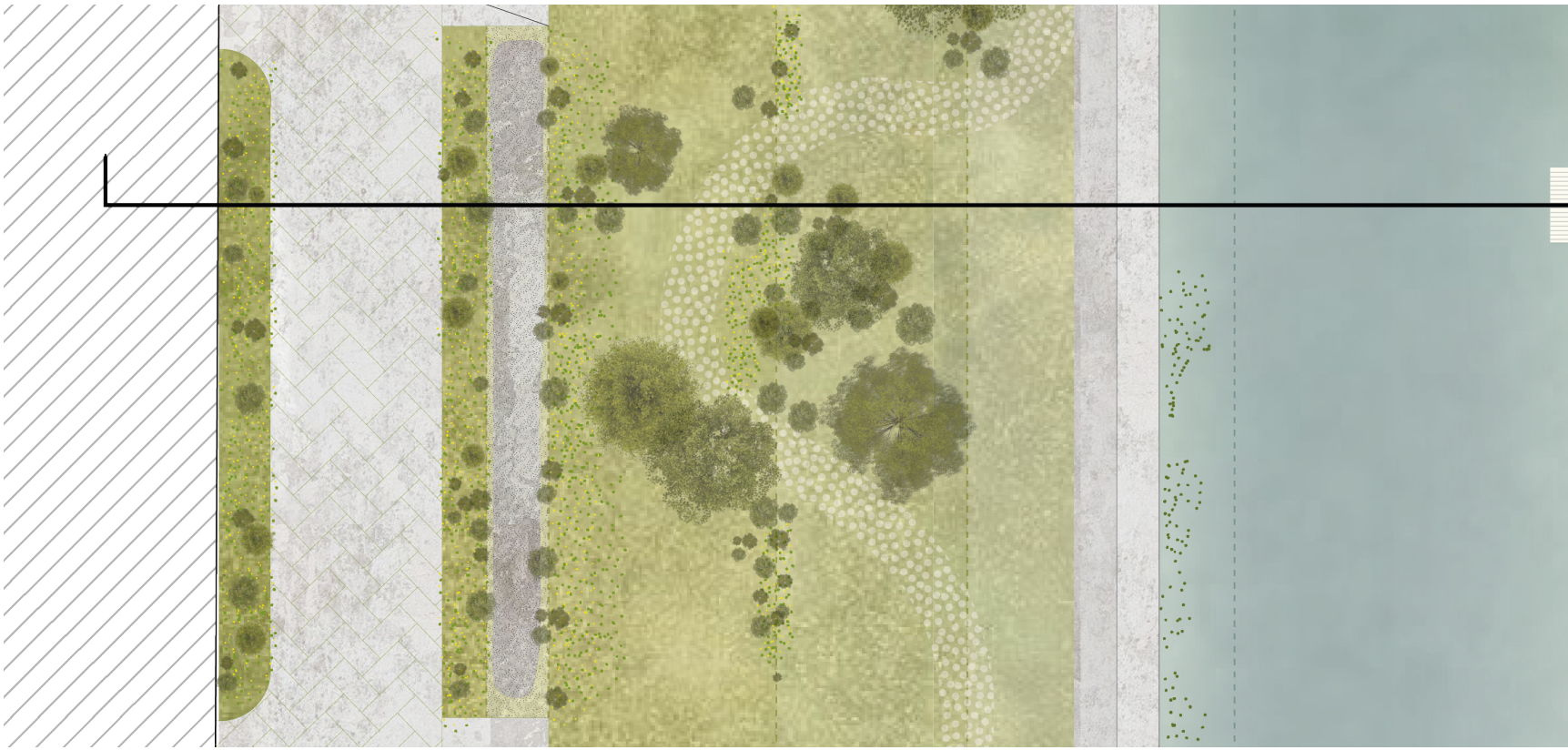
The **mild approach** consists of the naturalization of the bank with gentler banks and permeable beds. The vegetation of different heights and the trees define the shady paths along the canals. The difference in level of the canal bed provides multiple kinds of experiences with the water.

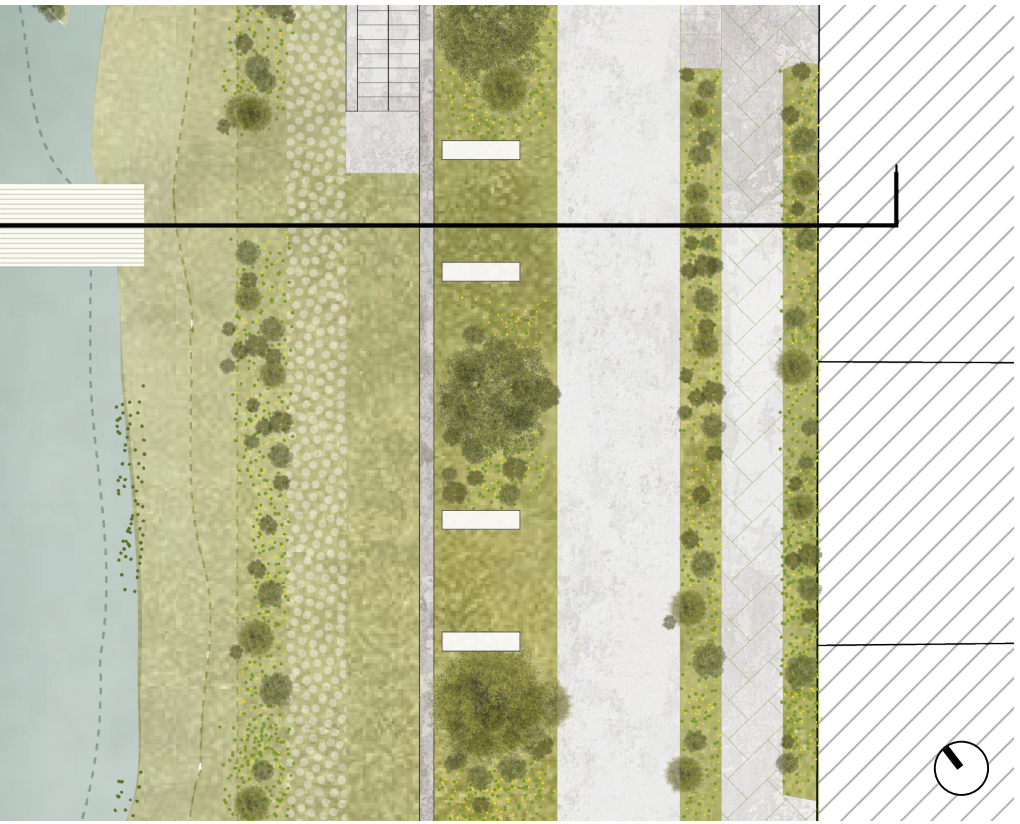
The **architectonic approach** addresses the historical built environment; the built canal banks contain the water and protects the buildings, while the canal bed is impermeable. Presenting a narrow section, the only way to interact with the water is through the walkway system slightly above the water table and inspired by the traditional alzaia (tow path). Not lending itself as a space for planting trees, the vegetation is introduced directly on floating platforms adjacent to the path to make it more mysterious and adventurous and to attract wild species.

The **hybrid approach** mixes mild and architectonic approaches by adapting to medium-sized street sections. It presents architectural banks and a permeable bed suitable for recharging the surface aquifer. In proximity to widenings or landmarks, the canal bank becomes more natural and organic. Since it addresses the non-navigable section of the Navigli system, it re-elaborates the water works meaning it engages the citizens.

FIG. 4.9
The different urban tissues that the Navigli system should addressed:
1. Via Melchiorre Gioia
2. Via San Marco
3. Via Conca del Naviglio
Some schematic diagrams summarise the character of each building typology (Author, 2023).

FIG. 4.10





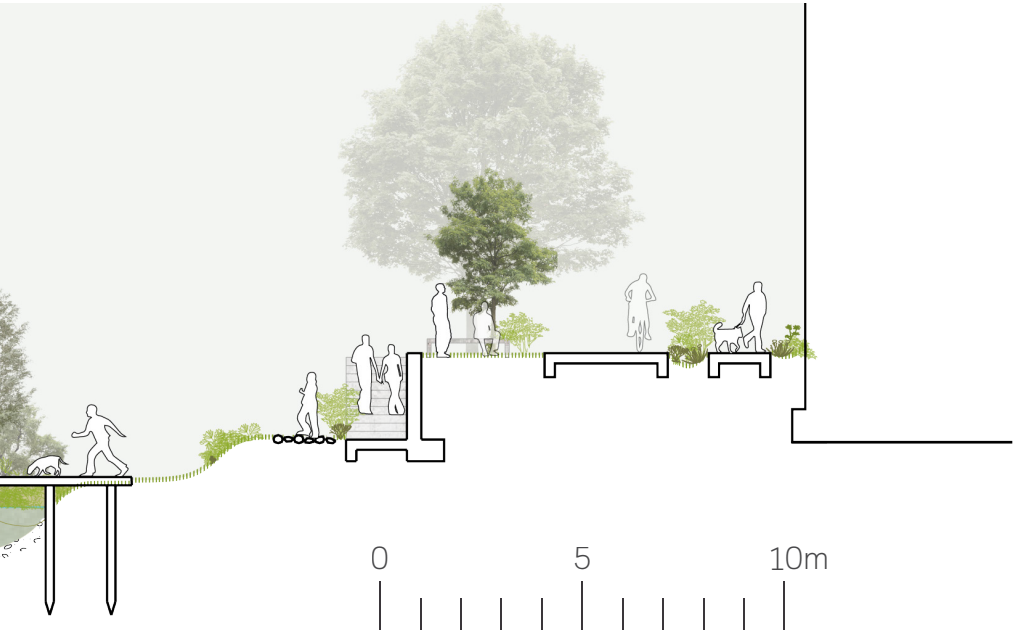


FIG. 4.11

FIG. 4.10

Plan and section of the mild approach in via Melchiorre gioia showing how the naturalisation of the canl bank enhance sociality at the small scale (Author, 2023).

FIG. 4.11

The keymap shows roads that are designed according to the mild approach (Author, 2023).

FIG. 4.12

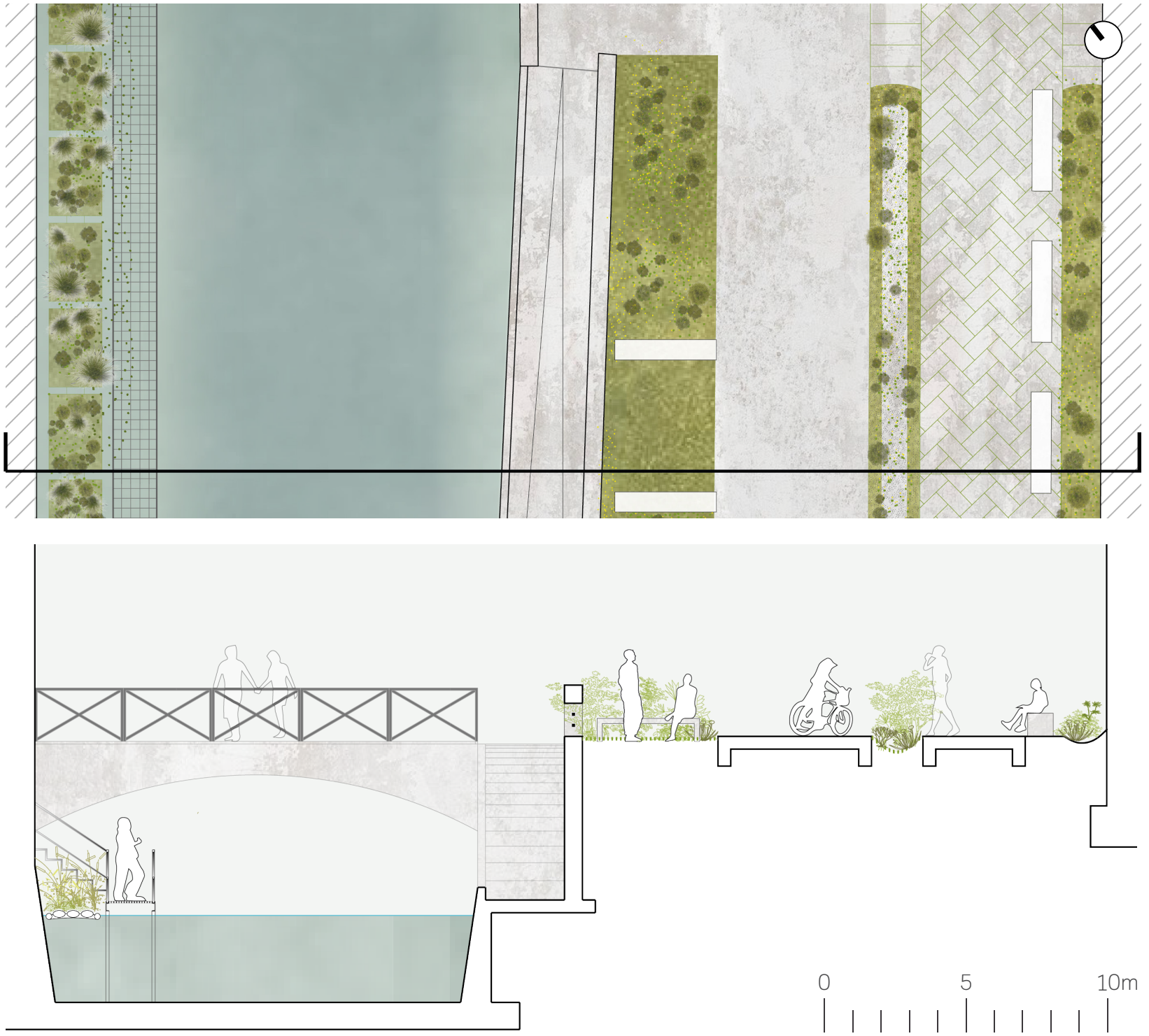


FIG. 4.13

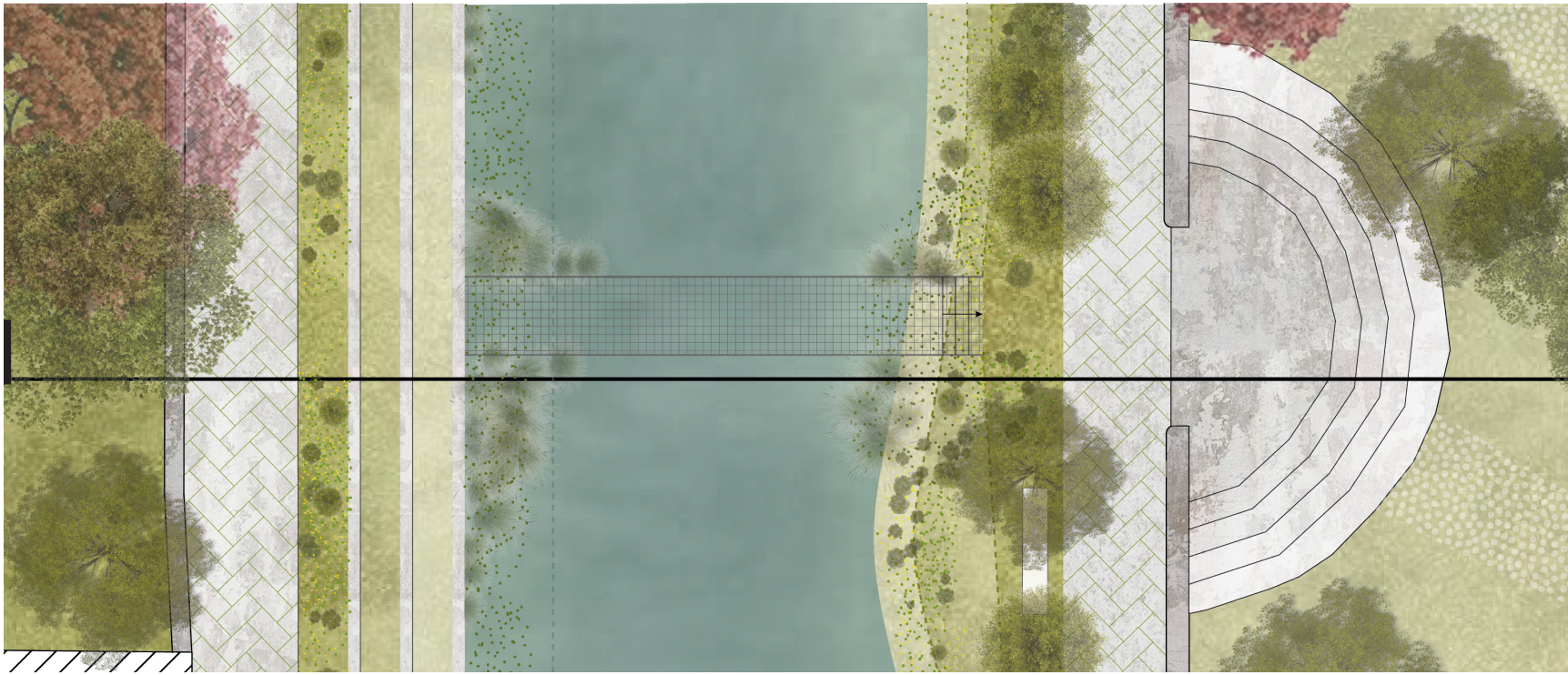
FIG. 4.12

Plan and section of the architectonic approach in via San Marco showing how nature can be incorporated into the built environment to enhance the new vocation of the canals as an ecological and recreational infrastructure (Author, 2023).

FIG. 4.13

The keymap shows roads that are designed according to the architectonic approach (Author, 2023).

FIG. 4.14



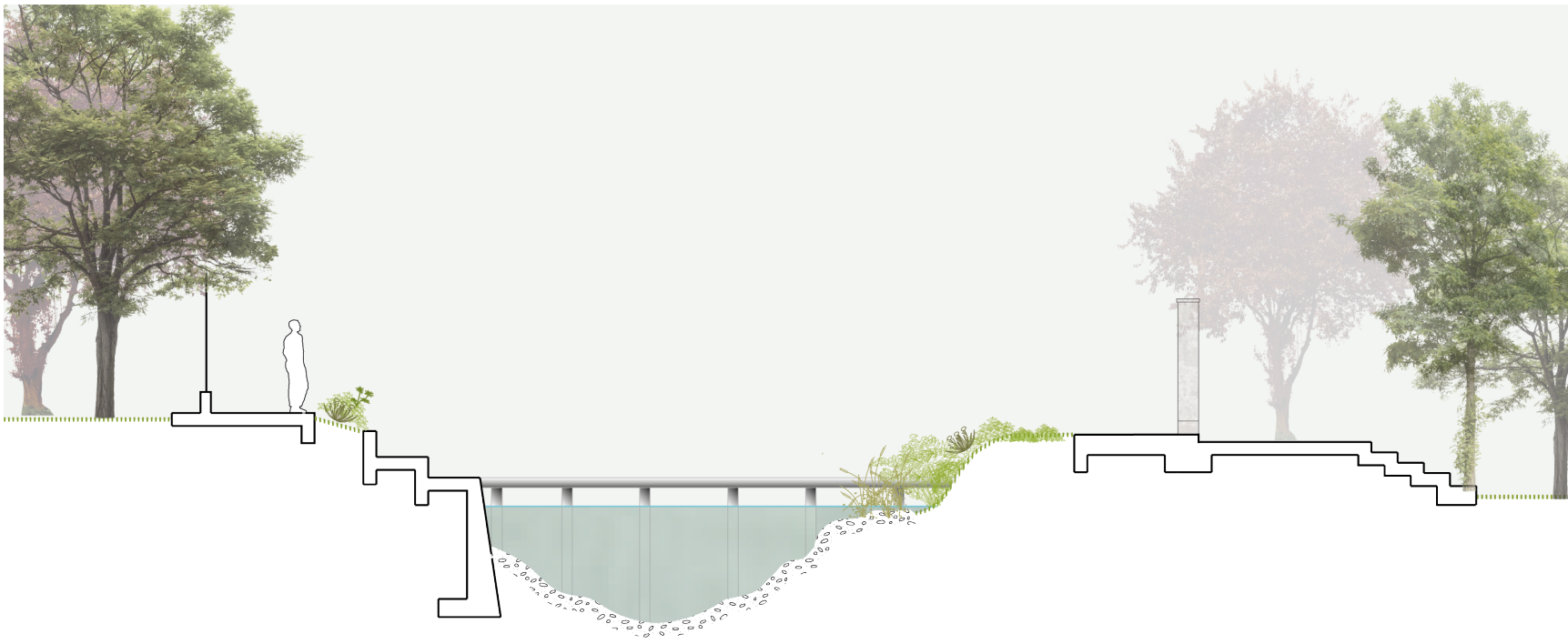


FIG. 4.15

FIG. 4.14

Plan and section of the hybrid approach along the Cerchia Interna showing how the water system address to the existing green areas (Author, 2023).

FIG. 4.15

The keymap shows roads that are designed according to the hybrid approach (Author, 2023).

FIG. 4.16.1

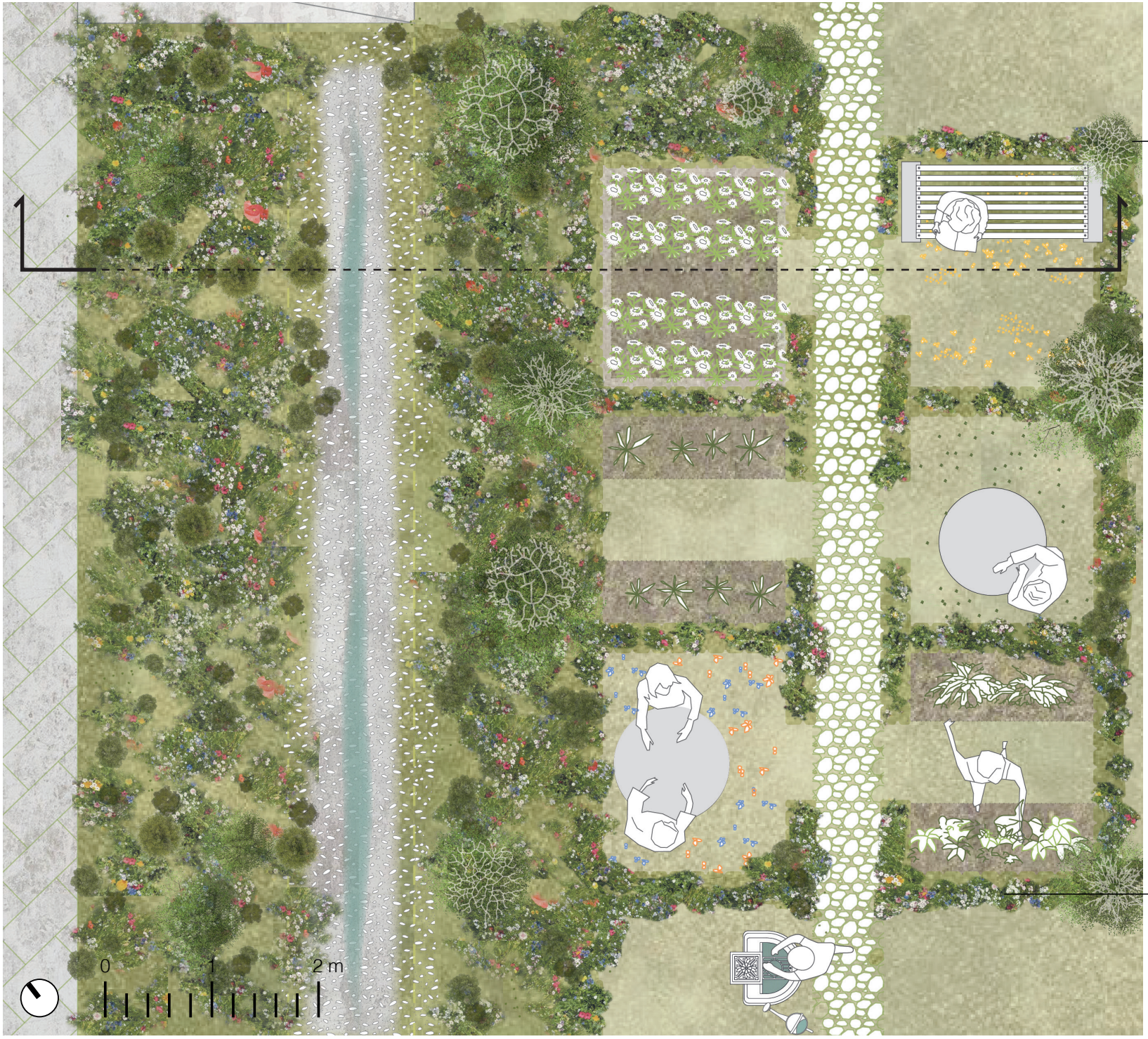


FIG. 4.16.2

Forestami

Papaver rhoeas

Papaver rhoeas

Papaver rhoeas

Rosa Canina L.

The Gardens of care

Once the form of the canals has been developed, it is crucial to ask how to revive the interaction between citizens and the urban landscape. Gardens of care arise as a solution to foster the social component in the landscape. These spaces are typical of the mild approach and are located between the residential and working fabric, particularly at the intersections of the neighbourhoods, for further interaction.

More specifically, these are ad hoc green areas for the community to cultivate or have their own outdoor space. Anyone can join this project and have a fragment of the garden at their disposal. Every piece is delimited by wild species chosen by environmental companies (e.g., 3Bee and Forestami) to encourage biodiversity and pollination and cultivation in urban space.

However, it would be utopian to think that, in an ever-changing city, citizen interest can be constant. It is also true that, as already expressed in the theoretical framework, the sense of care does not only refer to human beings. For this reason, in the event of a lack of care, the grid defined by wild species will close in, encompassing green spaces and tending to become a single forest. Faced with the formation of a forest, a last human attempt could be attempted by the ecological companies using this fragment of forest for their projects by inserting bee hives or experimenting with tree species. Hence, when human interest fails, the sense of care manifests itself in the third landscape by creating a succession of punctual forests along the channel and potential oases for flora and fauna.

In the case of the architectonic and hybrid approaches, gardens of care could be declined to the form of flower beds out of the front door. Evaluations of Forestami advise against introducing trees in confined spaces; therefore, each part of the city is entitled to its form.

FIG. 4.16

1. Plan of a Garden of Care under the influence of humans (Author, 2023).

2. wild flowers, bushes, and young trees introduced to define the limits of each private garden (Author, 2023).

3Bee
a world with bees

Papaver rhoeas

Daucus carota

Malva sylvestris

Medicago sativa

Taraxacum officinale

Matricaria chamomilla

FIG. 4.17.1

Stage 1

FIG. 4.17.2

Stage 2

FIG. 4.17

Sections depicting the natural evolution of the Gardens of Care after the loss of interest by humans (Author, 2023).

FIG. 4.18

The keymap shows the location of the Gardens of care (Author, 2023).

FIG. 4.18

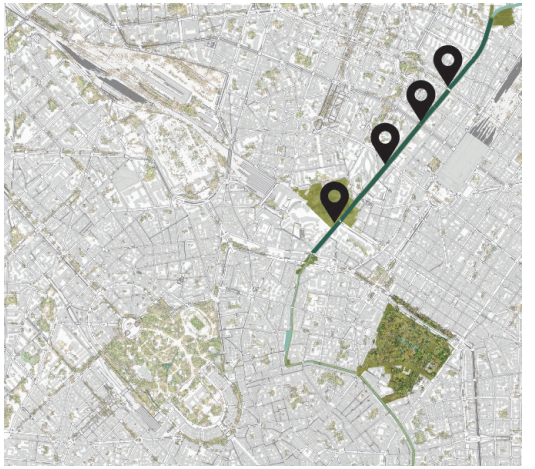
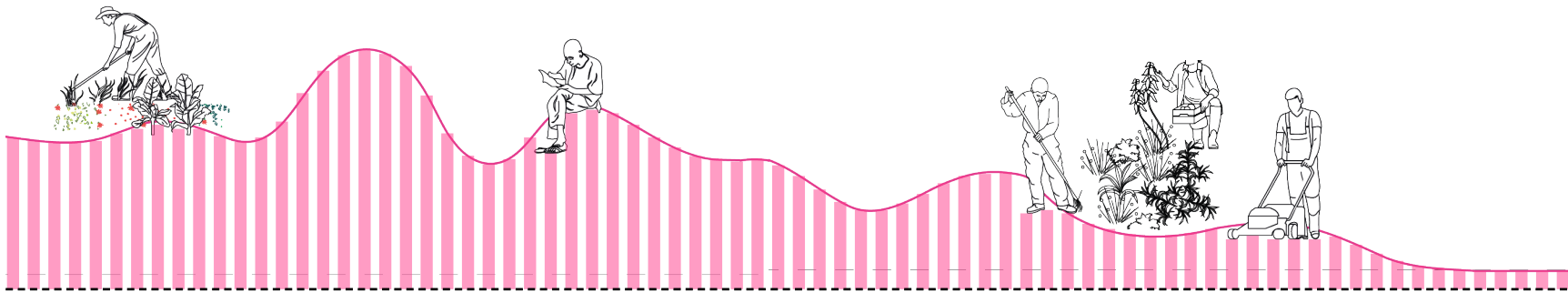
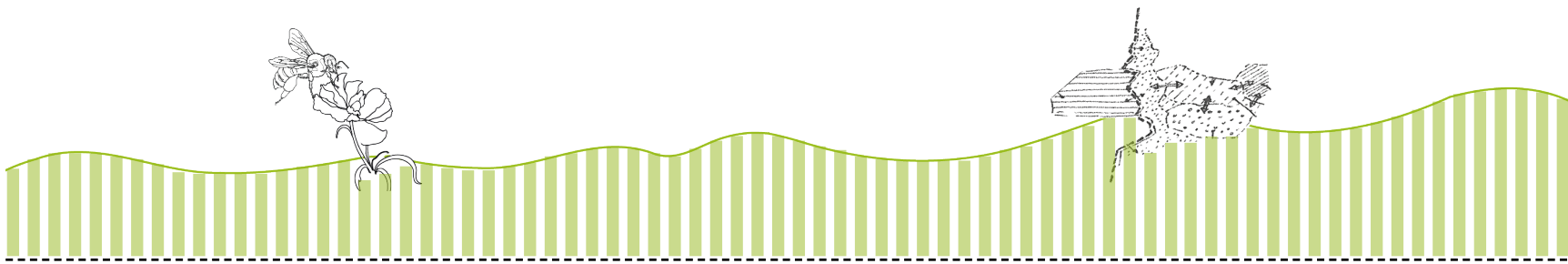


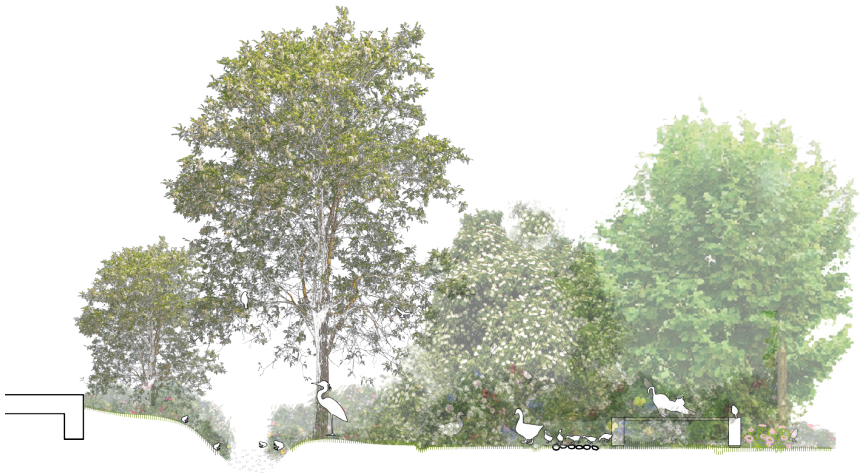
FIG. 4.17.3

Stage 3

FIG. 4.19







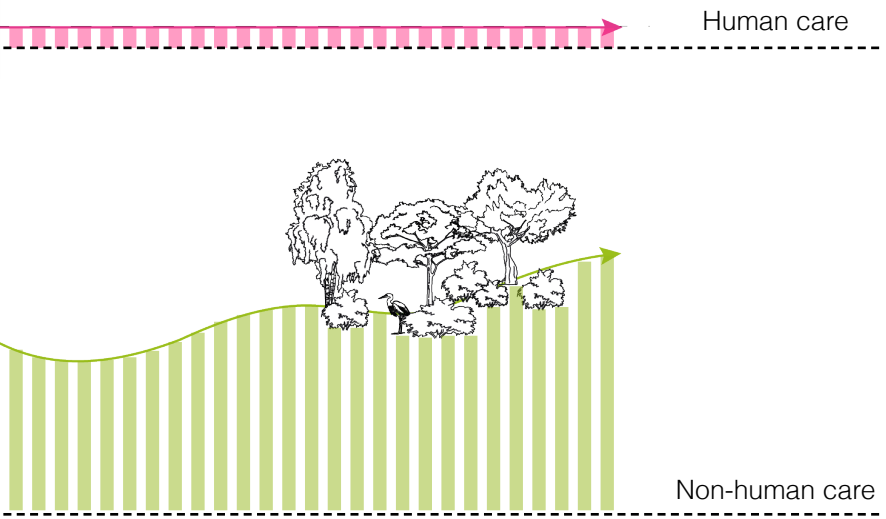
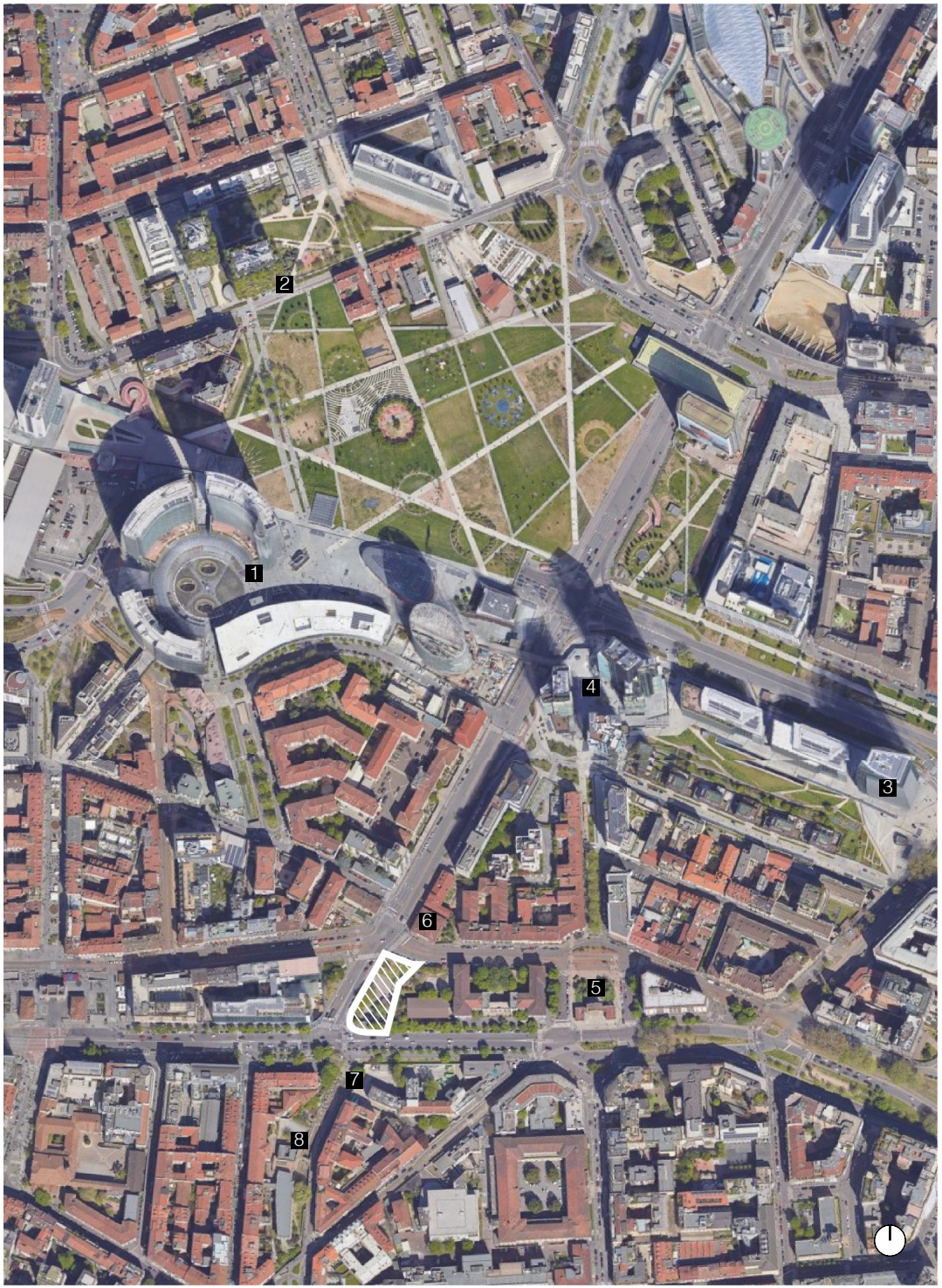


FIG. 4.19

Diagram showing the design with time and the inverse proportion between human and non-human sense of care (Author, 2023).

FIG. 4.20



CONTEMPORARY CITY SKYLINE

Unicredit Tower

Bosco verticale

Diamante Tower

Solaria Tower

HISTORICAL HERITAGE

Porta Nuova

Opera Pia Cucine Economiche

Ponte delle Gabelle Baths

Incoronata sluice

0 20 40 m

SITE 1
CUCINE ECONOMICHE

The design is located in Alfredo Malgeri Park, a neglected green space marginalised by the infrastructures. Based near the Porta Nuova complex, thus a mixed fabric, it has to confront the contemporary city skyline. Nearby we find:

• The Unicredit Tower, the tallest skyscraper in Italy, and Gae Aulenti Square;

• The Solaria Tower, the tallest residential skyscraper in the country;

• The Diamante Tower, with its characteristic square shape;

• The Bosco Verticale, with its hanging gardens.

Thus, it lends itself to be a strategic space for workflows and a transitional space to the historic centre where the Martesa Canal flows into the Naviglio San Marco.

The site also boasts the proximity to the city's historical heritage: in most of the cases, it is related directly to the Naviglio, such as the Gabelle Bridge, and the Conca dell'Incoronata, designed by Leonardo da Vinci, and Porta Nuova. Although past sources suggest that this was a recreational space with water, only the shape of the buildings beyond the Gabelle Bridge hints at the period when the block hosted the public baths.

The historical heritage includes the building known as Opera Pia Cucine Economiche, which was built to provide food to the indigent in the first phase of the development of Milan's capitalist system. When the massive urbanization led to the so-called "worker question", it was one of the first examples of social philanthropy that arose, where social cooperatives, mutual aid societies, and consumer cooperatives collaborated to guarantee new food outlets. It is a social model that might be worth recovering.

FIG. 4.21.1

FIG. 4.21.2

FIG. 4.20

Masterplan showing the design location and the main landmarks, including both the histical heritage and the modern skyscrapers (Author, 2023).

FIG. 4.21

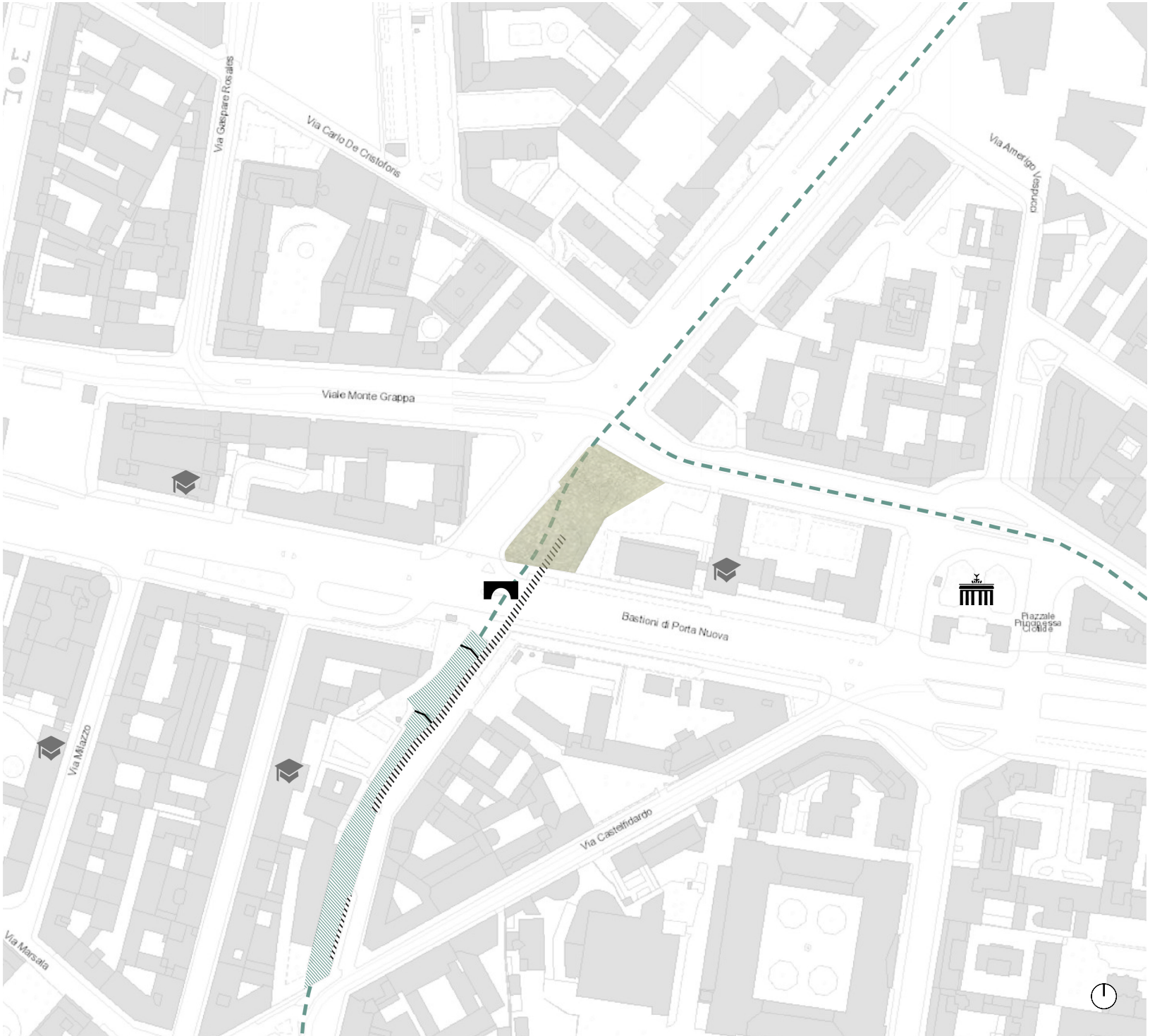
The urban urgencies clealy visible in Alfredo Malgeri Park:

1. The driveways fragment the urban fabric and make the street unsafe.

2. The green area is just used as a transitory space and results neglected and poorly maintained.

/Authour 2023)

FIG. 4.22


Via Gaspare Rosales
Via Carlo De Cristoforis
Via Amerigo Vespucci
Viale Monte Grappa
Bastioni di Porta Nuova
Piazzale Principessa Clotilde
Via Milazzo
Via Castelfidardo
Via Marsala

Built environment
Design location
Remain of the canal bed
Culverted Naviglio
Porta Nuova
Gabelle bridge
Incoronata sluice
Tow path
School

It is equally interesting to note that the site benefits from its proximity to three schools. Although marginalized by the infrastructure (and, from this point of view, unsafe for children's transit), they could be enhanced through a green design that involves them in its program.
Therefore, the project aims to enhance the landscape through an interactive and interconnected water space that can act as further water source instead of Seveso by creating a circular system.

Built environment
Education
Executive
Health
Culture
Residential services
Safety and civil protection
Sport
Social Services
Technology infrastructure for environment
Ongoing project

0 50 100 m

FIG. 4.23

FIG. 4.24

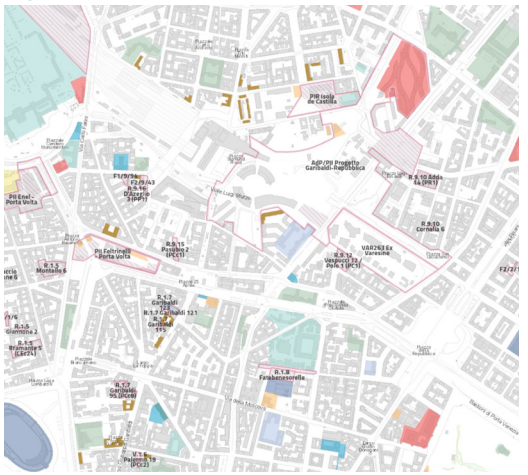


FIG. 4.22
Masterplan representing the social groups and the waterworks that might be an opportunity for landscaper design (Author, 2023).

FIG. 4.23
The social vocation of Opera Pia Cucine Economiche depicted in the painting "Alle cucine economiche" by Attilio Pusterla (Il Mediano, 2020).

FIG. 4.24
Public functions in the design context (Geoportale, 2023)

FIG. 4.25.1

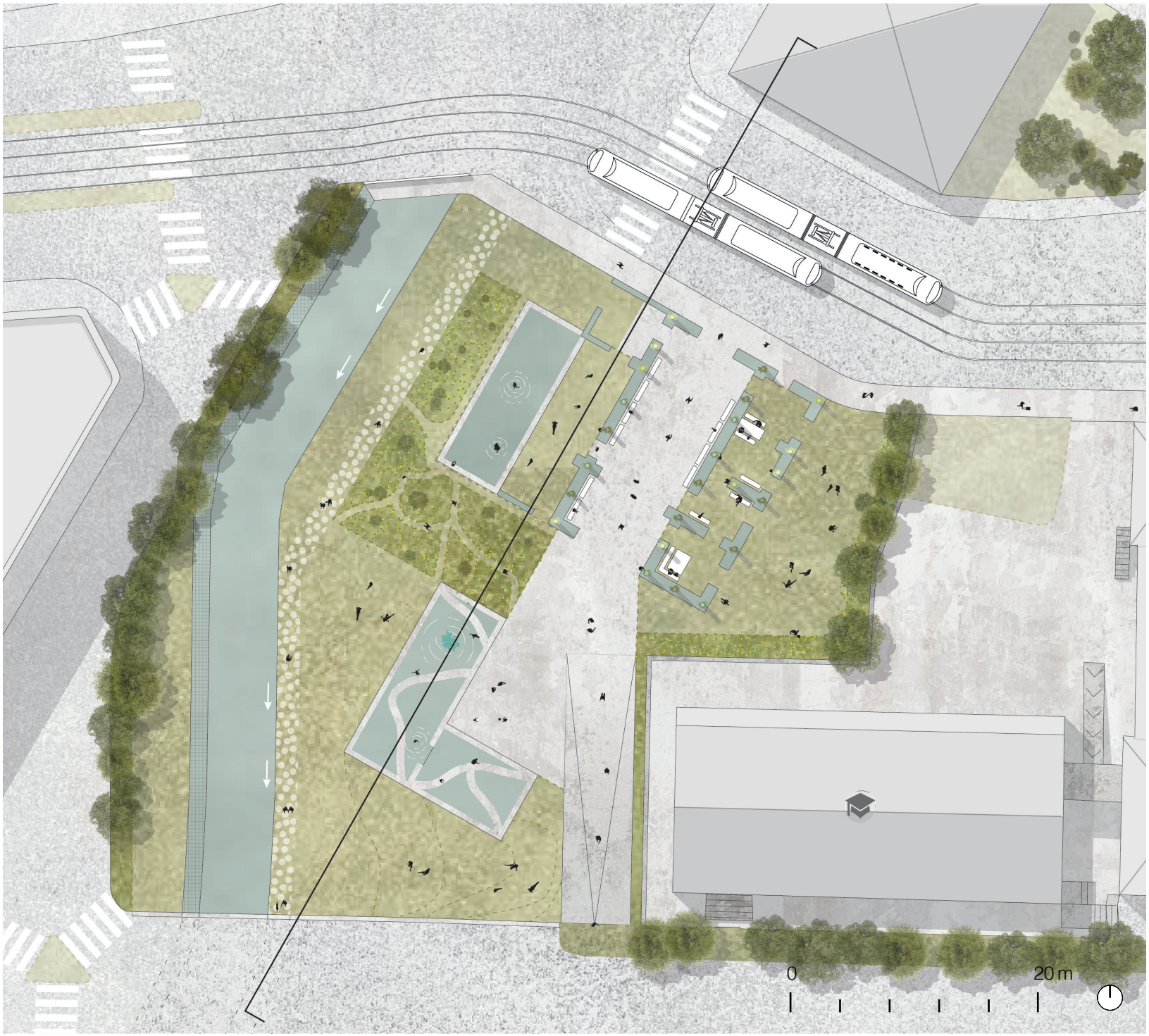


FIG. 4.25

Plan and section of the new vision for Attilio Mlageri Parks, which includes water recration, water circularity, social and spatial reconnection (Author, 2023).

FIG 4.26

Conceptual drawing of the basic form of the park (Author, 2023).

The water spaces in question are the water playground, the vertical farming plaza, and the bio-pool.

The space takes shape from the plan of the Cucine Economiche to create a mirrorlike green plaza to enhance the theme of nutrition through vertical farming, fruit plants, and refreshment areas where to spend leisure time outside the office.

It keeps the orography of the park intact, and it takes advantage of the difference in height between the Gabelle bridge and the park level to create the passage under the bridge to overcome the limitation posed by the infrastructure. Since it is a delicate transitional space because of the navigation sluice, the canal bank follows the architectonic approach.

The park is crossed by a linear route based on the existing accesses. A system of strolling paths is introduced that is more organic and immersed in wild species with flowers and shrubs to stimulate the curiosity of young children. The elevated path, typical of the architectonic approach, connects the park to a middle school providing new safe access to the school away from vehicular traffic, while, to the east, the path connecting the park to the elementary school is maintained.

Wilderness defines the park boundaries and flows and consist of various local flower species and fruit trees to encourage the crops' pollination. The space dedicated to vertical farming respects the seasonality of vegetables, avoiding monocultures: in this way, cultivated plants can also be sustenance for bees and other nectariferous animals. A line of fruit trees provides privacy for the adjacent schoolyard.

FIG. 4.26

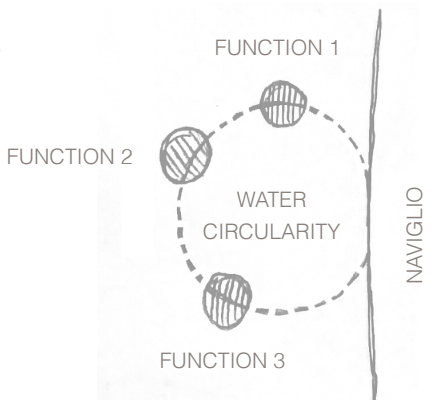


FIG. 4.25.2

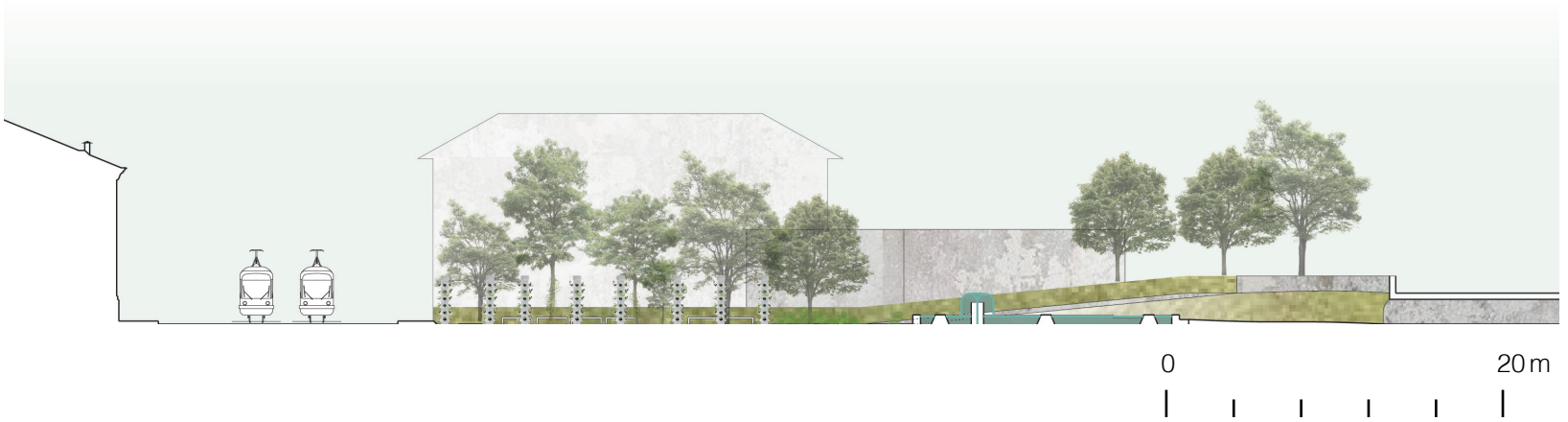
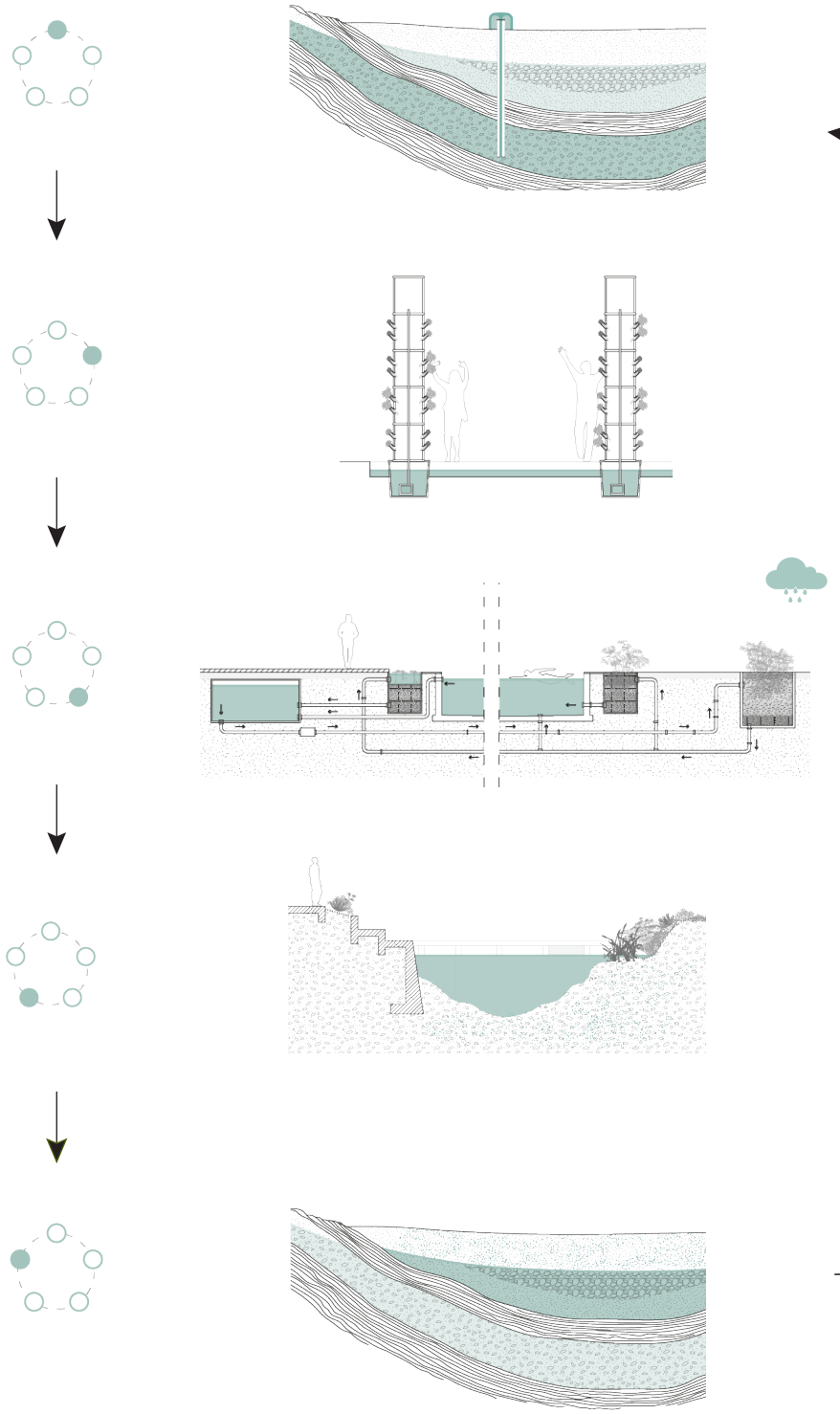


FIG. 4.27

FIG. 4.27
View of the park (Author, 2023).

FIG. 4.28



The water in the park comes from the deepest layers of the subsoil, composed of layers of gravelly strata alternating with clay. Thanks to an artesian well that reaches about 330 meters deep and brings deep mineralized water to the surface, an initial children's area will be alimented. The water is then channelled into the vertical farming plaza and flows into a trench where aquatic plants and gravel purify the water. The flow then enters the bio-pool and finally into the Naviglio. It is a flexible solution, as the good works during warmer periods, while, for the rest of the year, the water space serves as a retention area.

Programmatically, the two schools, now connected to the park, and the community from the close Biblioteca degli Alberi can be the social groups in charge of the management and the harvesting the crops, even though this is an experience open to all. Less formally, the park can become an afterschool gathering place for children, a place of refreshment thanks to the furnished spaces in the plaza that can be used during lunch breaks or after work to be with family.

FIG. 4.28

Diagram showing the circularity of water within the design by taking advantage of the soil properties (Author, 2023).

FIG. 4.29

Darsena of Milan

Arena 21 kindergarten

Chiesa del Buon Pastore

Underground parking lot

Viarenna sluice monument

0 100 200 m

SITE 2
CONCA DI VIARENNA

The design is in the Attilio Rossi Garden, in the final part of the Naviglio Vallone that connects directly to the Darsena. Before becoming a social hub, the Darsena had been abandoned for many years. However, this condition involved only the human sphere, as the site's inactivity made it an oasis of biodiversity. The reuse project implemented in 2010 erased all traces despite the benefits in ecological terms.

At the local scale, the park is in a residential area with tall invasive buildings and features neighbourhood services such as stores, a kindergarten, and an underground parking lot. The latter and the marginalising streets have made the green space infrequently used: it does not dialogue with its surroundings and it is, on the contrary, introverted, fragmented by inaccessible flower beds and fenced-off spaces. It is no accident that it is the target of violence and vandalism.

A picturesque element is the Chiesa del Buon Pastore and the adjoining oratory that respects the heights of traditional buildings. Other noteworthy elements are along the rest of the Naviglio Vallone and enrich the palimpsest. For instance, the monument of the Viarenna sluice (the first navigation lock in Italy) which has been relocated in an enclosed garden that followed the ancient route of the canal. Today it is not accessible. The project aims to enhance the park and existing features by creating a natural water landscape made dynamic by human intervention with the regulation of the sluice. Through the natural landscape, we also want to give importance to the historical heritage by taking the aesthetics of the former nature reserve in Darsena as a model.

FIG. 4.30.1

FIG. 4.30.2

FIG. 4.29

Map of the context (Author, 2023).

FIG. 4.30

The urban urgencies clealy visible in Attilio Rossi Garden:

1. The fences fragment the garden

2. The green area is enclosed by the infrastucture, therefore, subject to vandalism and poorly maintained (Authour 2023)

FIG. 4.31.1

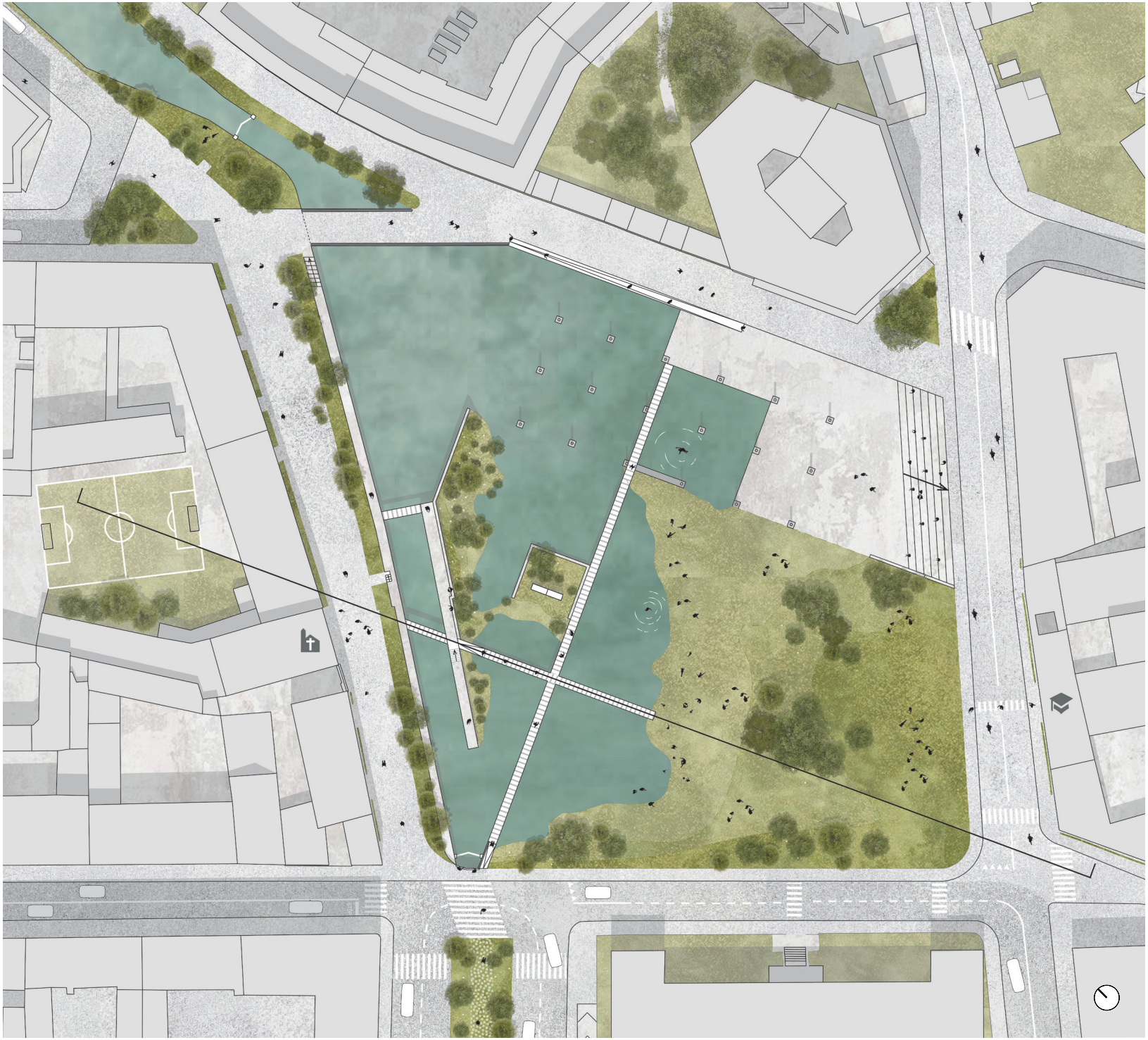


FIG. 4.31

Plan and section of the new vision for Attilio Rossi garden, which enhance ecology through water an human manipulation of the water works (Author, 2023).

Dealing with a space delimited by buildings, one seeks to emphasise the Chiesa del Buon Pastore as a possible reference for the park community, the monument of the sluice in memory of water technology, and the parking lot as part of the palimpsest in a renewed city that rejects car mobility.

While the first section of the Naviglio Vallone is designed according to the hybrid approach, the end section widens near the sluice. It shapes a water basin with a slightly sloping beach, encouraging passersby to approach the water.

Water flows regularly from north to south in the first section of the channel, while adjacent to the sluice, it shapes a body of water with an island that hosts the monument. The sluice regulates water fluctuation and the surrounding nature: it defines either a wet or humid ecosystem. The fact that the Cerchia Interna is not navigable allows greater height jumps between one part of the mechanism to the other: water enegy can be produced through the sluice.

In addition to the green space facing the body of water, a plaza is created by daylighting the underground parking while keeping its supporting structure intact. The regular scanning of the pillars becomes a compositional element for the park's base form.

The eastern retaining wall of the enclosed garden becomes the supporting structure of a wild and inaccessible green space that recalls the past vision of the Dock and houses the monument. Attention is given to a new basin vision that can be nature-friendly and celebratory of the water city.

A more direct pedestrian path surrounds the park and connects it with main points of interest, including the shore, the water path, and the plaza. The water path follows the structural mesh of the parking lot connecting the church, the monument and, finally, the plaza. Its supporting structure makes use of the parking lot pillars. In addition to maintaining the four main accesses, the bridges become the element from which to observe the basins. New accesses are defined adjacent to the kindergarten and church to accentuate their role in the park.

FIG. 4.31.2

FIG. 4.32.1

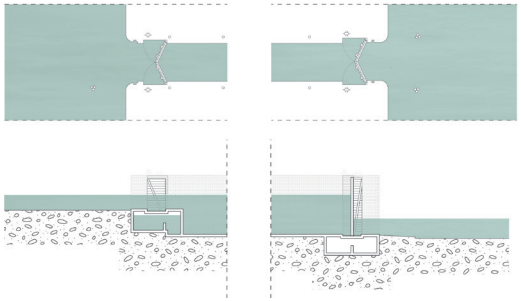


FIG. 4.33.2

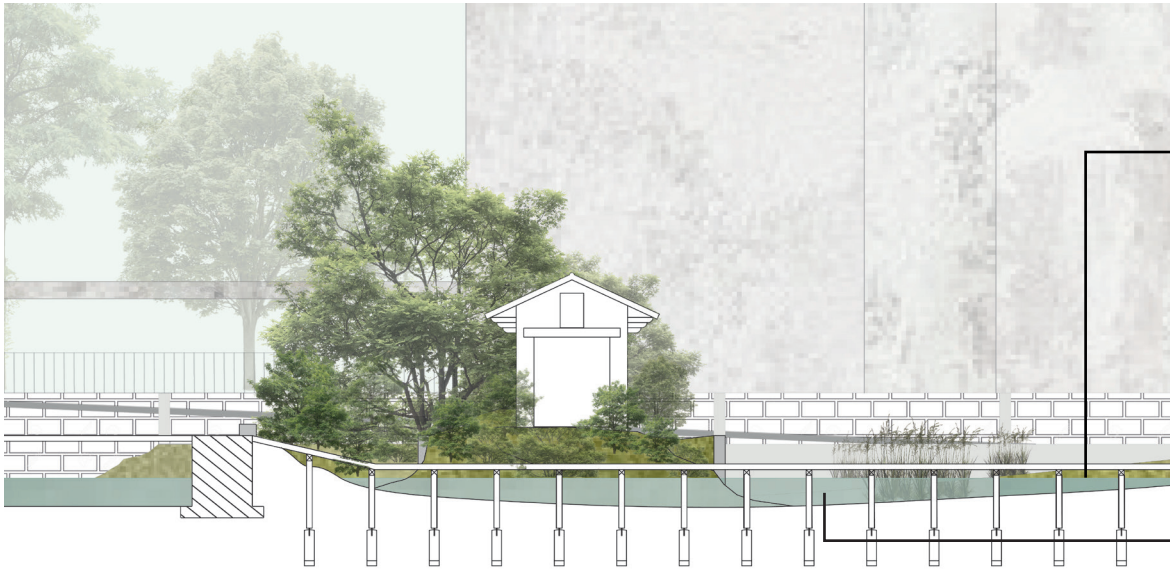
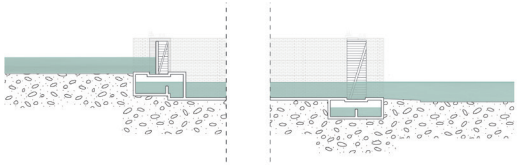
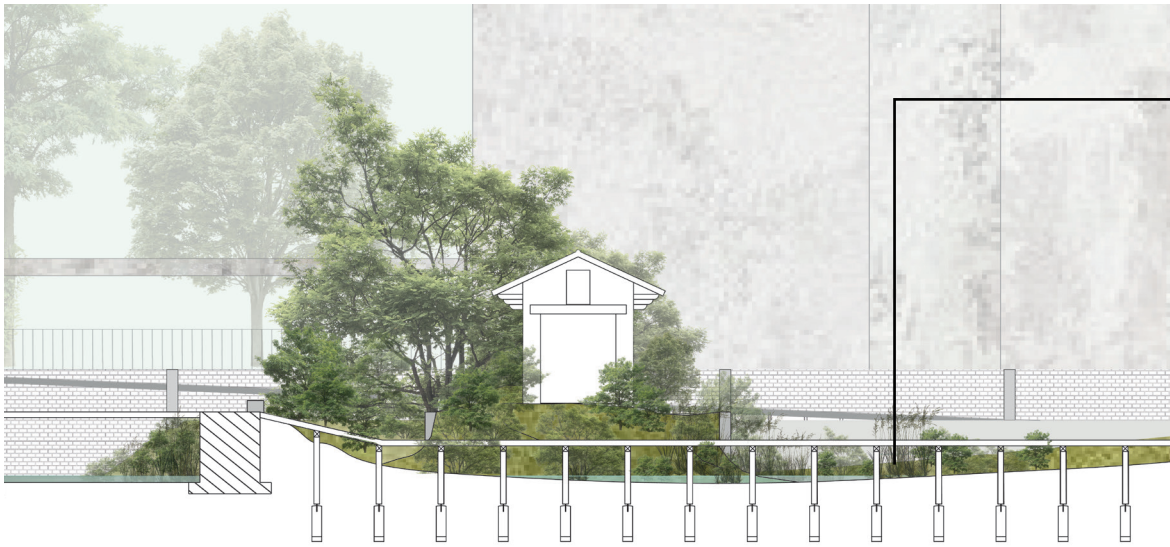
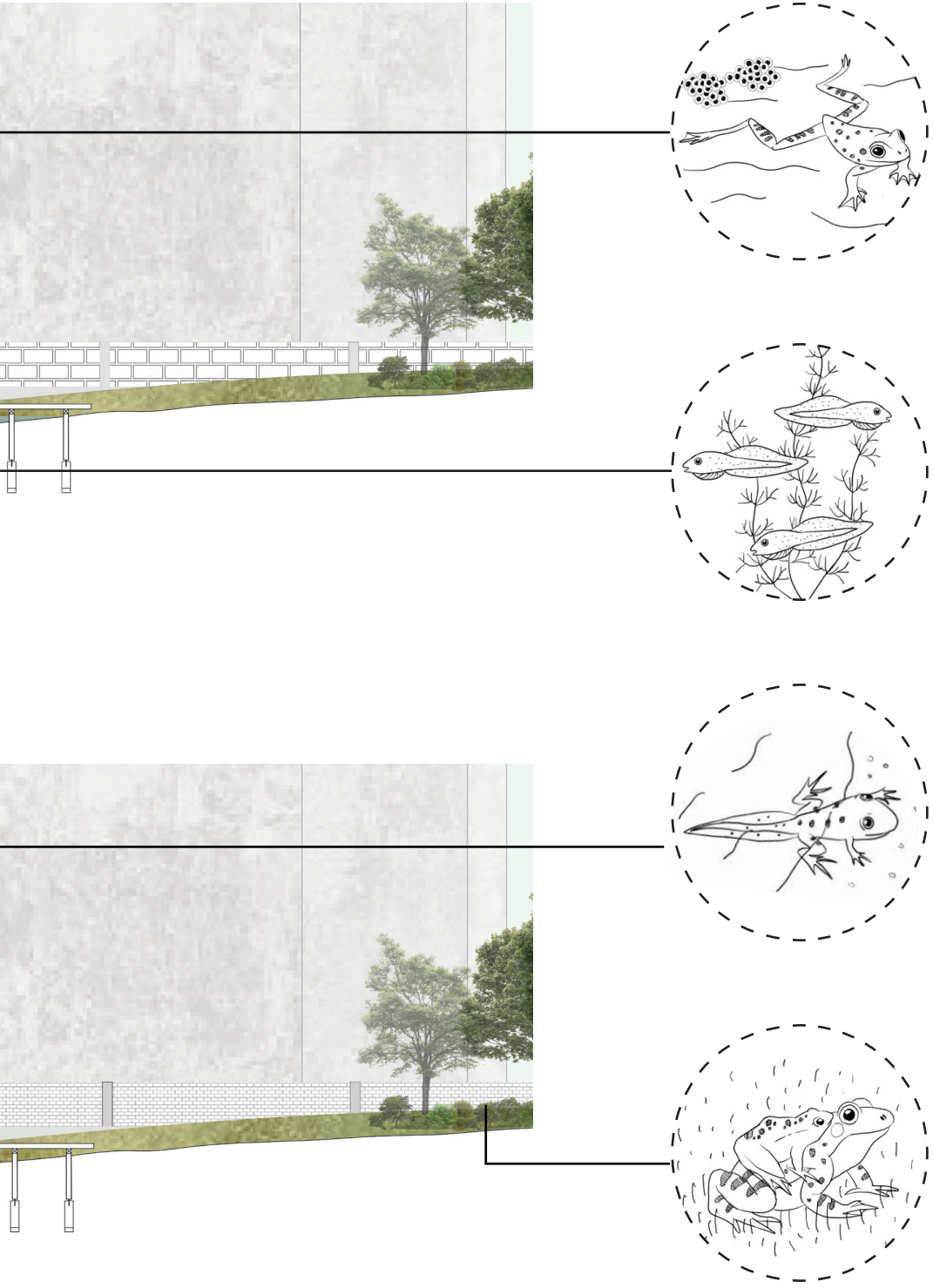


FIG. 4.32.2







To hide the invasive buildings, the park has tree-lined green spaces with uncultivated grassy areas. The untamed areas concentrate on biodiversity and become a shelter for animals. New tree types are introduced and placed to enhance view lines from access points.

The real added value is the rethinking of the sluice: once an element for navigation, now a regulatory element for the basin's water table. It is manoeuvred by the social groups involved. Thus, either a humid or a wet environment with related ecosystems can develop. It is an amphibious landscape, dynamic in its natural evolution, that can derive energy from the water flow, and it is configured as the alternative ecological port to the Darsena. By reviving the tradition, the canals can serve, once again, as infrastructure, in this case, for the exchanges within a species.

It could even be a creative solution to store fresh water in expectation of the hot season. In this context, Arena21 Kindergarten and the community belonging to the Chiesa del Buon Pastore are the two social groups that take care of the park. Open air lectures, ecological fieldtrips, and events will take place in an entirely naturalized context.

FIG. 4.32

Key plan and sections of the slice regulation (Author, 2023).

FIG. 4.33

Sections and sketches depictinf the flora and the fauna colonising the amphibious landscape (Author, 2023).

FIG. 4.34.1

1

FIG. 4.34.2

2

FIG. 4.34.3

3

FIG. 4.34.1

FIG. 4.34.4

4

FIG. 4.34.5

5

FIG. 4.34.6

6

At the neighbourhood scale, the new park vision becomes one of the tiles in the historical mosaic that distinguishes the surroundings. The landmarks are enhanced through a routing system based on the different historical water uses.
Some points of interest are:

- San Lorenzo Columns as symbol of the latent roman culture, as to them is attributed the first water diversion;
- Porta Ticinese Medievale which recalls the past use of water as a defensive line;
- The Arena that celebrates of water as a recreational element in naumachies;
- The sciostra in via Conca del Naviglio as a water work and the core of production and trading;
- The Viarenna sluice which rethinks the navigation feature to enhance the natural environment;
- The Darsena as the main historical port.

FIG. 4.34
The routing system based on water heritage:
1. San Lorenzo Columns
2. Porta Ticinese Medievale
3. The Arena
4. The sciostra
5. The Viarenna Sluice Park
6. The Darsena
(Author, 2023).

FIG. 4.35
Axonometric view of the system (Authour, 2023).

FIG. 4.36

FIG. 4.36
The intersection between the Naviglio Pavese and the Darsena (Author, 2022)

CONCLUSIONS

My graduation design proves to understand how the reuse of the Navigli can enhance inhabitants' sense of community in the public space and be, at the same time, a water link in the north of Italy in terms of ecology and scale continuum.

Although historical analysis has shown how the desire to be around water is inherent in civilization, my research sought to explore this theme from three macro areas.

With a closer look at the needs of modern society, I interviewed Milanese inhabitants by translating their concerns, needs and routines into parts of the design to raise awareness and enhance the potential of Milan as a water city. By establishing a dialogue with children, I've extrapolated activities in which water is a fluid, interactive, playful element, as in the case of the Cucine Economiche. This character has been further accentuated by the reuse of traditional waterworks for water manipulation and interaction in green spaces.

Gathering places are flexible and adaptable to multiple functions. On the other hand, examples like the Gardens of Care show how human disinterest is accepted and exploited to enhance the sense of care in the non-human realm.

The historical analysis of the traditional water system, the redesign and the reading of historical cartography allowed me to perceive the water system in its duality of a commercial system of remarkable technological innovation and a genuine, and pragmatic everyday scenario. In the design, the Darsena becomes the docking point for a slower experience along the Inner Circle to the Laghetto di San Marco, where it interacts with the water more directly. It would be interesting to deepen Milan's port identity, also on the territorial scale, with a route that reconnects Milan to the river system on a large scale as it already does on an urban scale in the case of the San Marco market and the port in the Darsena.

The urban-scale analysis of the fragmented ecological system led me to rethink the canals as a green corridor where we can experiment between natural processes and human manipulation. The urban landscape enjoys a renewed quality through the vegetatation diversification and the naturalization of the canal banks for a more direct dialogue with the water and exploiting soil properties. The design admits wilderness in the city as an oasis for flora and fauna by taking inspiration from models in harmony with nature and humans.

FIG. 4.37

FIG. 4.37

The green area along the Darsena (Urban File, 2019).

REFLECTIONS

Environmental relevance

This design is based on the interrelationship between society and the canals. On the one hand, the Navigli, thanks to the new public spaces, is socially enriched and is configured on an urban scale as a linear park where different experiences with water can be experimented with in stages together with the community.

On the other hand, the waterway enriches urban space by imposing itself as a solution for climate change issues, not only in terms of cooling, water retention and soil drainage but also in terms of sustainability, such as waterpower generation and empowerment of water management through interactive waterworks

Although an extreme intervention, the reuse of the Navigli is coherent with the genius loci and the transformative character of Milan: verging on the flexibility and adaptability of more targeted designs, it seeks to enhance water as a valuable asset.

Methodology definition

As Navigli is a complex centuries-old territorial system, it has been challenging to define a hierarchical scale for the material sought. The social component has been crucial in orienting the research in a more focused way. Interviewing people with an informal approach gave me a clear overview of what is not working in Milan.

It was probably the genuine dialogue with the inhabitants that motivated me to create designs with very simple functions. A park with a pond, a water square, and the enclosed kitchen gardens are all functions within everyone's reach, seemingly banal, but, at the same time, enriched by the information and concepts of the theoretical framework. Somewhere between the simplicity of the first vision and the complexity of the learnt concepts we find creativity, translated into multifunctional spaces that dialogue with the interior and the water.

The analysis of the case studies proofs that many issues could be addressed through water and landscape by further developing the traditional water system and customizing it to modern society.

Research Results

By taking the past technology as an example and reworking it in a modern key, water management in Milan can be investigated with a specific and resilient approach. An alternative symbiosis between nature and culture would be experienced in the city by developing the ecological aspect and introducing green elements by detaching from the conventional urban composition. This vision could coincide with a green city model capable of facing the climate crisis and resulting complications in the urban environment.

Space is sought for people and their active contribution to experiencing and caring for the landscape. A different anthropological model could develop on the local scale together with a greater civic sense led by traditional and inclusive identities and values.

With the daylighting of the Navigli, a historic trading route that connects Switzerland to the Adriatic might be restored in the future by enhancing and linking multiple cities in northern Italy. Thus, Milan would once again become an emerging port.

Ethical, social issues and dilemmas

Probably the most critical passage in my thesis project has concerned the theme of sociality and interaction. One always tends to see the potential of a place, hoping to receive positive feedback that will corroborate one's thesis. The truth is that several interviews showed a certain disenchantment and disinterest in the city, which is why I began to think that sociality and care, in general, are not a general condition but moments in history.

Theory related to the care and the design of spaces such as the Gardens of Care allowed me to understand that a landscape can be in harmony even if people are no longer involved. The sense of care had by the non-human can be an alternative to design space, and reappropriation by humans is part of the process. By combining these basic concepts with Gilles Clément's third landscape manifesto, I transformed a weakness into a design that never extinguishes because of its dynamism.

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