



# REVEALING ROME'S WATER-BASED CULTURE

*A RESILIENT, DYNAMIC AND INTERACTIVE LAYER*

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Landscape Architecture MSc 2020

## REVEALING ROME'S WATER-BASED CULTURE

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FIG. 02  
Castel Sant'Angelo (C. Vittorini, 2018)



Revealing Rome's water-based culture

## ABSTRACT

When we talk about Rome it is difficult not to think about its waters, from the Tiber to the beautiful fountains that adorn the cities. The original territory, where Rome was founded, was incredibly marshy, due to the continuous flooding of the Tiber, but the Romans, thanks to their ingenuity, were able to reclaim the area through sewers and drains and to obtain running water thanks to the complex hydraulic system of the aqueducts. The relationship between Rome and its waters begins from its origins and has represented for centuries the authenticity of the city.

The uncontrolled and immense growth of Rome, which occurred over the last 50 years, leads to a significant shift in urban infrastructure that has changed people's attitude toward the water. This positivist approach to the construction of the modern city has contributed powerfully to the destruction, cancellation, alteration of many signs of the historical stratifications that derived their reasons, origins, and significant developments from the water factor.

The Romans, who over the centuries coexisted with water in a resilient and technological society, today they perceive it as a separate element from their everyday life, which indeed often causes incredible problems with heavy storms and flooding or long periods of drought.

The city today urgently needs to propose a profound transformation to face the need for services and resolve issues brought by a developing populace and a modern lifestyle. Rome needs to build its resilience in reacting to the social and ecological difficulties of its time while considering Rome's really extraordinary nature. A uniqueness that must be protected and enhance.

This research aims to provide site-specific strategies to reveal, connect, preserve, and explore the existing water-based identity of Rome, meanwhile creating an adaptive and resilient system, that could reduce flood risk and create socio-ecological transformations. Based on an in-depth study of the city in its various aspects - morphological, cultural, social, archaeological - the area of the historical centre of the Palatine hill through to the Caffarella park has been chosen as study area. Along this axis the project defines "water-based" routes, which have the aim both to make known the ancient and modern water-based identity of the city and to solve the most serious problems of flooding and drought, creating public and green spaces available to citizens and tourists. Through the route, which begins in the Palatine area, in the urban core of the city, the visitor will learn about an unusual and unknown history of Rome in which various modern and ancient elements take shape as part of a larger system. Visitors, both tourists and citizens, will understand the link between aqueducts, fountains and thermal baths but also the importance of more modern elements such as wetland, bioswales, watersquares, finally arriving at the end of the route at the Nymphaeum of Egeria at Parco della Caffarella, a place full of mystery and charm, surrounded by nature. It is therefore thanks to these routes that the city and its citizens regain their water-based identity, in a project that leaves ample room for both educational and recreational moments, creating areas that restore the relationship between urban and nature.

*Keywords: sense of place, tourist routes, resilience, adaptation, nature-based solutions, urban ecology, green and blue system*

FIG. 03  
Tiberian Island (Author, 2019)



Revealing Rome's water-based culture

## ACKNOWLEDGMENT

The development of my thesis would not have been possible without the precious support of some people whom I would like to thank.

First, I would like to give my special thanks to my mentors Inge Bobbink and Claudiu Forgaci. The feedback and discussion sessions we had together helped me a lot and guided me through the research process.

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In these two years of master's degree, I have been lucky enough to meet people, who have made this experience unique and unforgettable.

I would like to thank all my fellow students in the landscape architecture course, even though the last semester we did not have the opportunity to be together, I am grateful for the moments and trips we had. In particular I'd like to give a sincere thanks to Margherita, Naeema and Noa.

This experience would never have been the same without my Foulkeslaan roommates: Andrea and Daniele, who besides roommates, have become like brothers to me. Thanks Andrea for your patience and loyalty, in the quarantine you have been such a calming presence and I discovered in you a great and sincere friend. Thanks to Daniele for your energy and enthusiasm, for those moments of pure craziness or, on the contrary, of peace and relaxation.

The three of us have built a unique and solid friendship that will last even beyond this; thank you very much for supporting me, I have beautiful memories with you that will remain forever in my heart.

I also thank Filippo (Vezz), for his authenticity and irony, we had so much fun and Alessandro, with whom I was lucky enough to spend the quarantine in April and May, discovering a sincere and always positive friend, thank you for the joy and spontaneity that you gave me.

Last but not least, Amina. Although we are very different people, we have built a beautiful relationship made of sincerity and support. Her accurate observations, her critical and analytical thinking skills, together with her vast knowledge, were fundamental for the development of my thesis, but especially for my personal growth, encouraging me to always do my best. Thank you for your patience - which I know I've put to the test at times - and for always being available for help, advice or for a simple coffee.

An important place for me is, and will always be, the restaurant "Il Tartufo", where I have been working for the last two years. From the beginning, it has been like a second home for me and Fabio has always been ready to welcome me and help me if I needed it. Thank you for this.

Thanks to "Il Tartufo", moreover, I got to know many people and today I am very close to some of them, in particular I thank Eleonora for her sincere positivity which I have greatly enjoyed this last year.

A big hug also goes to my friends, Helen, Laura and Olivia, unique and special people, for putting up with me and supporting me. Thanks girls for always being there when I needed it.

Finally, the most important ones, my family, who, even though they are far away, have never got tired of showing me all their love and affection. I will be always grateful for supporting my decisions and letting me develop into the person I am today. Vi voglio bene.

FIG. 0.4  
Poppy fields at Caffarella Park (F. Viviani,  
2020)

# INTRO DUCTION



## FASCI NATION

Today Rome offers one of the most spectacular urban aquatics displays in the world with fifty monumental fountains and hundreds of smaller fountains, over 2000 fountains in all, more than any other city in the world (Pulvers, 2002).

Strolling through town, we marvel at the pure abundance of water: Trevi Fountain, Fountain of the Four Rivers, Fountain of the Boat and not to mention the so-called *nasoni*, drinking water devices scattered all over the city.

However, nowadays this great abundance of fountains became a mere object of contemplation, a static, though beautiful, monument. Rarely we stop to consider how such ambitious work was possible. Where does the water come from?

In the Italian vocabulary, we describe the great and monumental fountains as *Mostra d'acqua*. *Mostra* comes from the Latin word *mostrare* that in English means to reveal, to show, to exhibit.

These beautiful fountains were, in fact, the terminal of an incredible complex water system, the aqueduct.

By the I century AD the entire city of Rome was served by aqueduct water, and by the early III century, 11 major aqueducts took freshwater from the Roman countryside and bring it to the city.

They brought to the city an availability of water of about 1,127,000 cubic meters each day, distributed among the private houses, about 1300 public fountains, 15 monumental fountains, and around 11 public baths, as well as basins used for shows such as *naumachie*, water battle, and artificial lakes.

In the final points of the aqueducts was often raised a monumental fountain and

it represented the public exposure of clean and drinkable waters brought from distant sources, thanks to the intelligence of the Roman engineers able to create this incredible complex hydraulic network.

The fountain, therefore, proves to be only the endpoint of a project of much larger dimensions, part of a system much more complex than it seems.

The aqueducts covered by centuries of history still run today, hidden within the walls of the houses, in the narrow alleys of the city or in the basement of buildings.



left FIG. 12  
Trevi Fountain (Author, 2019)

top right FIG. 13  
Aqueduct of Nero (B. Williams, 2015)

bottom right FIG. 14  
Aqueduct Virgo in the basement of a shop (Author, 2019)



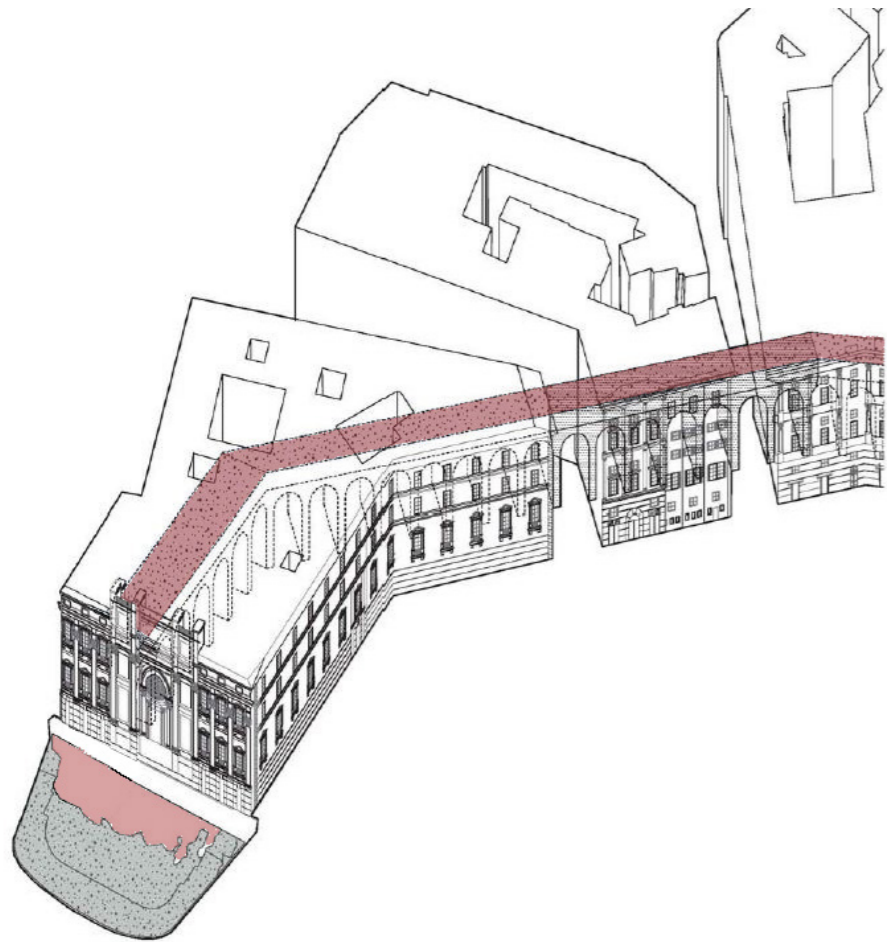


FIG. 15  
Reperire Via Acqua (Cesia Lopez, 2012)  
Edited by the author, 2019



## HISTORICAL CONTEXT

In the detail of Mattheus Greuter's 1618 map of Rome (FIG. 1.7), the artist conceptualized the hearth of the city through the water system of aqueducts and rivers that fed the city.

In the drawing we can see Aqua Vergine, Aqua Felice and Aqua Paola, represented by nymphs, pour their waters into the aqueduct, while Father Tiber, the Tevere (today is the Aniene river, the second-longest river in Rome) and the Marrana are pouring water in the river below, feeding the city. The twins Romulus e Remus are next to the Tiber, where, according to the myth, they were found, together with she-wolf that raised them. (K.W. Rinne, 2010, pag. 3)

Already in the 17th century, therefore, the identity of Rome was linked to water, natural or artificial, divinized in the form of semi-gods.

The foundation of Rome, according to the ancient source, happened on the 21st of April 753 BC. Rome grew from pastoral settlements on the Palatine Hill and surrounding hills on the South side of the Tiber. At this location, the Tiber is forming a Z-shaped curve, which includes an island where the river can be forded.

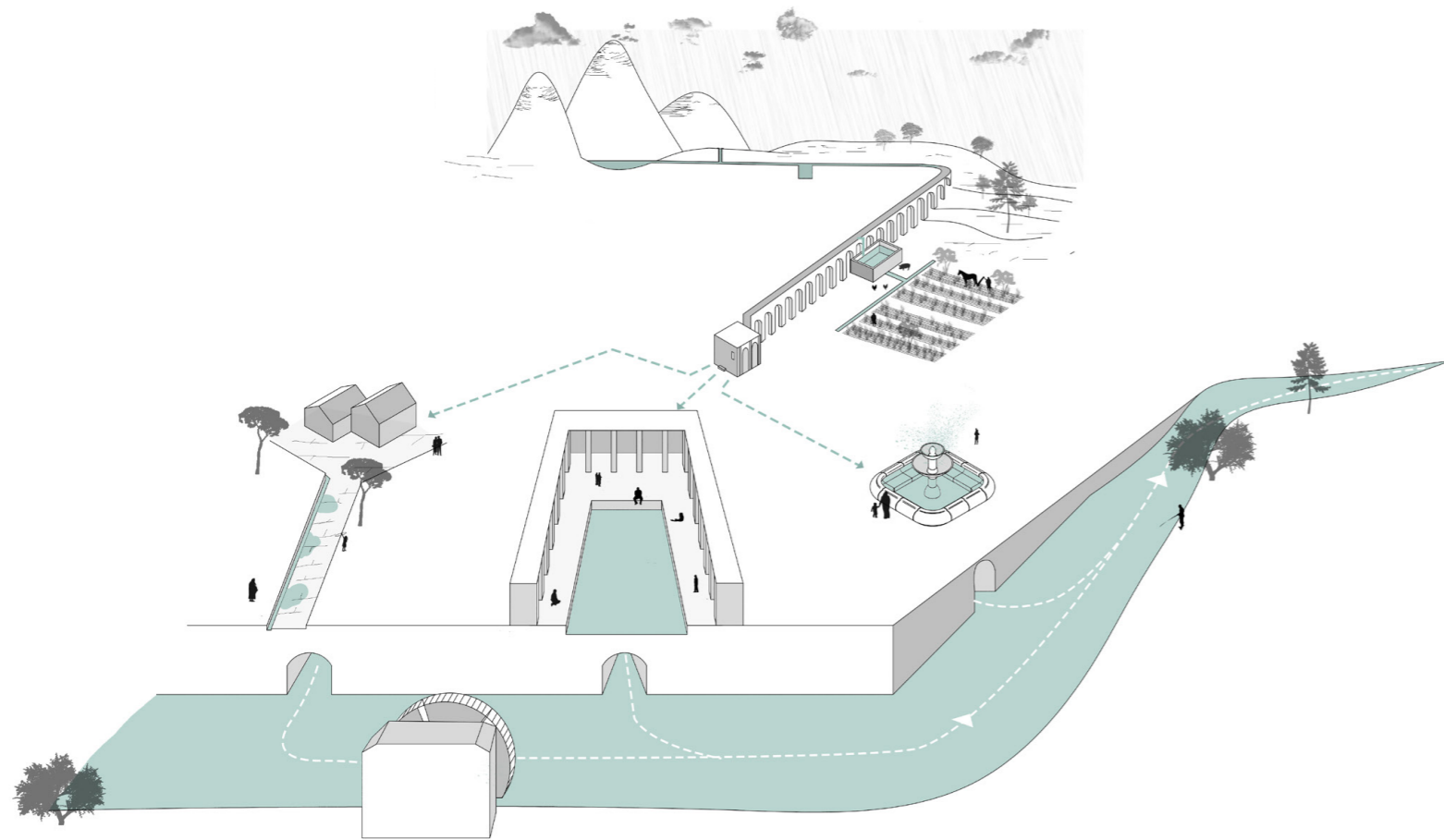
The original landscape was very rich in water but also marshy. The floods of the Tiber made the soil muddy and the territory was full of waterways.

Thanks to their ingenuity the Romans were able to manage and manipulate the water. Famous throughout the world are the Roman aqueducts that managed to guarantee a constant supply to the city or the *cloaca*, our modern sewers, outdoor or underground canals that cleaned the streets

and collected urban waste, not to mention the *cisternae*, usually underneath, they were able to preserve fresh and clean water even during times of drought.

The water was part of the everyday life of the Romans, not only for the many fountains spread in the city but also for the artificial lakes, built for aesthetics and useful supply of water in case of fires, and the *thermae*, baths, important places of social moment, of exchange of opinions and political ideas for the Roman nobility.

These are just a few of the thousands of examples of Roman engineering genius who had understood the importance of the water in a city and its cycle was assisted and controlled until the end to guarantee no waste and indeed the best and efficient use of it.



left FIG. 1.6  
Water cycle in ancient Rome: the aqueducts took the water from the mountains and brought it into the city. The water was then used for different functions, such as agricultural or leisure purpose (Author, 2020)

bottom right FIG. 1.7  
Pianta di Roma (M. Greuter, 1618)  
Retrieved from Biblioteca Nazionale di Roma



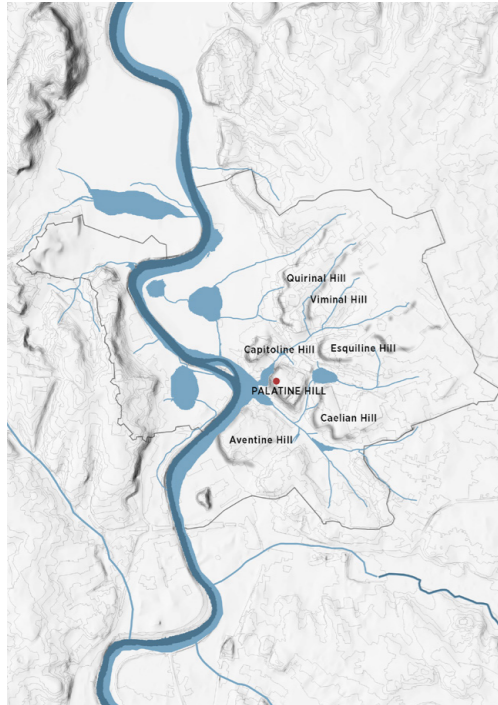


FIG. 1.81

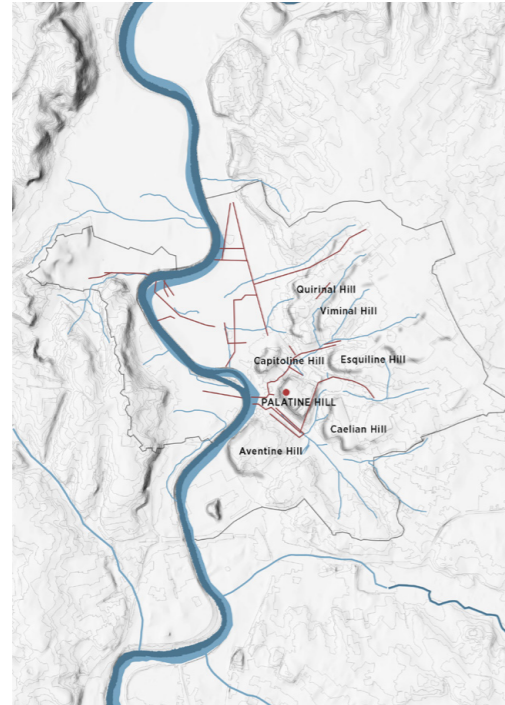


FIG. 1.82

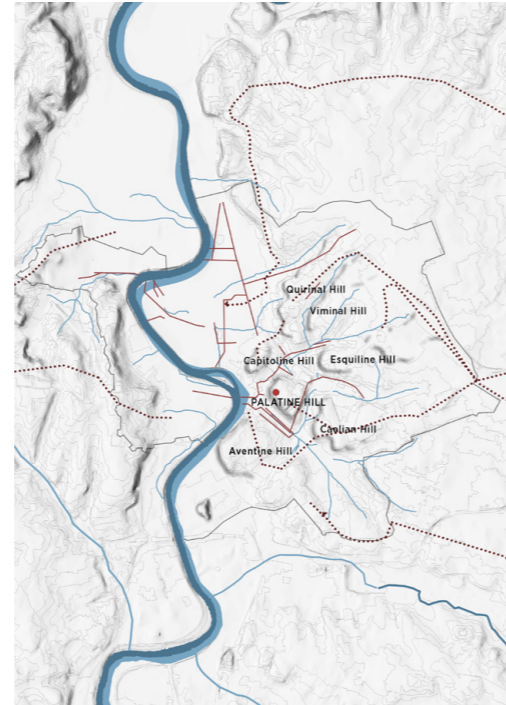


FIG. 1.83

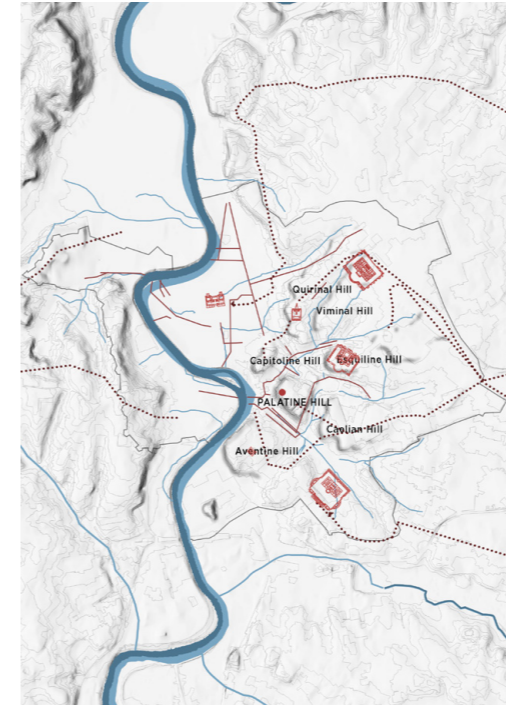


FIG. 1.84

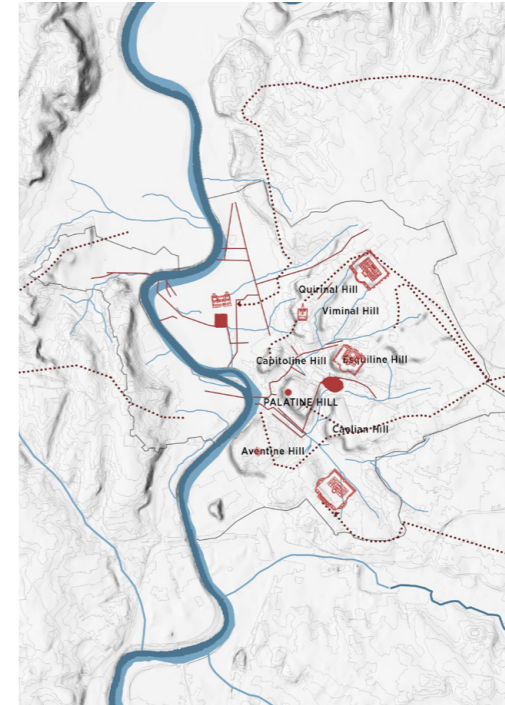


FIG. 1.85

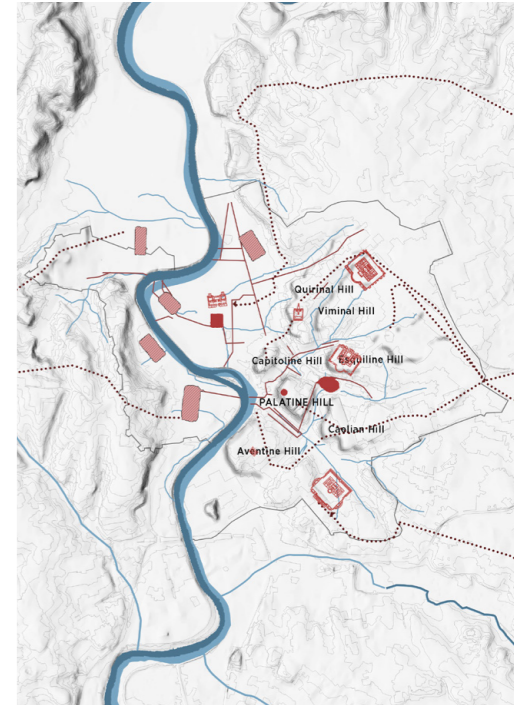


FIG. 1.86

- artificial lakes
- naumachia
- sewage
- aqueducts

FIG. 1.8

In the drawings is shown the evolution of the city of Rome.

1. First settlements on the Palatine hill in a marshy area
2. Land reclamation through the construction of sewers and canals
3. Construction of the aqueducts that brought fresh water into the city
4. Construction of the thermal bath, powered by the aqueducts
5. Location of the artificial lake, for both aesthetic purposes and to collect water
6. Final representation of the city of Rome, with all its water elements (Author, 2019)





Revealing Rome's water-based culture

In 537 the siege of Rome took place by the Goths. In order to force the city to surrender, almost all the aqueducts that fed the city were destroyed. Running water started to gradually disappear in the city. This was the beginning of the decay of the Western Roman Empire and the start of the Middle Ages.

During the centuries of the Middle Ages the Romans withdrawn from their aqueducts returned to their original water source: the Tiber and the streams that used to run in the city, the Marrane, in Roman dialect.

The reduced population gathered itself around the Tiber river, as a water supply, as a toilet, as a wash house and even as a dump. Its precious water was distributed to the city by the *aquaioli* or water porters.

At the same time the Marrane, as Almone and Aqua Mariana were considered sacred and their water, clean and drinkable, were fundamental for the survival of Roman people.

In a papal bull of 6 May 1389 the pope Boniface IX confirmed the exclusive control over Aqua Mariana (FIG. 1.11, number 1). The streams had a great economic value, as it was used to power a series of grain mills, irrigate crops and water cattle. Boniface IX created a group of conservators known as *Difensori dell'Aqua Mariana*, the “defenders” of the water, who acted as caretaker, collected fees from those who derived benefit from the streams and punished



left FIG. 1.9  
Claudio Aqueduct (Author, 2019)

top right FIG. 1.10  
A sixteenth-century water carrier, *aquaroli* (A. Brambilla, 1582)  
Retrieved from Museo di Roma, Archivio Fotografico Comunale

bottom right FIG. 1.11  
Marrana e Aquataccio (F.G. Paolo, 1540)  
Retrieved from Museo di Roma, Archivio Fotografico Comunale. Edited by the author, 2020



Revealing Rome's water-based culture

Although the Tiber provided Rome with water throughout the medieval periods, the Aqua Virgo was still working, even if barely a trickle of water, in the mid-sixteenth century. It was Pius V to decide to restore the Aqua Vergine, this initiative would create a more salubrious environment that would influence both physical and the spiritual realms.

The restoration of Aqua Vergine marked the beginning of the real renaissance of Rome's water infrastructure and with it that of its urban fabric- a Renovatio Romae (XVI-XVII)- a physical transformation that was also understood to be crucial to Rome's resurgence as the center of the Christian world (K.W. Rinne, 2010).

Are also the years of the spread of Protestantism in northern Europe, a real and worrying threat to the Catholic Church, which sees in the power of water and art the possibility of bringing the faithful closer to the Catholic faith: to restore water was to restore Roman authority.

Some of the ancient Roman aqueducts were thus rebuilt and a lot of money was invested in famous public works such as the fountains. Today the most famous are the Trevi fountain, the fountain of the Four Rivers, the Barcaccia and Tritone Fountain. The water acquires, then, a new value becomes a **method of propaganda** for the catholic church.

They wanted to oppose the austerity of the Protestantism, with the elegance, the magnificent, the creativity of the Catholic Church, who amused and improved the lives of their faithful.

The restoration of the ancient aqueducts changed Rome's physical fabric, altering the landscape of water acquisition, distribution

and use. Each fountain became the focus of a **public space** and a transformative nexus. The fountains were in fact **symbolic linchpins** for urban development, underneath them a **grid of pipes** and tubing stretched into the city, and both streets and squares were shaped and redesigned to provide a constant flow of water. Every point in the city was connected to another through underground pipes. Pipe by pipe, the topography of Rome was newly understood and studied . Contours were revealed through the flow of water.

left FIG. 112  
Tritone Fountain (Author, 2019)



Revealing Rome's water-based culture

## PROBLEM STATEMENT

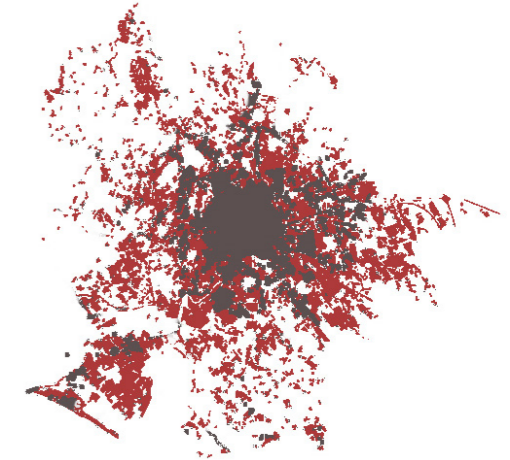
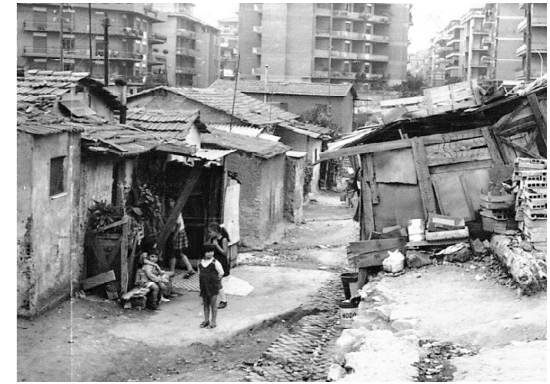
After the Second World War, Rome became a destination for immigrants from the South of Italy. The impact on Rome was significant and resulted in a real building explosion. As a result of migratory movements, housing needs increased and immigrants were employed as unskilled labor in the often improvised constructions of mediocre quality and linked to real estate speculation. From 1950 Rome, therefore, began to grow in all directions without any planning attempt; alongside the planned construction, neighborhoods and illegal housing development flourished, hundreds of blocks on the outskirts, further transforming the physiognomy of the city and aggravating the problems related to the lack of services.

One of the most important aspects of the analysis of this illegal phenomenon of unauthorized building construction is the risk of violating safety rules and regulations. Among these, various rules forbid the construction of soils that do not allow an acceptable degree of static safety of any building. This is the case, for example, of areas above surface aquifers, landslides or areas with high seismic risk.

The territory of Rome is, indeed, very rich in water. In addition to the Tiber river, that cuts the city from North to South, there were numerous streams of different sizes and lengths, called *Marrane*, which characterized the Roman landscape.

During those years, houses and even streets, which are today the main arteries of the city, were built over streams. The repercussions of these actions are still felt with serious flooding in many areas of the city.

This positivist approach to the construction of the modern city has certainly acted, in the



*left* FIG. 113  
Roman desolated suburban (L. Dammicco, 2018)

*top right* FIG. 114  
Acquedotto Felice in the 60s (Unknown)  
Retrieved from [http://www.istitutoeuroarabo.it/DM/roma-le-borgate-di-ieri-le-periferie-di-oggi/#\\_edn2](http://www.istitutoeuroarabo.it/DM/roma-le-borgate-di-ieri-le-periferie-di-oggi/#_edn2)

*right* FIG. 115  
Shacks in Rome in the 1950s (Unknown)  
Retrieved from [http://www.istitutoeuroarabo.it/DM/roma-le-borgate-di-ieri-le-periferie-di-oggi/#\\_edn2](http://www.istitutoeuroarabo.it/DM/roma-le-borgate-di-ieri-le-periferie-di-oggi/#_edn2)

*bottom right* FIG. 116  
Rome 1950 in brown and Rome 2010 in red (Author, 2019)

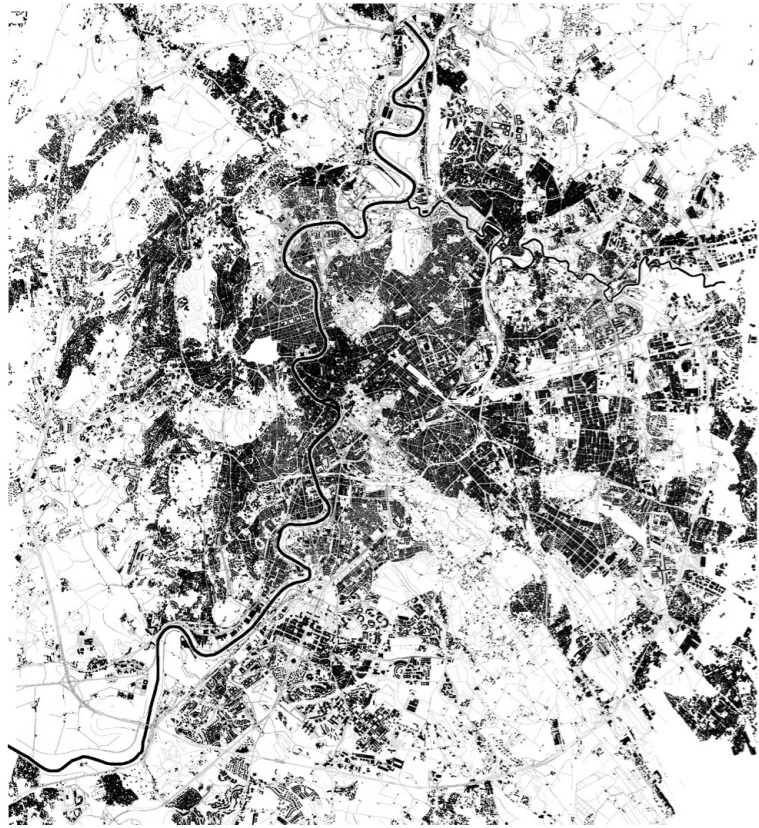


FIG. 1171

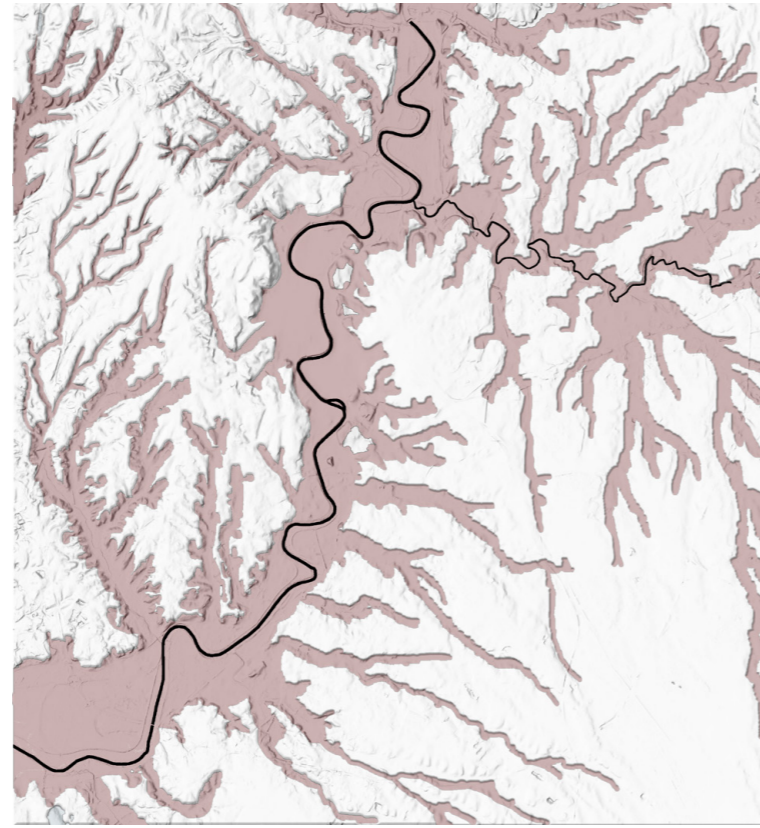


FIG. 1172

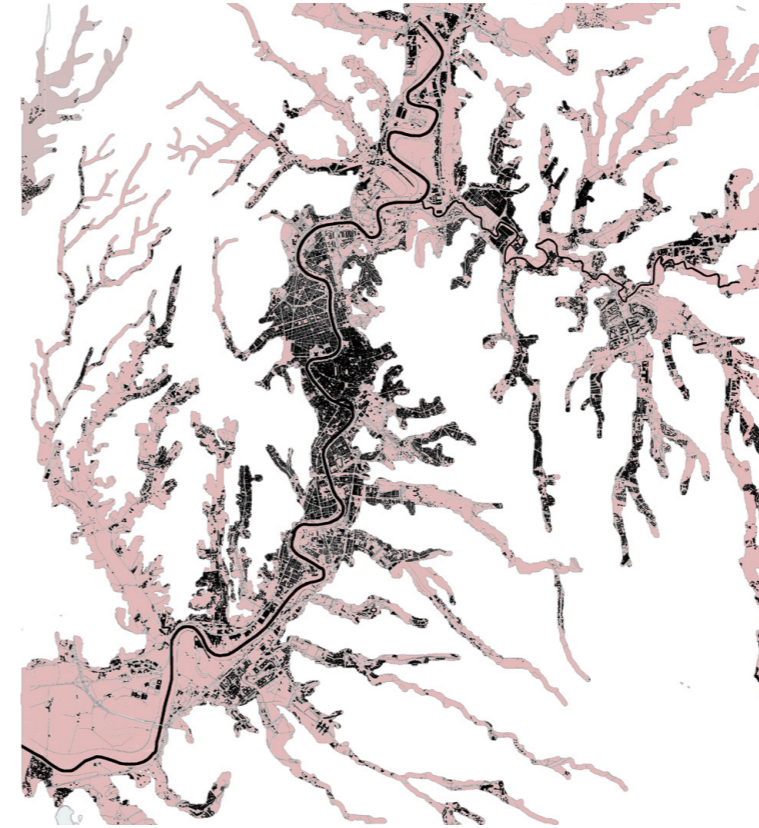


FIG. 1173

context of new urgent and massed needs, to partially hide the structural and symbolic value of the water factor, to give priority to a functionalist sense of the construction of underground networks and intensive exploitation of the resource for industrial cycles and energy production purposes. This predominantly utilitarian approach -combined with engineering concepts of urban and territorial networks based on criteria of economy and functionality, with mainly mono-functional optics and often with a misunderstood sense of unlimited resources- has contributed powerfully to the destruction, cancellation, alteration of many signs of the historical stratifications that derived their reasons, origins and significant developments from the water factor.

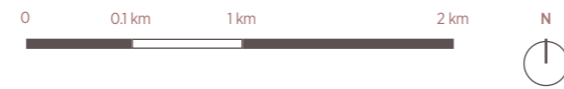
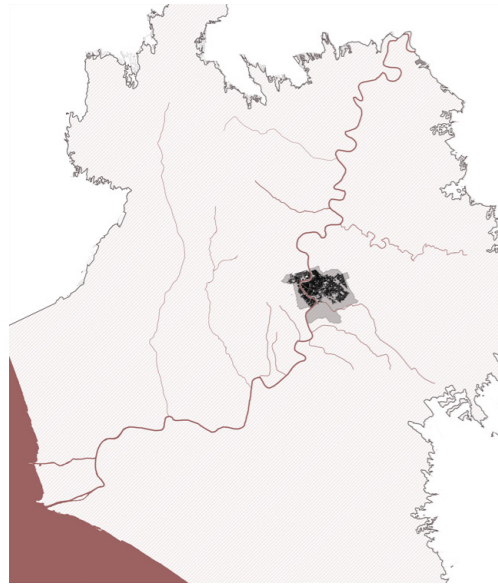
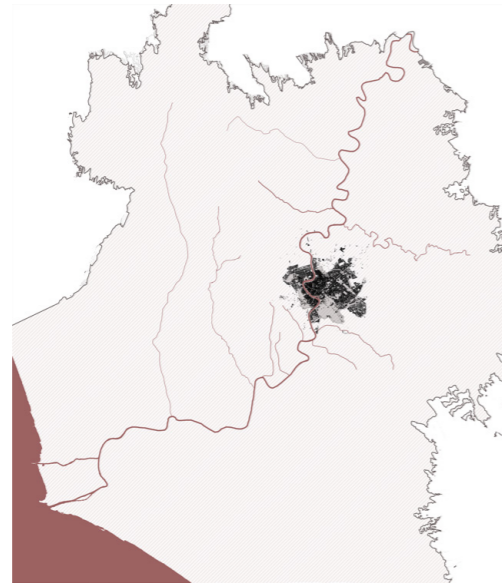


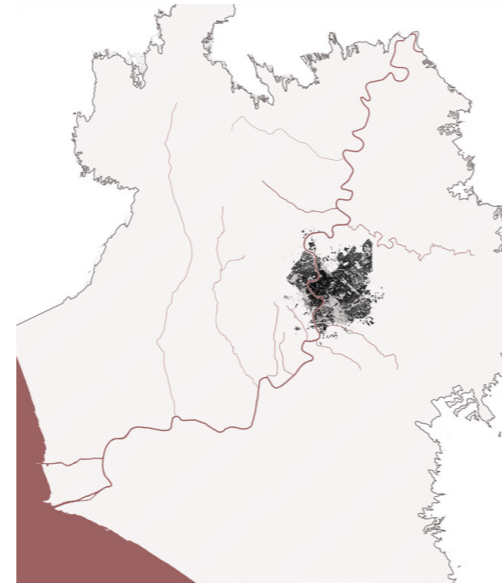
FIG. 117  
 1. Map of the built city in 2010  
 2. Hydrography map  
 3. Combination of the two previous maps.  
 It shows the city of Rome built on water  
 (Author, 2019)



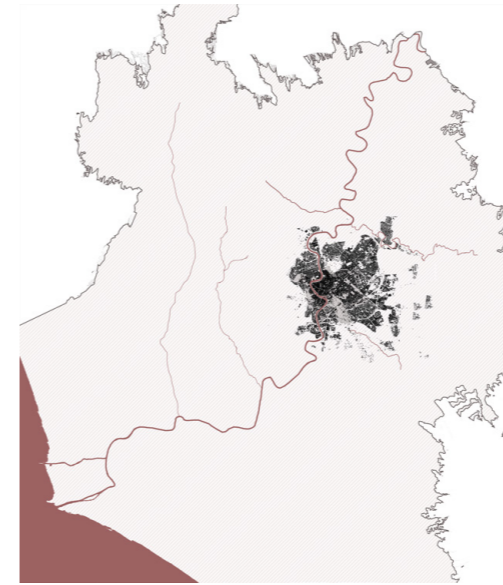
1873



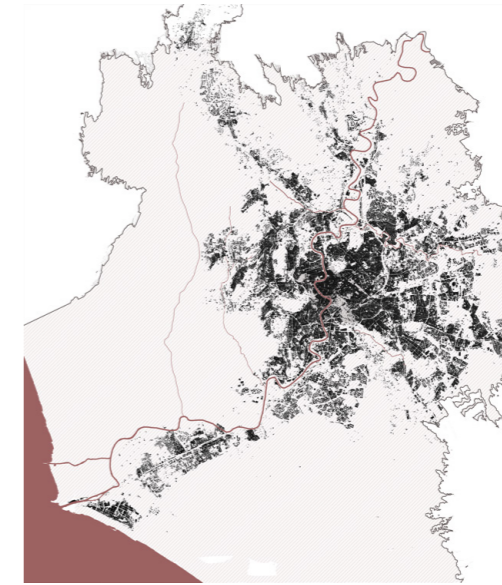
1910



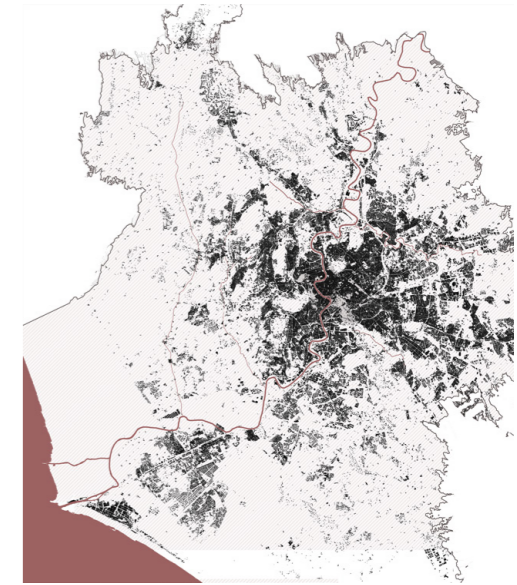
1930



1950



1980



2010



FIG. 118  
Urban expansion of Rome from 1873 to 2010. It should be noted how the city tripled between the 1950s and 1980s (Author, 2019)

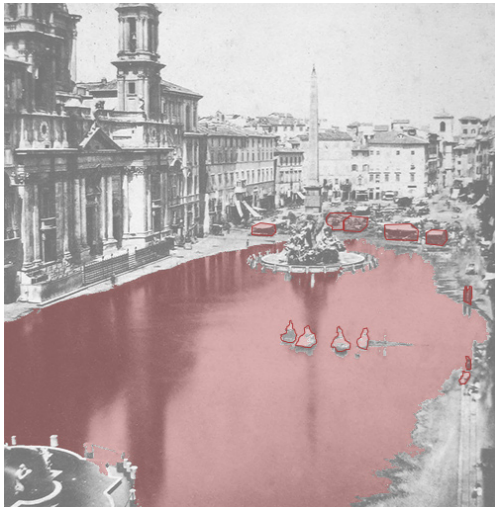


FIG. 119.1

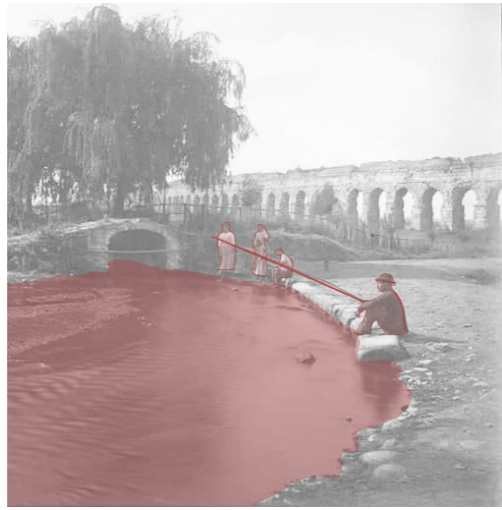


FIG. 119.2

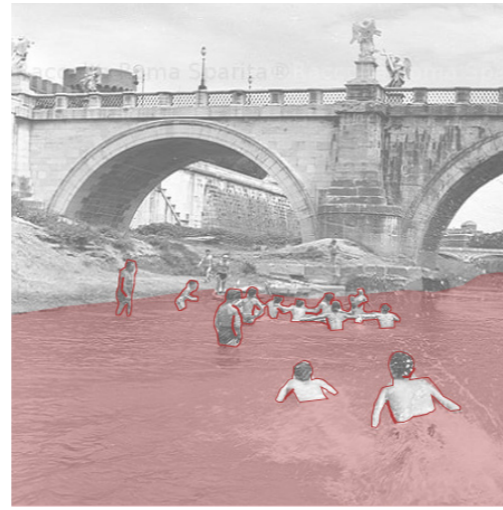


FIG. 119.3



FIG. 119.4



FIG. 119.5



FIG. 119.6

left FIG. 119

1. Water battle in Piazza Navona in 1860 (T.Cuccioni, 1860). Edited by the author, 2019

2. Fishing in the Marrana river in 1880 (M. Besso, 1880). Edited by the author, 2019

3. Swimming in the Tiber river in 1953 (M. Salustri, 1953). Edited by the author

4. Piazza Navona today (Author, 2019)

5. Aqueduct Park in Rome (Author, 2019)

6. The Tiber River (Author, 2019)  
To date there are no traces of the ancient aquatic features

Before this uncontrolled growth of the city, which has completely upset the urban layout of the city and it has created many social and urban imbalances still visible today, many traditions or events took place among the Romans citizens and the water. Not only the contemplation of the beautiful fountains that the city is adorned with but also, for example, until the first half of the 20th century, every summer small water battles were organized in Piazza Navona. The square was, in fact, lightly flooded with a maximum of 50 cm of water and adults and children could find a moment of leisure and freshness in the hot Roman summers. The Tiber, the city's main river, was also a meeting point for young people who came to bathe or to relax along its banks before the walls were built. The Marrane characterized the Roman landscape and people came to fish or do their laundry.

completely losing the original dynamism and fluidity of the city of which water was the founding element.

All these elements have always been integral parts of the daily life of the Romans, the water has been, for better and for worse, characterizing element in the life of the citizens. To date, this relationship seems to have been completely erased, the Marrane have been destroyed and there is no more trace of the famous naval battles. These are images that bring to mind a distant memory of a Rome that no longer exists, where water is now mainly a problem, due to the heavy floods that are becoming every winter more severe and more frequent.

The primary and authentic connection between man and water has been progressively demolished in the last 100 years, to make place for concrete, streets and buildings, and impersonal neighborhoods,





Revealing Rome's water-based culture

## RESEARCH OBJECTIVE

Rome is an incredible complex territory where alternative forces cohabit and coexist rather than proposing a singular and total narrative of the city. It is a place of contradictions and anachronisms, in which history, culture, art, tradition, religion, politics have existed side by side for centuries.

Rome presents itself as a city where classical monuments and temples lie alongside modern gas houses; where ancient churches coexist with contemporary ones; This coexistence is not only the geographic cohabitation of diachronic elements built in different epochs but also, and above all, the mutation and evolution of meaning that these elements endured and continue to endure throughout time.

In this elaborate and unique context, the landscape architect's role is to understand the complexity of such a city to work with the right sensitivity and shrewdness to provide a design that reflects the specificity of the site. The project won't distort or upset the city, but on the contrary, it will gently lay down a new beneficial and necessary layer. The design strategies will consider all the most relevant resources in the landscape, environment, tourism, history, site-specificity, and culture, enhancing them.

The objective of this research is to *mostrare*, reveal, the water elements that have characterized the city of Rome.

In a place which has been shaken by over-urbanization, mass tourism and the effects of climate change for the past 50 years, the project provides site-specific strategies to reveal, connect, preserve, enhance, and explore the existing waterbased identity of Rome, meanwhile creating an adaptive and resilient system, that could reduce flood risk and create socio-ecological transformations.

FIG. 120  
Two Roman pines (Author, 2019)



Revealing Rome's water-based culture

## RESEARCH QUESTION

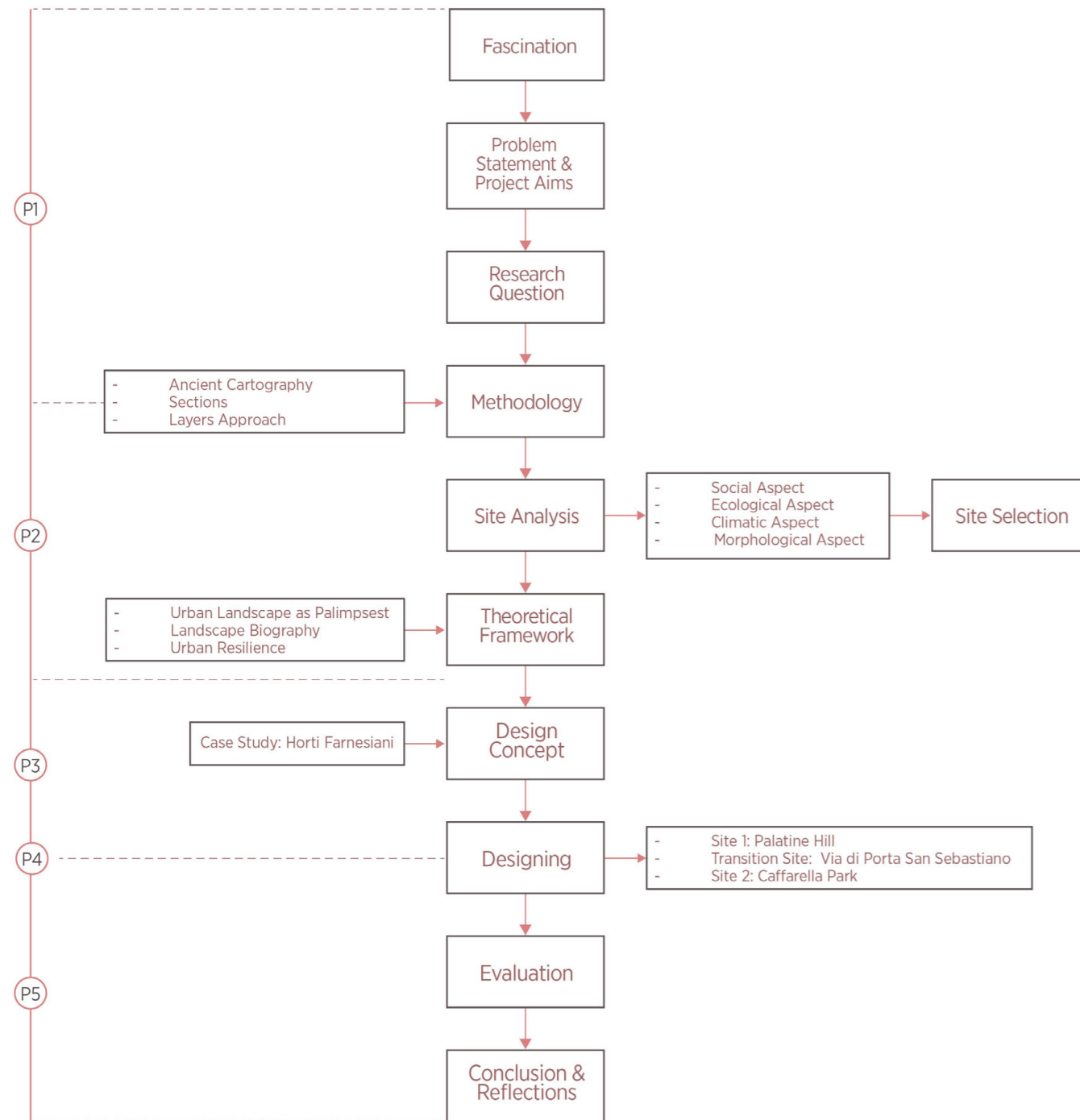
How can natural water and water management elements of Ancient Rome be revealed and integrated in a resilience green and blue strategies which enriches the ecological and experiential qualities of the public space?

A set of sub-questions were formulated to help answer the main research question.

- How has the cultural-social relationship between Rome and its water evolved through time?
- How make people, both visitors and citizens, aware of the importance of water in Rome's history?
- What relationship exists between the different layers that compose the city and what would it mean to add a new one?
- How is the orography of the terrain connected to the creation of Rome and how can it be exploited in design?
- How can the architectural water elements of Rome (aqueducts, fountains, etc), now seen as single and nostalgic elements, and the natural water elements, can be re-integrated into the city structure as a new and dynamic layer?

FIG. 121  
Marrana stream (Author, 2019)

# METHODOLOGY



The city of Rome requires an alternative approach to deal with the existing situation and forthcoming problems.

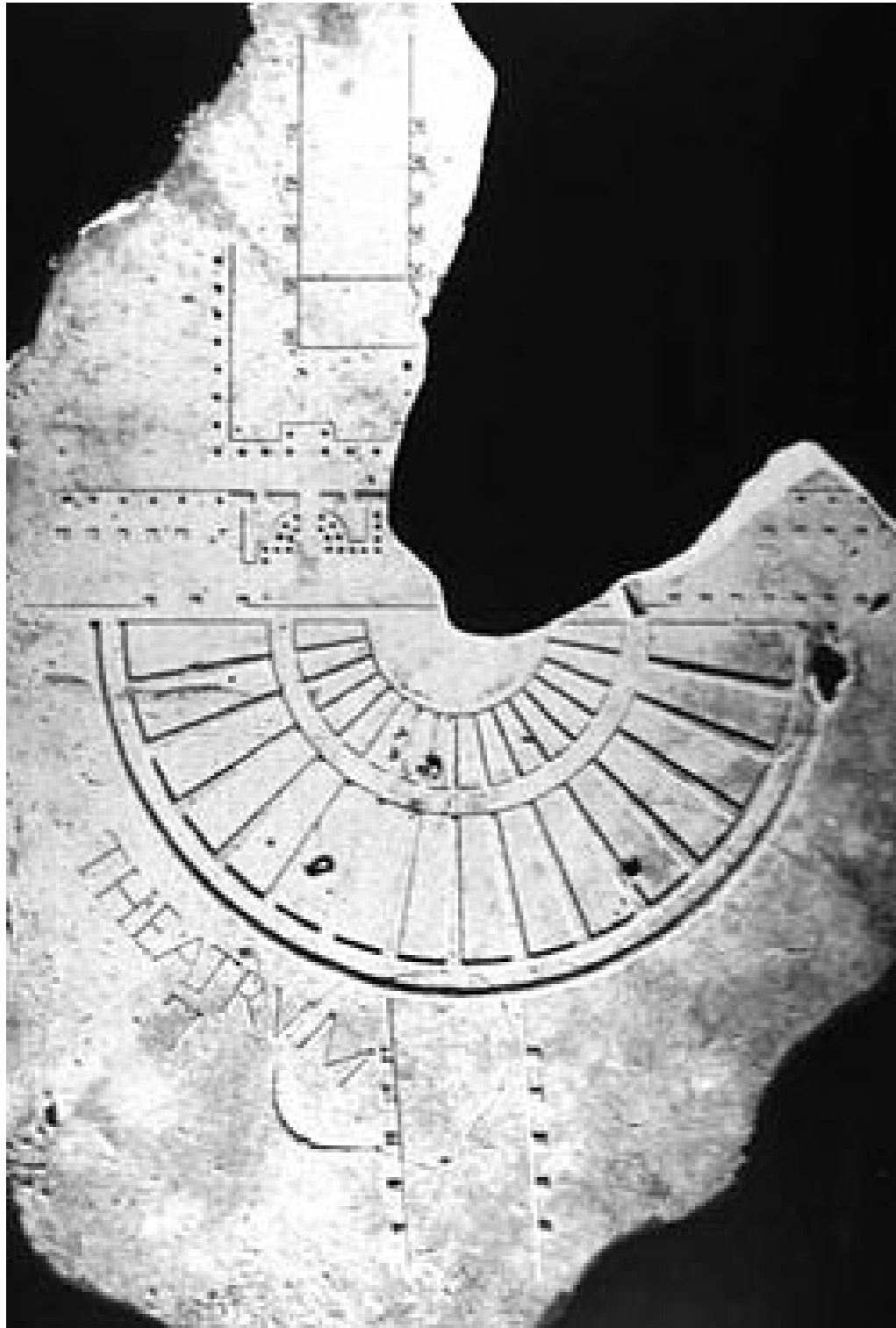
This thesis project was initially structured on the research and study of *ancient cartography*, to better visualize how Rome has developed throughout the century. Together with that, drawings of *sections* were developed, in different locations of the city, which gave a clear idea of the layers of which the city is composed; it was natural then to move into a *layer approach*, from which this composition of layers was well defined and arriving at the definition of palimpsest.

This practical work was accompanied with theoretical study, as it is shown in the second chapter “Theoretical Framework”.

On one hand, the theory of **urban landscape as palimpsest** and **landscape biography** helped to visualize and study the city from a more natural point of view, linked to its history, its territory in the search for its identity. Thanks to these theories a spatial and geographical interpretation of the territory of the city of Rome was developed and then the final site location was selected. On the other hand, the theory of **urban resilience** provided the necessary tools, in a more urban vision of the city, to deal with design.

Finally, the study of the *Horti Farnesiani* as a case study, brought the idea of the final design concept, whom the design was then developed.

FIG. 122  
Timetable (Author, 2020)



Revealing Rome's water-based culture

## ANCIENT CARTOGRAPHY

The history of cartography is closely linked with the history of the city of Rome. In fact, already in the III century, the Romans created a detailed map, in which it was possible to admire their architectural works, like the temples or the baths, defining the original structure of the city. It is the so-called *Severan Marble Plan* of Rome, and originally measured about 13 m in height by 18 m in width and consisted of about 150 rectangular marble slabs, to date there are still visible about 15% of the original fragments.

With the decline of the Roman Empire and the affirmation of Christianity, the previous structures began to lose their importance, in favour of the construction of religious buildings. Some of them were converted into churches, one of the most admirable examples is the Pantheon, which from Roman temple became in VII century a Christian church and consecrated it to St. Mary and the Martyrs. This denotes a new type of centrality, which we can define as Christian.

The structure and size of the Rome of this phase can be read in the map drawn up by Bufalini in 1551. This, in fact, is the first map of the city since ancient times that shows all the streets and blocks, churches and important buildings and is reproduced with a plan view and not a bird's eye view.

However, one of the most complete and most important maps of Rome from the historical point of view is the one drawn by Gianbattista Nolli in 1748 and defined as the *Great Plant*.

It shows us the image of the city of the eighteenth century with a precise drawing and consistent with the situation at the time. From its reading, the footprints of the

urban plan are evident, starting from the interventions wanted by Sixtus V and a new layout of the city that gravitate on centralities that we define as cultural, i.e. squares and gardens and buildings, expression of the feeling of the time.

We can also notice the opening of the city towards the north underlined by the Piazza del Popolo from which the trident departs, which stretches towards the southern part of the city.

This opening is opposed to a closure towards the south. We have here an important shift, the historic centre of Rome, where for centuries the city has developed, between the Forum and the Colosseum, is abandoned to favor the northern part, which has a more organized and fervent urban layout.

In the years between the XIX and the XX century, the new political structure of post-unification Italy, and in particular the move of the capital from Turin to Rome, saw the city subject to important changes from an urbanistic point of view.

In fact, works of "urban engineering" were carried out, including the construction of new residential districts that tended to occupy the areas left empty and the construction of the walls along the Tiber. In particular, the latter intervention drastically changed the appearance and the relationship of the city with its river. A new centrality of the city that was organized around the ministries and government offices of the new Italy.

The history of Rome can be partly understood by reading the ancient maps that show its evolution and change and this was the first fundamental step in the process of the project.

FIG. 123  
Reconstruction of part of the Forma Urbis  
with cavea of theatrum Pompei shown  
(U.K. Vestal, 1999)  
Retrieved from <http://www.theaterofpompey.com/auditorium/imagines/maps/modernfurl.shtml>

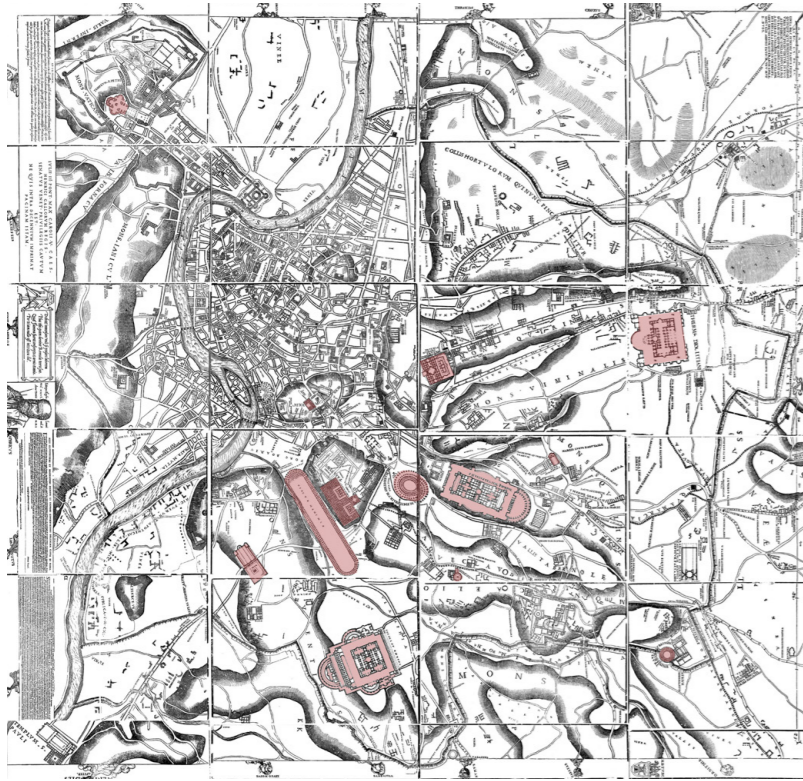


FIG. 124.1



FIG. 124.2



FIG. 124.3

FIG. 124

1. Christian centrality (L. Bufalini, 1551)  
Retrieved from <http://www3.iath.virginia.edu/waters/bufalini.html> (Edited by the author). Edited by the author, 2020

2. The great plan of Rome, cultural centrality (G.Nolli, 1748)  
Retrieved from <http://nolli.uoregon.edu/>. Edited by the author, 2020

3. Nuova pianta di Roma, new centrality (E. Sanjust, 1909)  
Retrieved from [http://www.cittasostenibili.it/industriale/industriale\\_Scheda\\_7.htm](http://www.cittasostenibili.it/industriale/industriale_Scheda_7.htm)



Revealing Rome's water-based culture

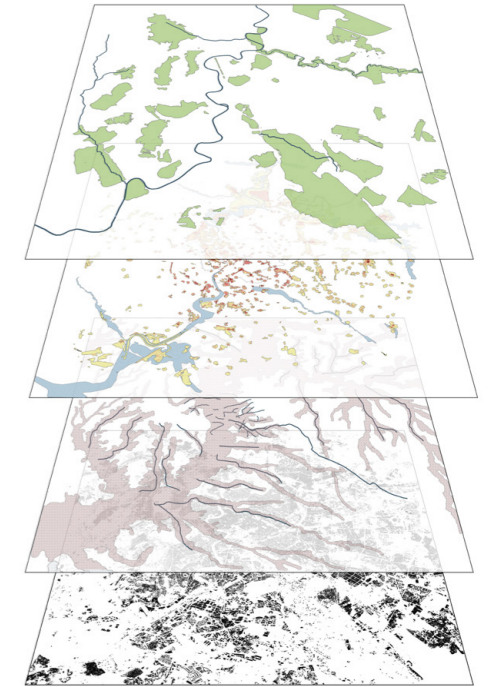
## SECTIONS

During all the time in analysing the city, more attention was given to the different aspects that worked between them, this stratigraphic analysis was then fundamental for a morphological and spatial interpretation of the city that it is been deepened in the following chapter. In addition to reading the maps, in order to be able to understand more deeply the historical stratification of the city, sections has been performed on different areas of the city.

In fact, the city of Rome has a unique feature: since the Romans time, when a new building, temple or stadium had to be built the pre-existing buildings were not demolished but rather maintained. The new project was built on top of existing one, exploiting its materials and structure. This type of attitude has continued throughout the Middle Ages and the Renaissance, giving us today a city that is literally stratified.

As you can notice in the section (FIG. 1.27) the historical centre is always at a lower level, even of meters, than the contemporary city. In FIG 1.25 where the Augustus' forum is photographed, it can be seen that it is about 3 meters deeper than the street level: the evolution of Rome happened layer after layer, year after year, creating a difference in level between the two cities, the ancient and the contemporary one.

coincidence that, for example, the whole area of the historic centre is the one most subject to flooding, because it is precisely the lowest.



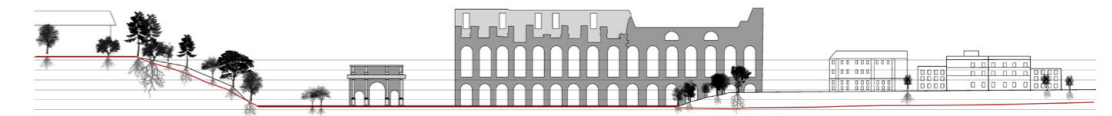
## LAYERS APPROACH

It was natural at a later stage to work by layers (FIG. 1.26). By superimposing the maps obtained through my analysis, but also the topography and hydrography map of the city, I was able to get a clearer and more complete view of the territory of Rome. From this stratification in fact I have obtained places that generate synchronizes or on the contrary incredible friction: it is no

left FIG. 1.25  
Augustus Forum, below respect to the street level (JAfp Agence France Presse, 2020)

top right FIG. 1.26  
Considered layers in the site analysis: green and blue layer, floods, hydrography layer and the existing fabric (Author, 2019)

bottom right FIG. 1.27  
Section in the city centre. In red the original height of the city (Author, 2019)



# THEORETICAL FRAMEWORK



FIG. 21  
Via dei Fori Imperiali (Afp Agence France  
Presse, 2020)



## LANDSCAPE AS PALIMPSEST

The word palimpsest, based on the definition of Cambridge Dictionary, literally means a very old text or document in which writing has been removed and covered or replaced by new writing.

In the urban planning field, the concept of palimpsest is used to explain the construction stages of the architectural monuments and the urban morphology development during the era (Azimzadeh et al., 2007).

The territory, in fact, is not a given but the result of different processes. On one hand, it changes spontaneously and gradually due to natural effects such as the erosion of beaches or the birth of volcanoes, on the other hand, the landscape is subject to human interventions such as bridges, dams, roads.

The spatial development of the landscape is represented by the result of its evolution, both natural and man-made, over time.

Therefore, the palimpsest concept supposes that a new urban layer is superposed on the previous one; the case of Rome is an unique and extreme example of palimpsest because the traces of the ancient civilizations are still visible in the structure of the city.

In fact, in its urban fabric, or in the facade of a palace or in the alleyway in the historical centre we can still read traces of its history. The changes in the urban structure of Rome denote its being “processual”, i.e. not bound to rigid and preset schemes. Its growth is due to continuous phases of reconstruction and revolution.

The processes of evolution that have intervened in the city can, therefore, be described as replacement, superimposition, mutation, transposition. These processes see as an example Pompey’s theatre (FIG 2.4, next page), one of the first masonry

theatres in Rome built in 55 BC. Except for the ancient written sources, it would seem that nothing of this theater has remained intact, but in reality, going to analyze the urban fabric, we notice that near Campo dei Fiori, between a rather orderly system of streets, there is a very different composition of buildings, in the shape of a hemicycle. And it is precisely here that the ancient stadium was tuned, and still today in the basement of the houses you can find the arches and hypogean areas of the circus. Rome, therefore, a whole discovery, formed by a process of creating relations where there may, or should, be none.

In *Civilization and Its Discontents* (1929), S. Freud recognizes a similarity between the way Rome evolved in stages and the mind of the individual person: “Where the Coliseum stands now, we could at the same time admire Nero’s Golden House; on the Piazza of the Pantheon we should find out only the Pantheon of today as bequeathed to us by Hadrian, but on the same site also Agrippa’s original edifice [...] And the observer would need merely to shift the focus of his eyes, perhaps, or change his position, in order to call up a view of either the one or the other.” (Freud 1929).

He suggests a perception of Rome as a physical entity, with its past and its memories, in which nothing that has once exists could die and all the ancient features survive alongside the most recent ones.

In fact, without an accurate investigation of the patrimony, the identification of the contemporary is not possible. The urban palimpsest approach can actively contribute to understanding and preserving the local identity of the site.

If the term palimpsest refers to those

FIG. 22  
Representation of the concept of palimpsest in the city of Rome (Author, 2020)





medieval parchments, repeatedly scraped and rewritten, but on which traces belonging to the past remained, in the same way, the territory is the bearer of the memory of the place, which is inherent in it thanks to a phenomenon of accumulation that occurs over the years. It is necessary that these layers, sometimes even very thin, are not erased but act as a starting point for interventions in the area. The traces hidden and buried in the cities must, therefore, be rediscovered and revalued.

This innovative image of the territory as a palimpsest, therefore, refers to a fragmented and discontinuous vision in which the architect is required to work continuously to best enhance the landscape.

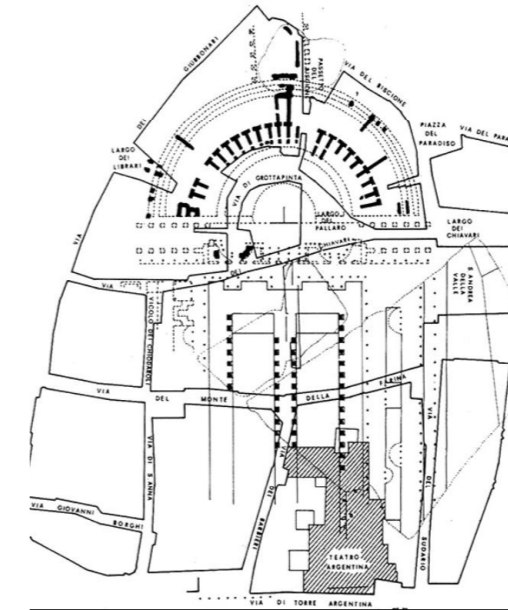


FIG. 2.41

left FIG. 2.3  
Theatre of Marcellus: the concept of stratification is evident on its facade. From an ancient theatre in the lower part to a fortified castle in the upper part (B. Caffi, 2010)

bottom right FIG. 2.4  
1. Plan of Theatre of Pompey

2. Today urban fabric. The shape of the theatre is clearly visible  
Both retrieved from <https://www.roman-ompero.com/2010/06/teatro-di-pompeo.html?hl=en>



FIG. 2.42



Revealing Rome's water-based culture

## LANDSCAPE BIOGRAPHY

Along with the palimpsest concept, it was important for the development of the project to consider and study the concept of the cultural biography of landscapes, in order to better integrate the knowledge of landscape and heritage with the practice of planning and design.

A landscape biography tells the layered life story of a landscape: how it has developed in the continuous interaction between humans and nature. It comprises an in-depth exploration of the genesis of a landscape over time, involving both physical and immaterial dimensions and integrating knowledge from a variety of disciplines. (Stadhouders, 2016).

Landscapes synthesize in their image a very rich quantity of data, of different aspects, which are nothing but the result of cultural, natural and anthropic history. Carlo Tosco offers us this description of the landscape: "The territory before our eyes is like an open book that tells its story and that we must learn to read and interpret. It will always be a matter of incomplete and fragmentary information, but able to provide the basic elements to trace the overall picture." (C. Tosco, 2009).

The *biographical* study of the landscape is fundamental, since through this it is possible to know and become aware of the relationship that there is and has been between territory and civilization. Knowing it, helps to operate in the present consciously and with greater skill. The knowledge of history and more precisely of the reasons that have determined the appearance of things - of cities, territories, etc. - is essential. In fact, not only it allows us to better understand the links and meanings present in the real world, but it also offers operational stimuli in order to intervene within contexts. History doesn't immobilize, it doesn't petrify; rather it guides.

Landscape biography seems well-attuned to meet integrative and sustainable approaches in which cohabit the "old" landscape and the needs of the stakeholders, developing consideration of social identity and quality of life. In fact, it brings histories, memories and traditions of the place posing at the same time the attention to relevant current social and ecological issues, to the values of the existing landscape and the landscape biography approach is able as well to make good use of future developments of the territory in landscape design.

As landscape biography puts the focus on an integrative long term perspective of landscape changes, it relies on a large and varied set of historical, environmental and other sources as data to inform studies about the diverse ways in which communities have interacted with their natural and cultural environments through time. (Kolen and Renes 2016). The first step is to look into "conventional" data, geomorphology, soils maps, etc, but it is fundamental in this approach to carry out careful research concerning the social-cultural knowledge typical of the site in question. It is important to make use of physical-material sources such as diaries, images, paintings, but also films and documentaries. Only in this way, will it be more comprehensive to reconstruct the original social and environmental context.

Therefore, landscape biography focuses on the multidimensional (cultural, social and economic) aspect of landscape changes within a certain period or the "layeredness" of landscape at specific moments in time. (Renes, 2015).

The analysis of the past, the memories, the events, the people and the territory serves to mature a critical consciousness capable of guiding reflection on current problems and places: to learn to cognize, in order to re-cognize.

FIG. 25  
View on the Tiber Valley (J. P. Hackert, 1799)  
Retrieved from <https://www.invaluable.com/auction-lot/jakob-philipp-hackert-70-c-0c0ba94574>



Revealing Rome's water-based culture

## URBAN RESILIENCE

Since the 1950s we have lived in what the Nobel laureate Paul Crutzen has called Anthropocene, or the geological era of man, in which the most important territorial, biological and climatic changes on the planet are attributed to the human species. (Crutzen, 2006)

In this scenario, cities represent the densest and complex product of this human activity, and are the home of our present and increasingly of our future: in fact, more than 50% of people live today in urban conglomerates, and according to 2018 forecasts of the World Urbanization Prospects almost 70% is expected by 2050. From an environmental point of view, it must be considered that cities occupy less than 3% of the world's surface but are responsible for 75% of the emission of greenhouse gases.

The challenge of our era is therefore in the first instance an urban issue: the growth, in terms of size, and the development, in terms of evolution, of cities must return to consider horizons of liveability, opportunity, equality and, above all, sustainability.

In this modern debate on climate change, urban growth and environmental pollution resilience have gradually become a fundamental concept in urban planning. The project 100Resilient City defines urban resilience as "the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience." (100 Resilient Cities 2017)

The resilience approach, therefore, emphasizes flexibility, diversity, and adaptive learning to replace established socioeconomic management commandments, such as optimality, efficiency, stability, and risk management (Leach, 2008).

FIG. 26  
Girl playing (Author, 2018)



**URBAN RESILIENCE:**  
*applying on the design*

Urban resilience is profoundly identified with the built and natural environment. Understanding the physical features of a city is fundamental in order to understand the social, economic and environmental resilience that can be achieved.

The morphological landscape is a fundamental element in the design and development process. It must consider landforms, ecosystems and open-space networks that shape the natural environment and influence human activity (Von Borcke, 2009).

Considering the topographical, climatic, hydrological and ecological conditions can help to determine advantages peculiar of the landscape and create exceptional results. Landscape elements such as natural waterways, mature trees, historic features, unique habitats and ecosystems can be used within the design (Llewelyn-Davis, 2000, 58).

The notion of landscape infrastructure, e.g. green and blue network is a useful strategy in order to “greening” the city and obtain ecological network inside the urban fabric.

This tool can serve many functions such as: providing wildlife habitat, reducing air pollution and energy consumption, cooling the urban environment, containing, and treating stormwater, and beautifying the city (Beatley, 2008, 190). Designing natural areas will reach performance objectives, such as flood alleviation, show multifunctional urban spaces with many additional social, economic and environmental benefits (Kimpton et al, 2012).

In the case of Rome, as many other cities in the world, the drainage system is centralized, constructed in underground channelled system. This rigid and artificial network is bringing more and more problems, continuous flooding of streets and squares,

manholes and sewers that can't handle the huge amount of water arriving during heavy rain in winter times and little chance of drainage due to the large impermeable surfaces.

Moreover, during the summer, the city faces another huge issue, the urban heat island effect. The Legambiente Report confirmed the worrying phenomenon in Rome, where the temperature increase compared to the historical average was +1.8° (Legambiente, 2017). In the extra-urban areas, richer in greenery and less densely urbanized, the temperature was constantly lower than in the city centre. The heat island effect amplifies global warming on a local scale, making homes increasingly unlivable. The absence of green areas, water channels and paved spaces creates a sort of urban calotte and a reflection of heat from the bottom upwards. For all this reasons, a decisive intervention is urgent: by retrofitting the layout of built-up areas in a water sensitive fashion, more and more public spaces are made greener, carrying additional benefits to the living space; e.g. reducing urban heat islands, air quality regulation, alleviating and adapting to floods and droughts, enhancing social interaction and supporting the restoration of ecosystems in the city (Bacchin et al, 2014). The main concept is to create a design in which the storm-water infrastructure is made clearly visible, working with the water above the ground -the so called green storm-water system (GSI)- rather than use the traditional grey piped infrastructures, exploiting the **green and blue principles** in order to have a healthy and resilient city.

In the following pages, the functioning of the green street, the urban wetland and the watersquare, some green and blue principles, are explained by schematic sections (FIG 2.8, 2.9, 2.10, 2.11).

**FIG. 2.7**  
Climate adaptation toolbox.  
The following toolbox includes climate adaptation solutions, used in the project, that address issues as cloudburst flooding, heat stress, drought and river floods, subdivided in 9 categories.  
Retrieved from J. van Lohuizen, Climate adaptive solutions for the neighborhood, 2014. Edited by the author, 2020

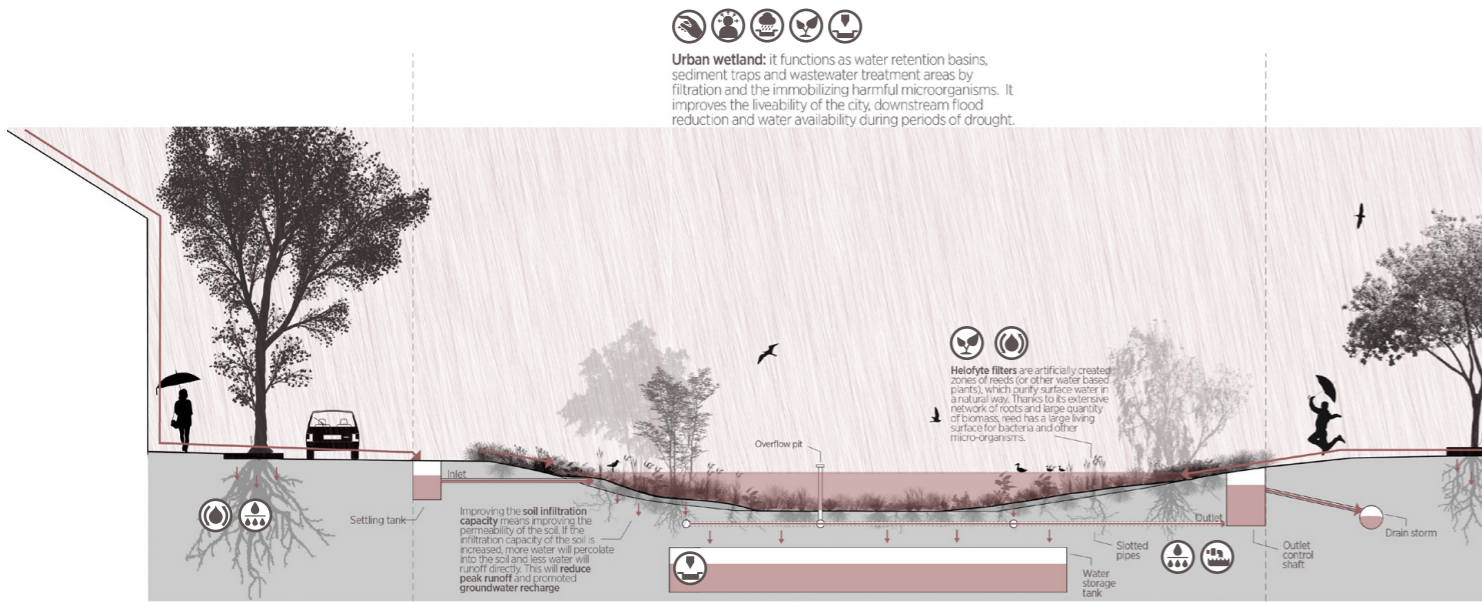


FIG. 2101



FIG. 2102

0 1m 2m 5m

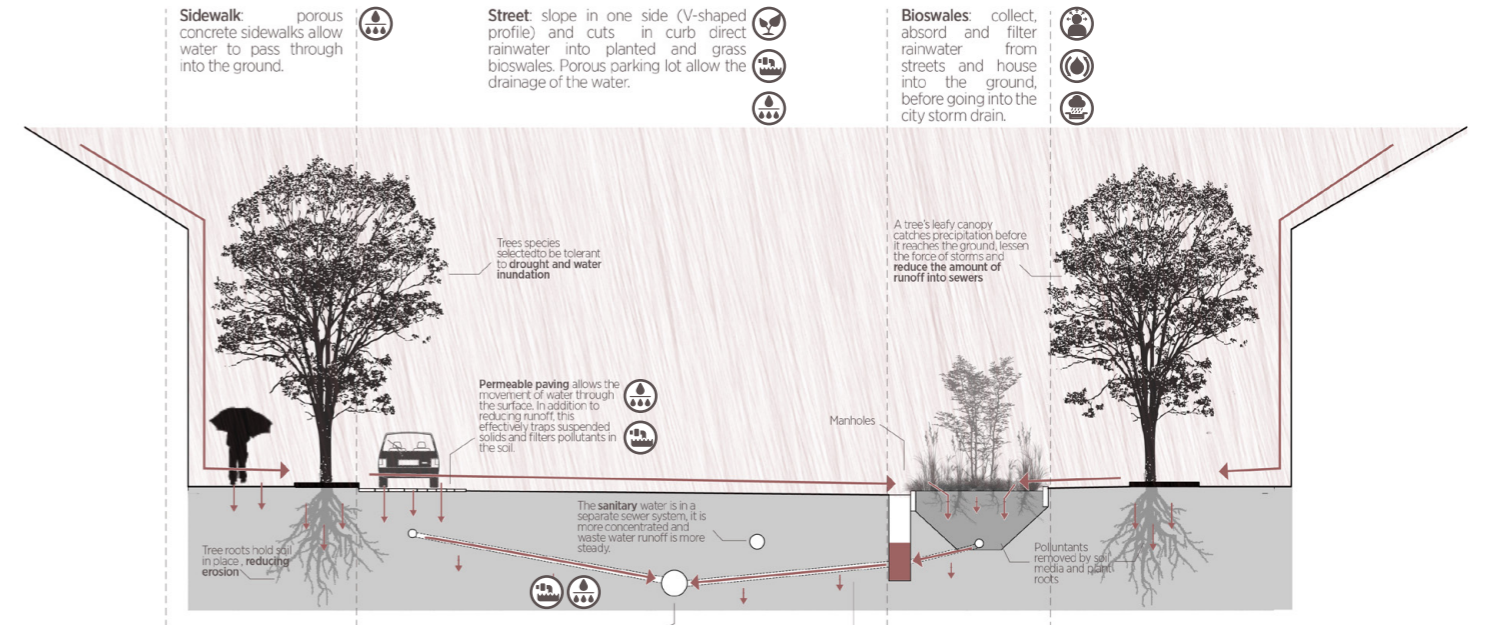


FIG. 2101

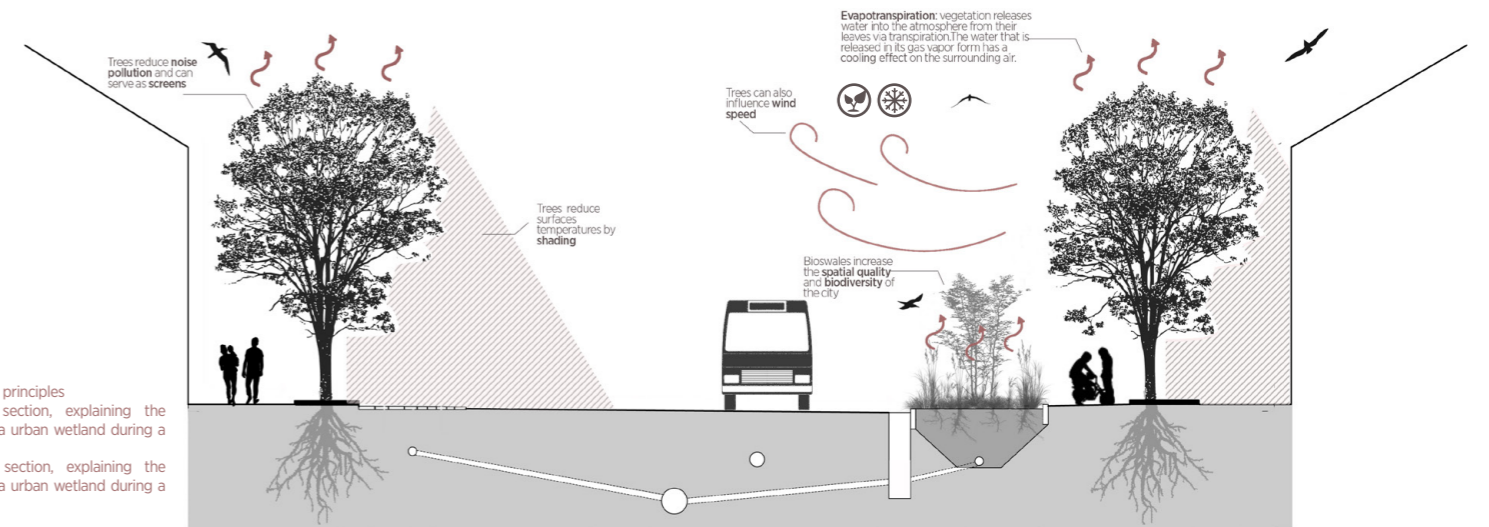


FIG. 2102

0 1m 2m 5m

left FIG. 28  
Green and blue principles  
1. Schematic section, explaining the functioning of a urban wetland during a rainy day.  
2. Schematic section, explaining the functioning of a urban wetland during a sunny day.  
(Author, 2020)

right FIG. 29  
Green and Blue principles  
1. Schematic section, explaining the functioning of a green street during a rainy day.  
2. Schematic section, explaining the functioning of a green street during a sunny day.  
(Author, 2020)



**Watersquare:** it is a multifunctional space and it combines water storage with the improvement of the quality of urban public space. Most of the time it is dry and in use as recreational space but during heavy rainfall lower-lying areas can be submerged. The run-off from the surrounding district is connected to the square by open drains or rainwater drainage systems.

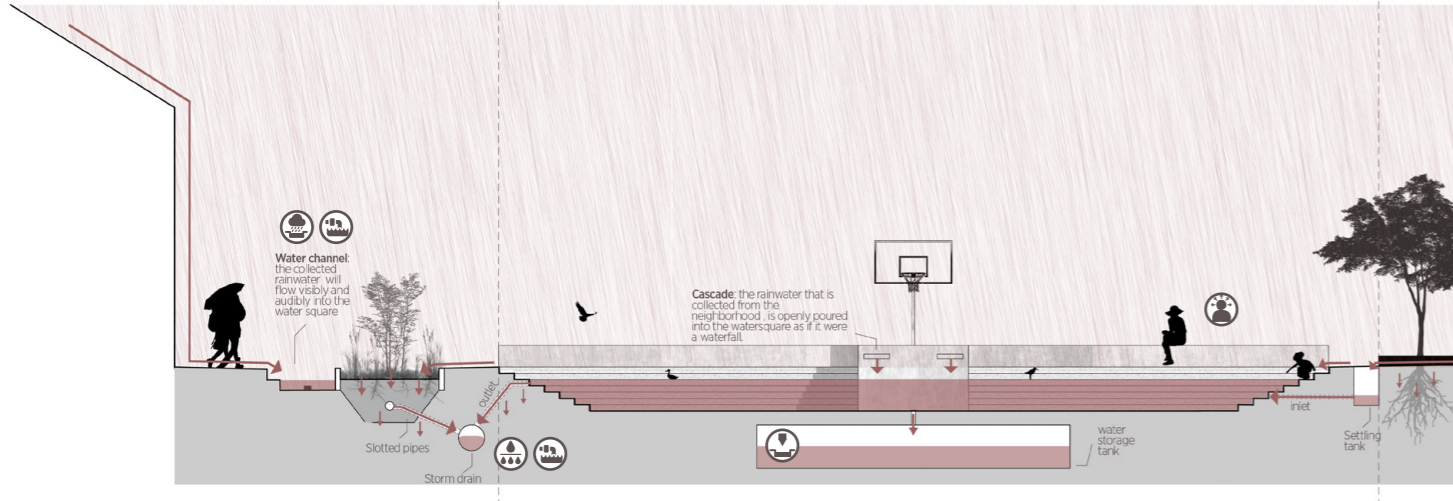


FIG. 2.11.1

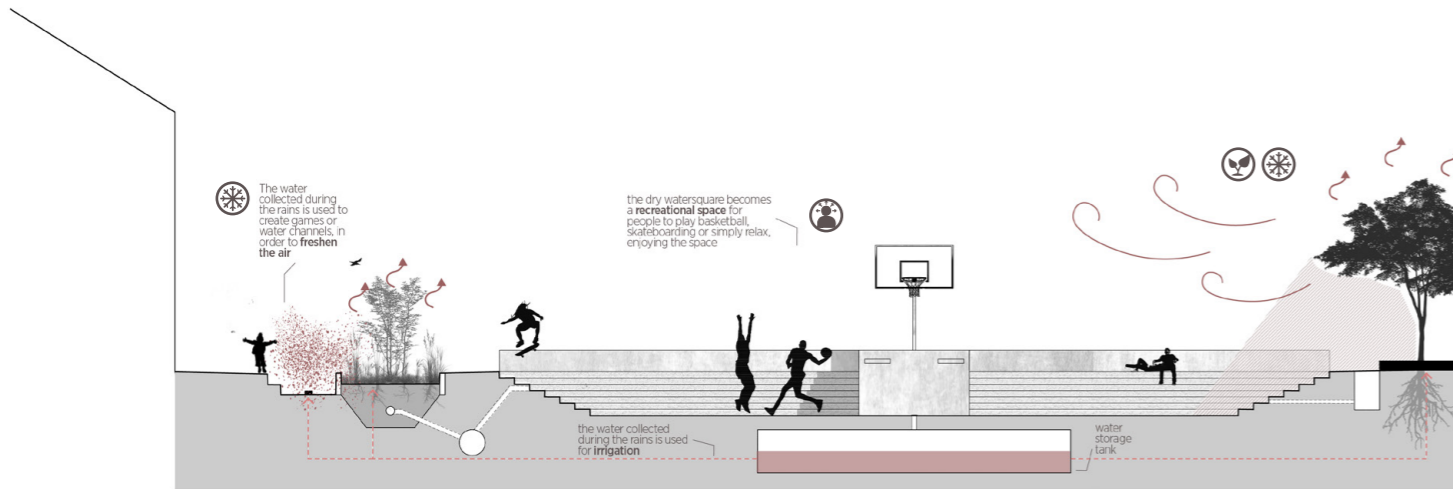
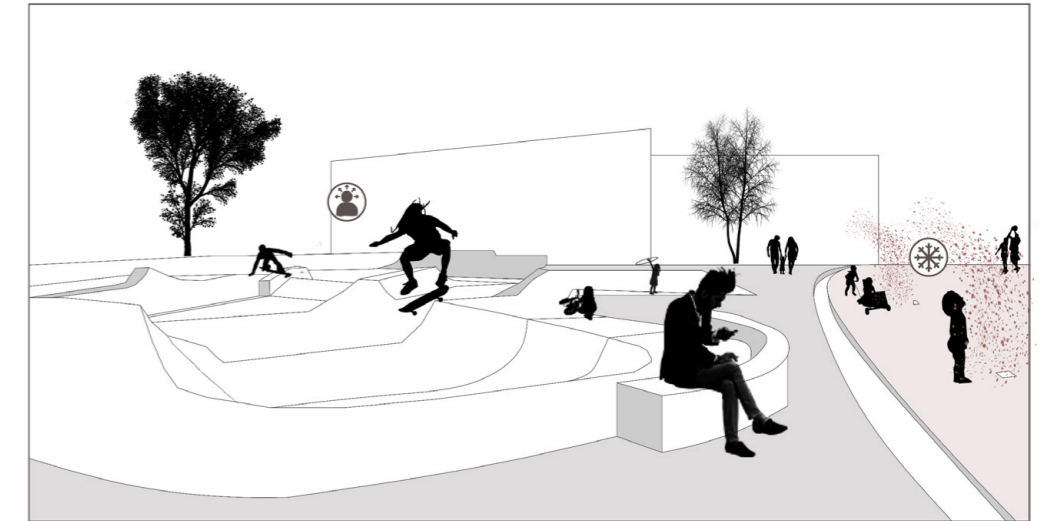


FIG. 2.11.2



left FIG. 2.10

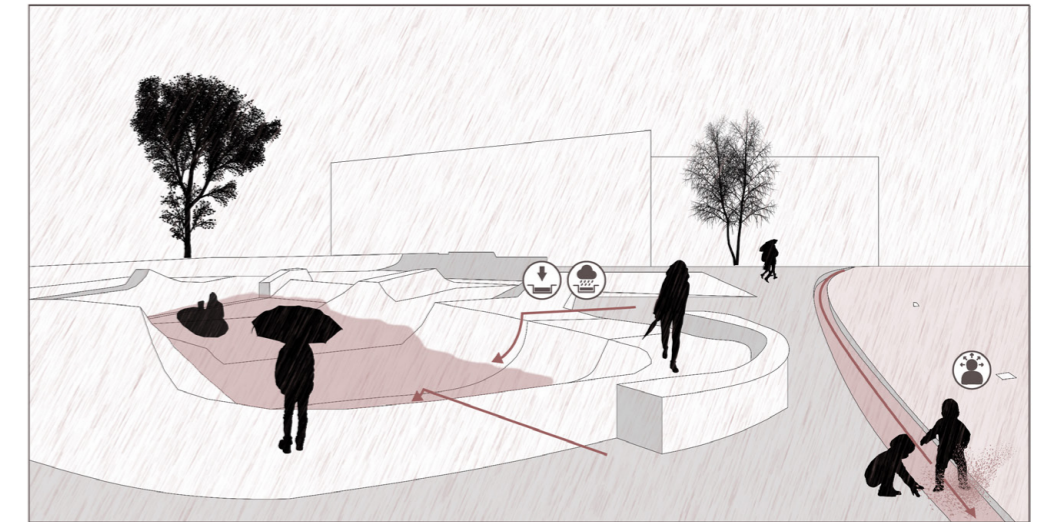
1. Schematic section, explaining the functioning of a watersquare during a rainy day.

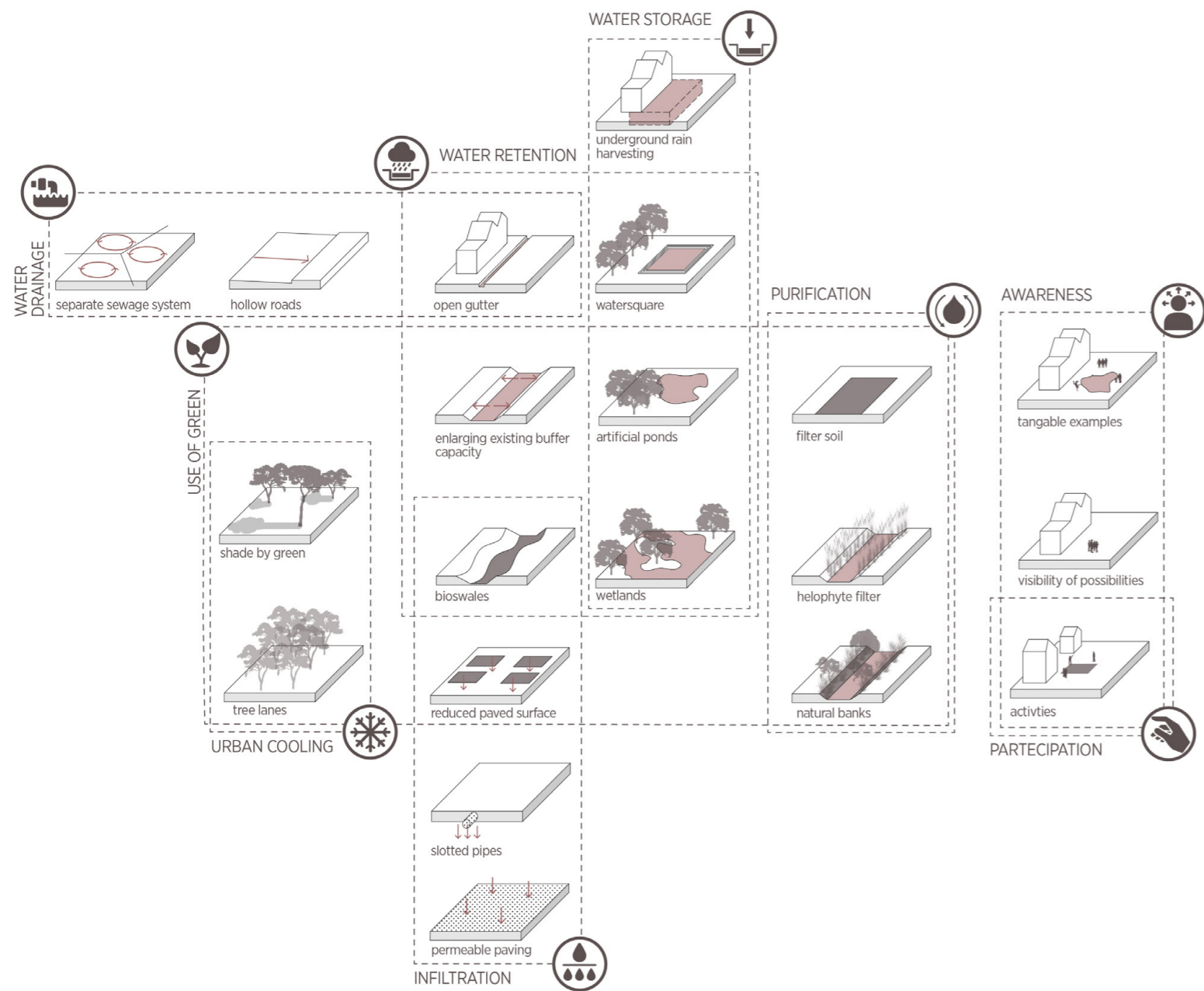
2. Schematic section, explaining the functioning of a watersquare during a sunny day. (Author, 2020)

right FIG. 2.11

1. View of the watersquare during sunny days: it becomes a skate park and playground for kids with some fountains that cool the air.

2. View of the watersquare during rainy days: the space changes completely becoming water basins (Author, 2020)





left FIG. 2.12  
 Overlapped toolbox. Since many design principles address multiple categories, it is difficult to pigeon-hole every single principle into just one category, because they are all interconnected. Retrieved from J. van Lohuizen, Climate adaptive solutions for the neighborhood, 2014. Edited by the author, 2020

Each elements of the designed toolbox contributes to climate adaptation. Each of them is part of more than one category; in fact, the intervention of each of them includes the solutions to several problems interconnected with the others categories, creating a single system (FIG 2.12).

Looking at the previous schematic section (FIG 2.8-9-10) it becomes clear that these strategies do not only contribute to the initial water problem, but also to other topics: such as the shade and evapotranspiration, the Urban Heat Island effect with the increase of green, water purification, soil infiltration, subterranean water storage.

It is no longer necessary to expel water quickly from cities through underground canals, but on the contrary, it is required now to adapt urban spaces to the new climatic situation, so that water can filter through soils, keep it in tanks with the aim of ensuring safety in times of maximum rainfall and have it available in times of drought.

A new approach is needed with necessary targeted strategies such as safeguarding soil permeability in urban areas, the recovery and reuse of rainwater, the use of materials capable of reducing the heat island effect, planting of trees in order to allow more ventilation and shadow in the city and to enhance the biodiversity of the city and the spatial quality, the creation of underground tanks for the recovery and retention of rainwater -with double safety function, because it allows to direct water into the moments of extreme rain towards the tanks and to save water to be used for different uses in public spaces, especially in summer periods-. It is important to underline the relevance of these measures in terms of **raising**

**public awareness** about climate-related issues, through tangible example, as well as promote activities, such as workshops or small community initiatives, encouraging participation of the locals. These can all be solutions that would improve the quality of life in the city as well as mitigate its environmental impact.

Adaptation to the climate is, in fact, the great challenge of the time in which we live in.

# ANALYSIS



FIG. 31  
Bramante Staircase in the Vatican  
Museums (M.Tagliarino, 2015)





Revealing Rome's water-based culture

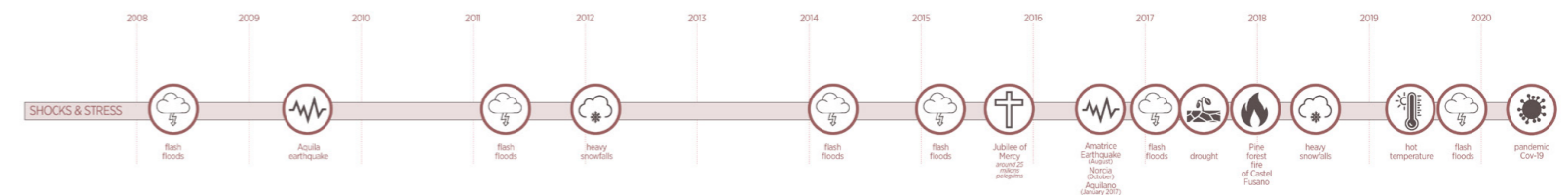
Throughout history, Rome, like many other cities, has had to reconcile the needs of social, economic and political life with granting its spaces to exist within the morphology and territorial characteristics. The rapid urbanization and expansion of the city in the last century have certainly brought a disparity of these demands, also leading to new requests. The city today urgently needs to propose profound transformation to face the need for services and resolve issues brought by a developing populace and a modern lifestyle. One of the characteristics specific to Rome is the need to develop design strategies that address today's challenges by taking into account its history as a complex and fundamental aspect of the transformations that are required (Coppola, 2013).

We need to introduce all the necessary tools that could help the city to understand its resources and opportunities, make it ready for the shocks and stress that are happening more and more frequently. The city needs to build its resilience in reacting to the social and ecological difficulties of its time while considering Rome's really extraordinary nature. An uniqueness that must be protected and enhance.

Today's challenges concern, in particular for this thesis research, the social, ecological, climatic and morphological aspect. From the social point of view, the historic center is plagued by a very high rate of uncontrolled tourism that, year after year, is devouring its essence.

Ecologically Rome is quite well presented with a high presence of parks and green areas, especially thanks to the historical heritage of hunting villas of the Roman nobles and popes. This high percentage is accompanied, however, by poor maintenance of the same and a disconnection between the parks, now soaked in the urban fabric. The aspect of climate change that has caused in recent years heavy floods with high inconvenience to citizens during the winter and dry summers and temperatures above average.

Finally, the chapter culminates with a morphological analysis: the interpretation of Rome's territory. In search of the genius loci of the city, the research explains the indirect relationship between the city, the landscape and its identity.



left FIG. 3.2  
Santa Maria Maggiore (Afp Agence France Presse, 2020)

bottom right FIG. 3.3  
Shocks and stress in the city of Rome from 2008 to 2020 (Author, 2019)



Revealing Rome's water-based culture

## MASS TOURISM

A city like Rome attracts millions of tourists every year: people from all over the world wants to know and visit the eternal city. The development of tourist activities has positive effects especially on the economy of the areas concerned. By favouring the creation of businesses operating in the sector (hotels, restaurants, shops, service activities, etc.) there is, in general, an increase in employment and income of the local population.

However, tourism in recent years, with modern means of transport and economically advantageous travel and accommodations offers, is revealing a worrying aspect.

In an article by Domus, the Italian journalist Marco D'Eramo, denounces the "agony" of the world's historic cities, caused by mass tourism: "It is heartrending to watch the death throes of so many cities. Glorious, opulent and hectic for centuries and in some cases millennia, they survived the vicissitudes of history, wars, pestilence and earthquakes. But now, one after the other, they are withering and becoming steadily less populated, reduced to theatrical backdrops against which a bloodless pantomime is performed. Where life once throbbed, and cantankerous humans elbowed their way through the world, pushing and shoving and trampling on one another, now you will find only ubiquitously similar snack bars and stalls. What was once a bustling din of loud excitement is now all conveniently listed in travel brochures." (D'Eramo, 2014, Domus, n 982)

Unfortunately, Rome doesn't subtract from this description: in the last decades has suffered, and continues to suffer, a worrying depopulation, if in 1951, 370,000 people

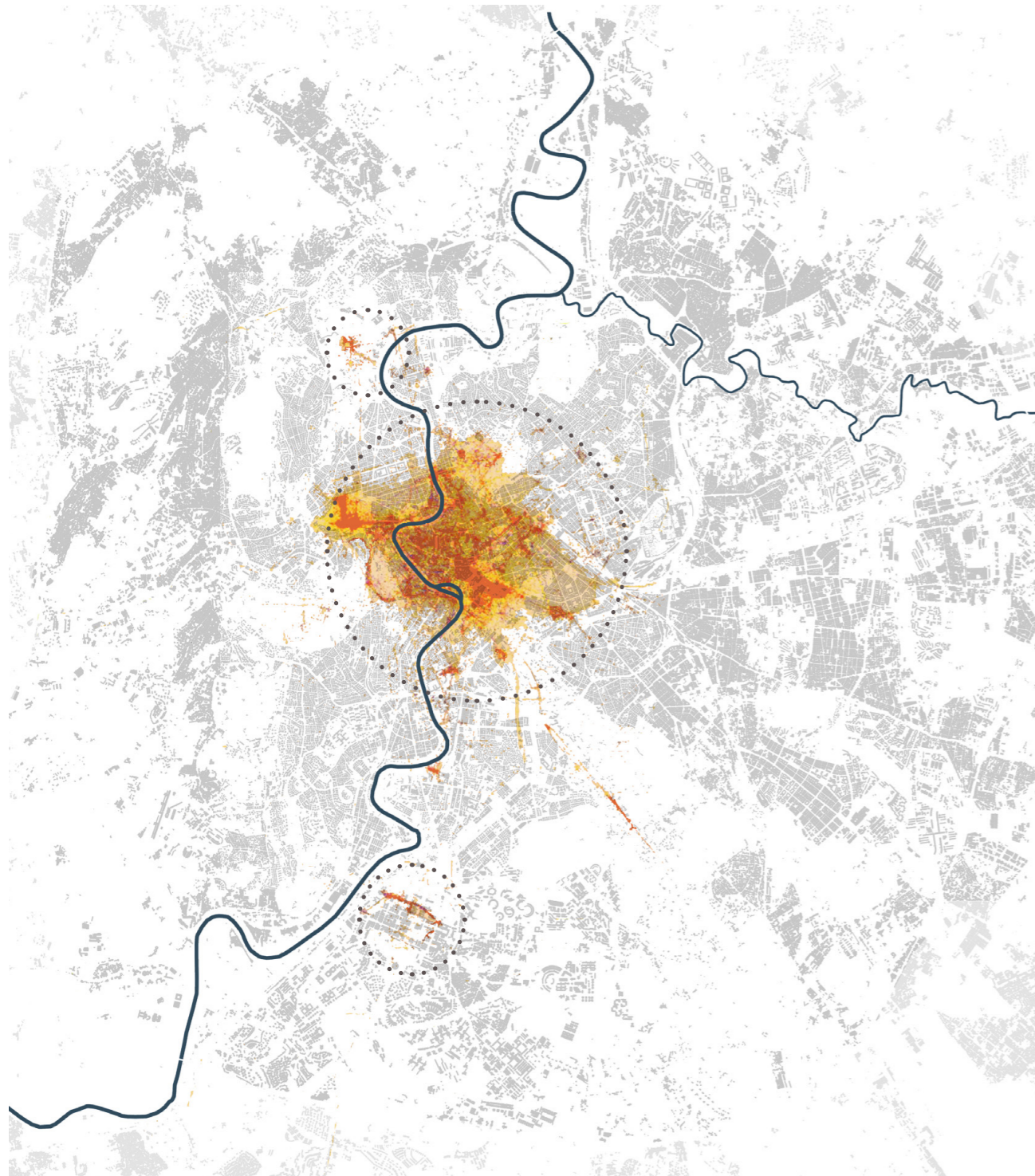
lived in the centre, today there are only 80,000 (Gainsforth, 2018)

A recent report commissioned by the Municipality of Rome for the "Futouroma 2019-2015" project, states that there are now a million more people in Rome every day than its inhabitants. Most of them are tourists, half of whom stay in the city in hotels, bed and breakfasts, etc., and the other half pass through it. The city, therefore, is subjected to continuous stress due to an effective inability to properly host this enormous amount of people, but creating distress to residents and tourists themselves.

Urbanicide -this is how Gaetano Scognamiglio, president of "Promo P.A. Fondazione" has defined this new reality- is the phenomenon that leaves the bodies of urban centers almost intact but kills its soul, in the name of mass tourism, the approval of the commercial fabric, with the end of the artisan shops, local gastronomy and above all with the escape of the residents (Scognamiglio, 2019)

Re-qualifying the historic center means recovering a cultural identity that would otherwise be lost, a cultural identity that, if connected with the surrounding areas, can become an engine of tourist growth, services and therefore also economic growth. Secondly, intervening on existing structures, upgrading them energetically, means safeguarding the landscape-environmental context within which the historic centre is located and consequently raising the level of life quality, is based above all on the perception of the surrounding environment in which each of us lives. Spaces exist only if there are people. And

FIG. 3.4  
Tourists in Piazza San Pietro, Rome (A. Di Meo/EPA, via Shutterstock, 2018)



- Area with a high concentration of tourist
- Area with a medium concentration of tourist
- Area with a low concentration of tourist



the problem of historical centres, not only in Rome but everywhere, is that often there are no longer people living there, but only people who use them, who exploit them. The historical city centre is being reduced to a theatrical setting and, once the activities are closed, it empties and degrades. The challenge is to combine its protection with the need to build new urban spaces where people, residents and tourists, can live harmoniously. The city centre is not only a city of stone, of vestiges, of monuments, but a city of relationships and of human beings: something alive that as such must be preserved.

These data on the right show how real is this phenomenon in Rome. The city has a very high presence of monuments with a modest historic centre of 32 square kilometres. Looking at the map on the left (FIG 3.5) we can note that throughout the city only the red and yellow areas, coincident mostly with the historic area, are the most visited: about 30 million people every year (Istat, 2018) in an area incredibly modest compared to the city. A record that is worrying and needs immediate intervention. Many other areas of the city have in fact an incredible potential but are unknown to most. There is then the growing need to redevelop the more peripheral archaeological areas and create a tourist flow that includes a wider area, leaving the historic centre free to breathe.

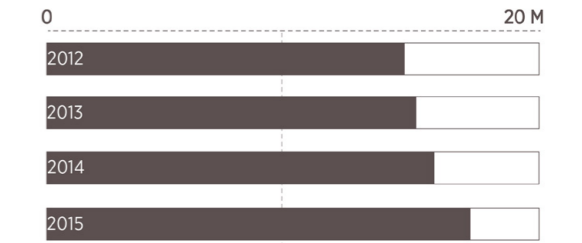
### > 25,000 MONUMENTS

In Rome there are more than 25,000 points of historical, artistic and archaeological interest, undoubtedly an unequalled record.

### 32 km<sup>2</sup> HISTORIC CENTER

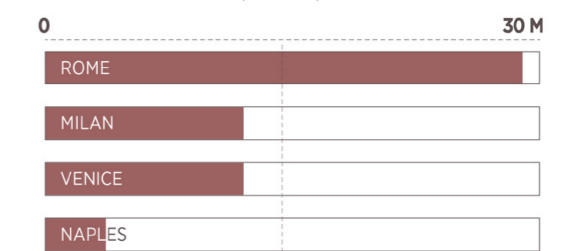
The historic center of Rome has been in the Unesco list of World Heritage Sites since 1980.

#### VISITORS TO MUSEUMS, MONUMENTS, ARCHAEOLOGICAL AREAS 2012-2015 (+19%)



Rome Statistical Office, 2016

#### TOURISM IN ITALY (million)



istat 2018

FIG. 3.5  
Touristic map. It shows the most visited area in Rome. Highlighted the city center, South the neighborhood EUR and North Flaminio neighborhood, that have some relevant touristic attractions (Author, 2019)



Revealing Rome's water-based culture

## CITY AND NATURE

### BLUE STRUCTURE

The city of Rome is connected to its urban waters and rivers. Today, however, as has been said, because of urbanization these landscapes have been lost, while the Tiber remains isolated from its city because of the high embankments (FIG 3.7).

Unfortunately, this progressive forgetfulness of the origins of the city has also led to extreme carelessness. The waters of Rome are on average sufficiently polluted, damaging the aquatic ecosystem and in some cases being dangerous to the health of citizens in the areas concerned.



*left* FIG. 3.6  
Templum of Aesculapius in Rome (J. Benoist, 2012)

*right* FIG. 3.7  
Montages along the course of the Tiber. It is shown the grey and high embankments that completely isolate the Tiber from the city (B. A. Boyes, 2011)



FIG. 3.81

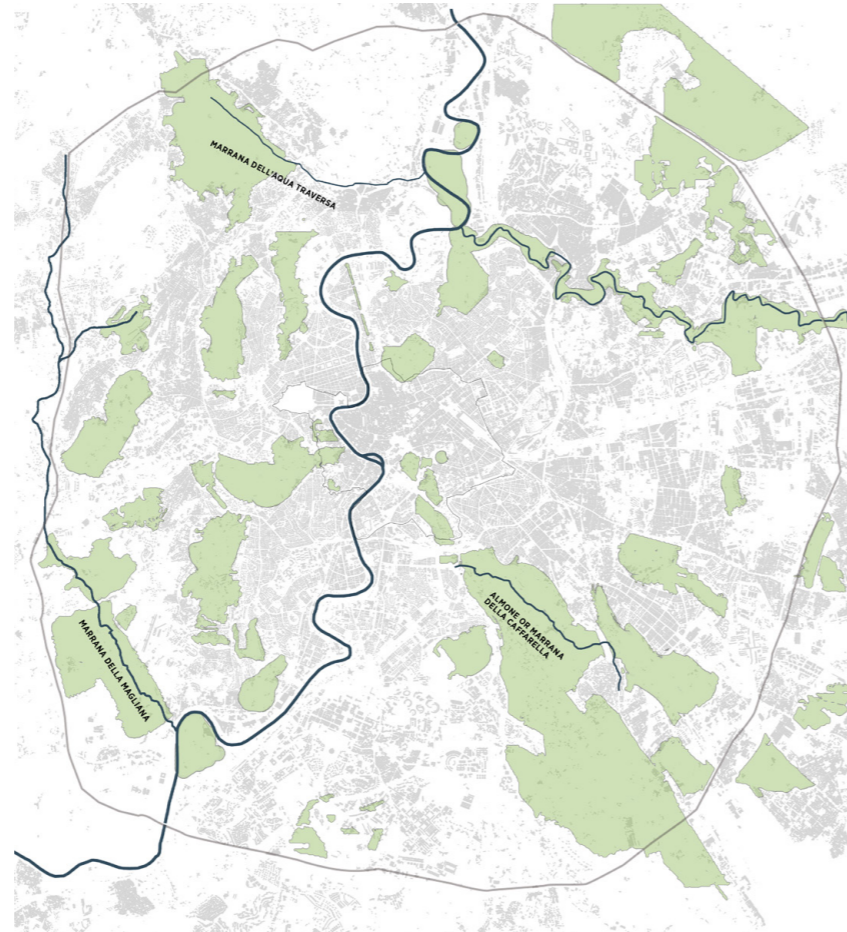


FIG. 3.82

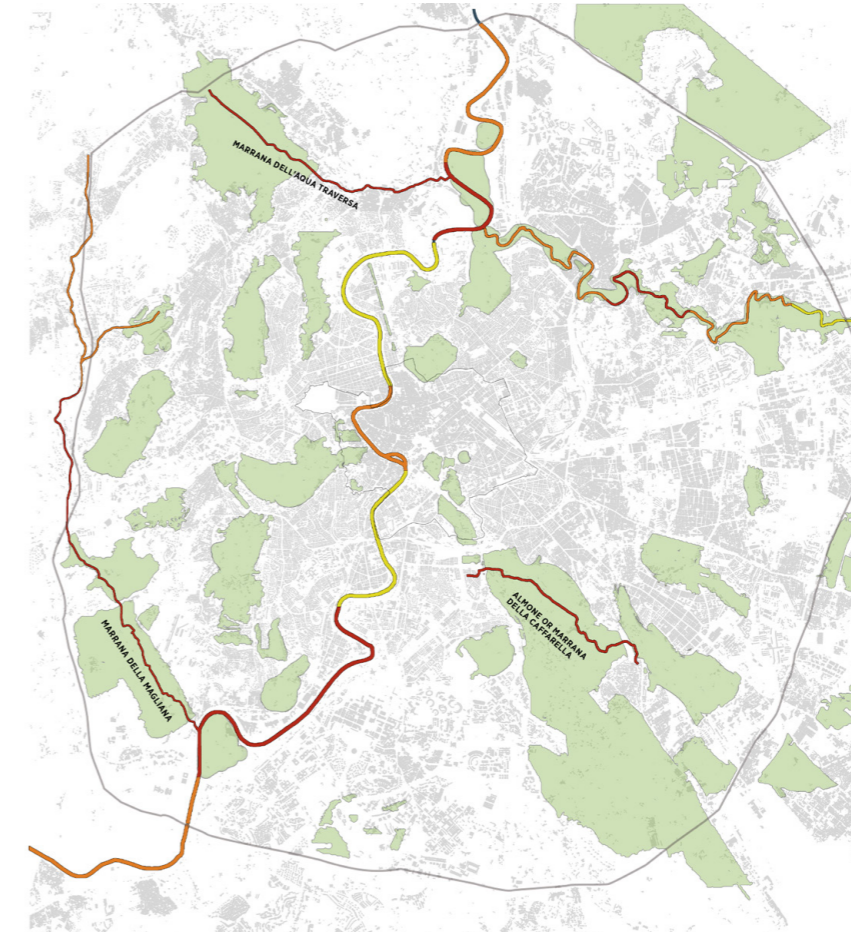
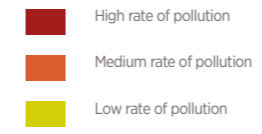


FIG. 3.83

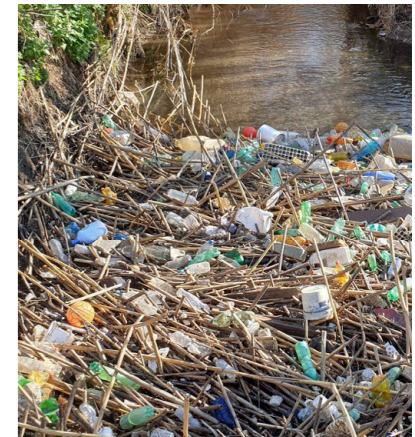


FIG. 3.8  
 1. Waterways present in the city before its expansion  
 2. Waterways left today  
 3. Map of the pollution rate of the waterways today  
 (Author, 2019)

right FIG. 3.9  
 Pictures of Marrana della Caffarella stream highly polluted (Com. Territoriale VII Municipio, 2016), (P. Tar, 2019)



Revealing Rome's water-based culture

## GREEN STRUCTURE

In the report of the Environmental and Green Protection Department of the Municipality of Rome in collaboration with the Civil Protection, it is highlighted that, despite the numerous land use changes that have occurred in the last fifteen years, there are about 43,000 hectares on a total extension of 129,000 hectares of greenery and about 50,000 hectares of agricultural crops, for a total of 13.8 m<sup>2</sup> / inhabitant.

This incredible numbers in the city of Rome is difficult, if not impossible, to see. The large parks are in fact distant from the historic center and are poorly connected and often unknown to most. The consolidated city offers several public parks but the maintenance is often lacking. Despite this incredible disposition of parks, therefore, there is a need for a coherent development and design, as well as greater maintenance, of urban greenery in the city to ensure a better exploitation by its citizens.



left FIG. 3.10  
Vatican Gardens (S. Bauer, 2013)

right FIG. 3.11  
Caffarella Valley from above, to note the vast green area embedded in the urban fabric (Unknown)  
Retrieved from <https://paesaggiogenerazioneperiferie.it/roma-rete-ecologica-2/>



*fraxinus ornus*

*quercus robur*

*quercus cerris*



*larus michahellis*

*columba livia*

*passer italiae*



*ulmus minor*

*sambucus nigra*

*platanus orientalis*



*actitis*

*alcedo atthis*

*remiz pendolinus*



*populus nigra*

*salix alba*

*populus alba*



*phalacrocorax carbo*

*ardea cinerea*

*gallinula chloropus*



*sinapis pubescens*

*galanthus nivalis*

*gallium mollugo*

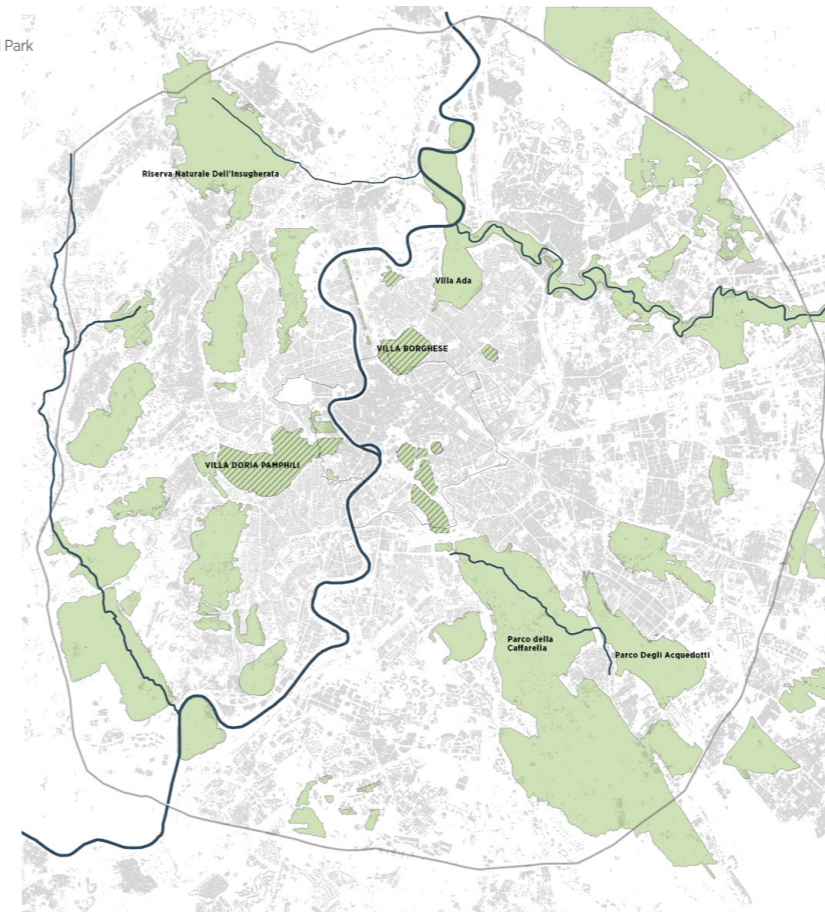


*lutra lutra*

*sorex araneus*

*bufo bufo*

■ Parks  
■ Archaeological Park



827 km<sup>2</sup> Surface area of natural capital

URBAN GREEN SPACES OF HISTORICAL, ARTISTIC AND CULTURAL VALUE (sq m)



istat 2014

Around 2,800,000 inhabitants with:

- Protected areas 87 800 ha
- 41 000 ha parks and natural reserves
- 53 000 ha agricultural areas
- 11 000 archaeological parks
- 1550 species of spontaneous flora in the GRA
- 1990 spontaneous or naturalized tree species

left FIG. 312  
The most common flora and fauna in the city of Rome (Author, 2019)

right FIG. 313  
Map of the green areas in Rome (Author, 2019)





Revealing Rome's water-based culture

## CITY AND CLIMATE CHANGE

### FLOODS

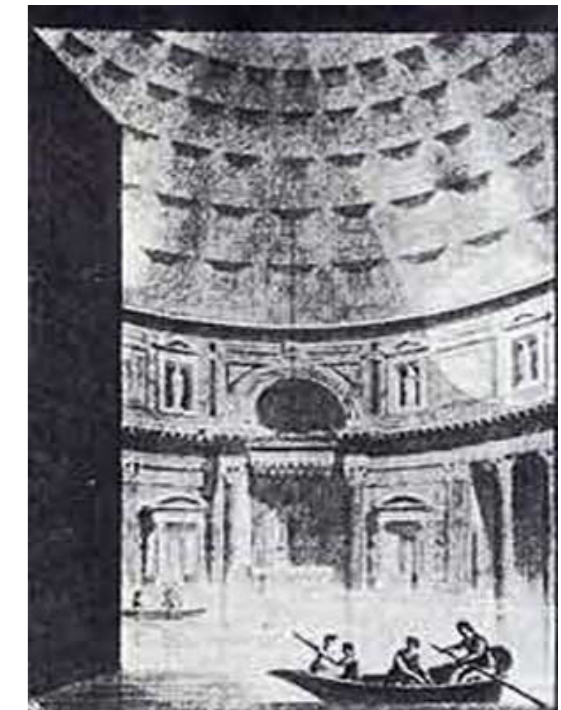
The phenomenon of floods affecting Rome has ancient origins. In fact, since its foundation, the city has always been linked to the events of its river, which is still witnessed today, thanks to gravestones placed in the historic centre on which are reported the levels reached by the floods. The problem of flooding in the past was linked to the existence of marshes located at lower altitudes that communicated with the Tiber and was further aggravated by the construction of the *cloacae* (sewers) which flowed directly into the river, contributing to the flow of water. Some periods were characterized by a strong respect and enhancement of the river, while others were marked by degraded conditions, with disastrous consequences in case of flooding, due to poor management and maintenance from the Tiber riverbed. All this was put a first brake at the end of the 19th century with the construction of the *Muraglioni*, still present today, in order to contain the floods along the embankment, which however determined a change in the river landscape. There have been **20 episodes of intense flooding in the metropolitan city of Rome in the last 7 years**, one of the highest in 2012 reached 13.49 meters high.

However, the repetitiveness of the events has shown another element of criticality linked to the development of the city, not so much with respect to its intrinsic hydrological risk, but to its **inability to absorb even modest rainfall** due to its often abusive urbanization and therefore carried out in areas at hydrological risk and with inadequate sewerage.

The risk today concerns an urban area of 1,135 hectares where about 250,000 people

live and work, it is the highest exposure in Europe. Rome has areas that are flooded even just for a few hours of rain. This is due to an inefficient sewage system, the lack of maintenance of the manholes and approximately 700 km of indispensable tributary waterways of the Tiber and Aniene are inefficient and largely disappeared.

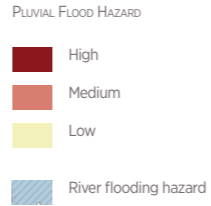
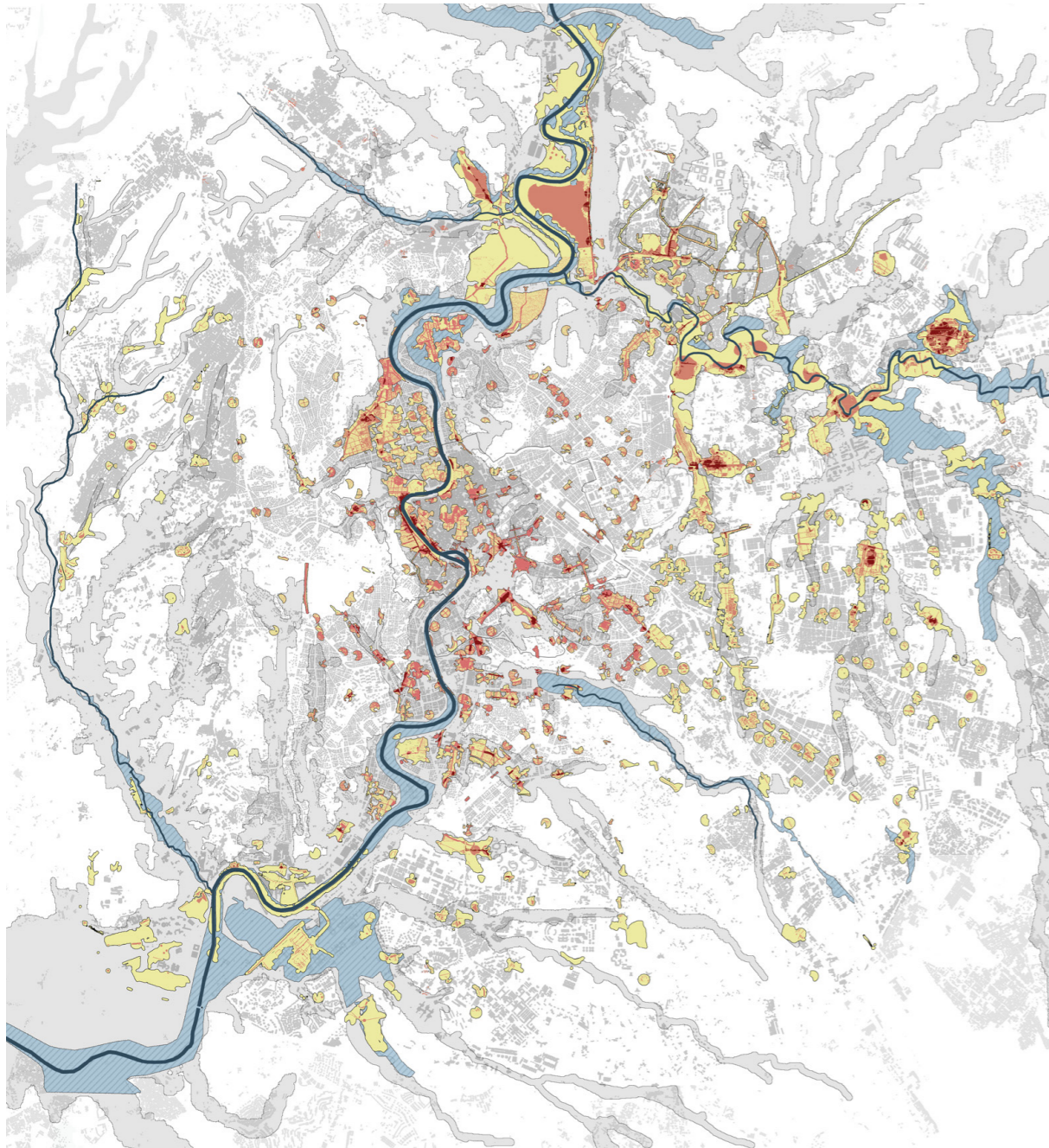
As you can see from the map on the following page (FIG 3.14), the areas most at risk of flooding are especially the areas of the old town, as they are at a lower level of the modern city, and all those areas built on the old hydrographic grid.



left FIG. 3.14  
Flooded Piazza Navona during the heavy rainfall occurred in November 2019 (Unknown)

right FIG. 3.15  
Flooded Pantheon (G. Panini, 1740)  
Retrieved from <http://www.luciomariapollini.com/cultura/enrica%20vinci/11%20tevere/foto%20tevere/072%20-Pantheon1910.jpg>



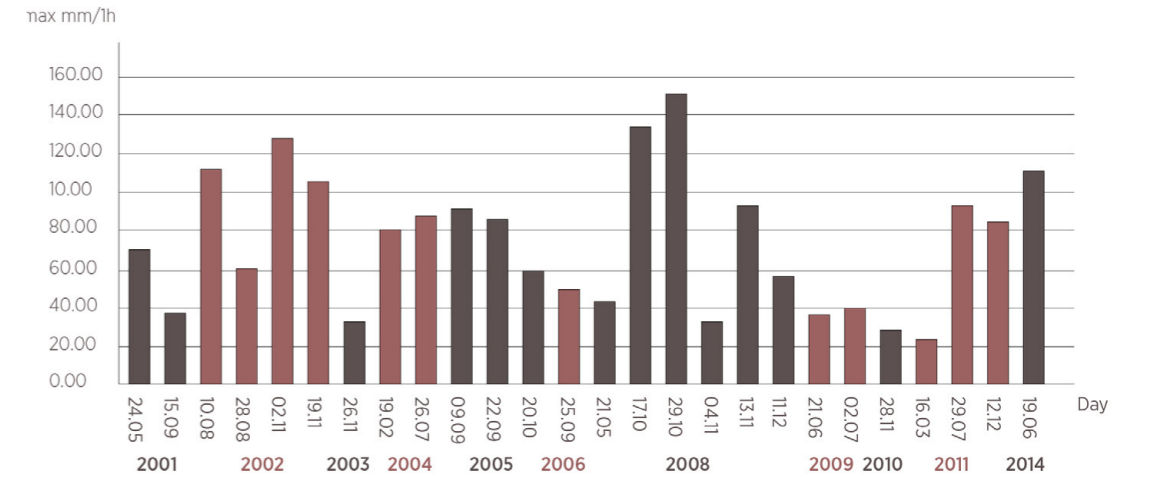


## > 250,000 PEOPLE AT RISK OF FLOODS

More than 250,000 citizens live in areas where there is a high risk of flooding, one of the highest in Europe.

### DOCUMENTED PLUVIAL FLOODS BETWEEN 2001-2014

The number of observed floods considerably rose from 2008



istat 2017

left FIG. 316  
Map of flood hazard in Rome (Rome, 2019)

right FIG. 317  
Rome flooded during a rainstorm in November 2019 (Unknown)  
Retrieved from <http://www.totalita.it/articolo.asp?articolo=8868&categoria=5&sezione=30&rubrica=> and from [https://www.repubblica.it/cronaca/2020/04/22/news/meteo\\_piogge-254672345/](https://www.repubblica.it/cronaca/2020/04/22/news/meteo_piogge-254672345/)





Revealing Rome's water-based culture

## DROUGHT AND URBAN HEAT ISLAND

According to NASA, from 1964 to 2017 average global surface temperatures rose by 0.17-0.18 °C. (Nasa, 2018)

In 2017 one of the hottest springs and summers in Italy in the last 60 years was recorded, some regions saw 80% of the average rainfall below normal (Coldiretti, 2017).

In a perspective of change in seasonal rainfall the risk is that there will be more and more empty catchment basins and lakes, dry streams and rivers, with impacts both on crops and livestock and in cities.

In 2017, in the four main Italian catchment areas (Po, Adige, Arno and Tiber) the average annual flow rates recorded an overall average reduction of 39.6% compared to the average of the thirty-year period 1981-2010.

In this year the city of Rome has recorded a very **serious period of drought** and heat.

The water crisis, due to a lack of rain - that means also less infiltration into groundwater reserves- but also a poor management of the city's hydraulic system - sections of the ancient Roman aqueducts are still used and they are notoriously leaky - has led to rationing drinking water for eight hours a day for a million and a half Rome residents. *Bracciano* lake, which provides 8% of the water for the city has dropped by 150 cm, a level so low had never been recorded.

The famous *nasoni* and fountains of the vatican have been closed and Rome one of the most famous cities for its fresh and available water, found itself on its knees, bent by a drought that lasted throughout the summer of 2017.

To these factors, it needs to be added the problem of the heat waves during the summer season: the air temperature in the city not only reaches higher values than in

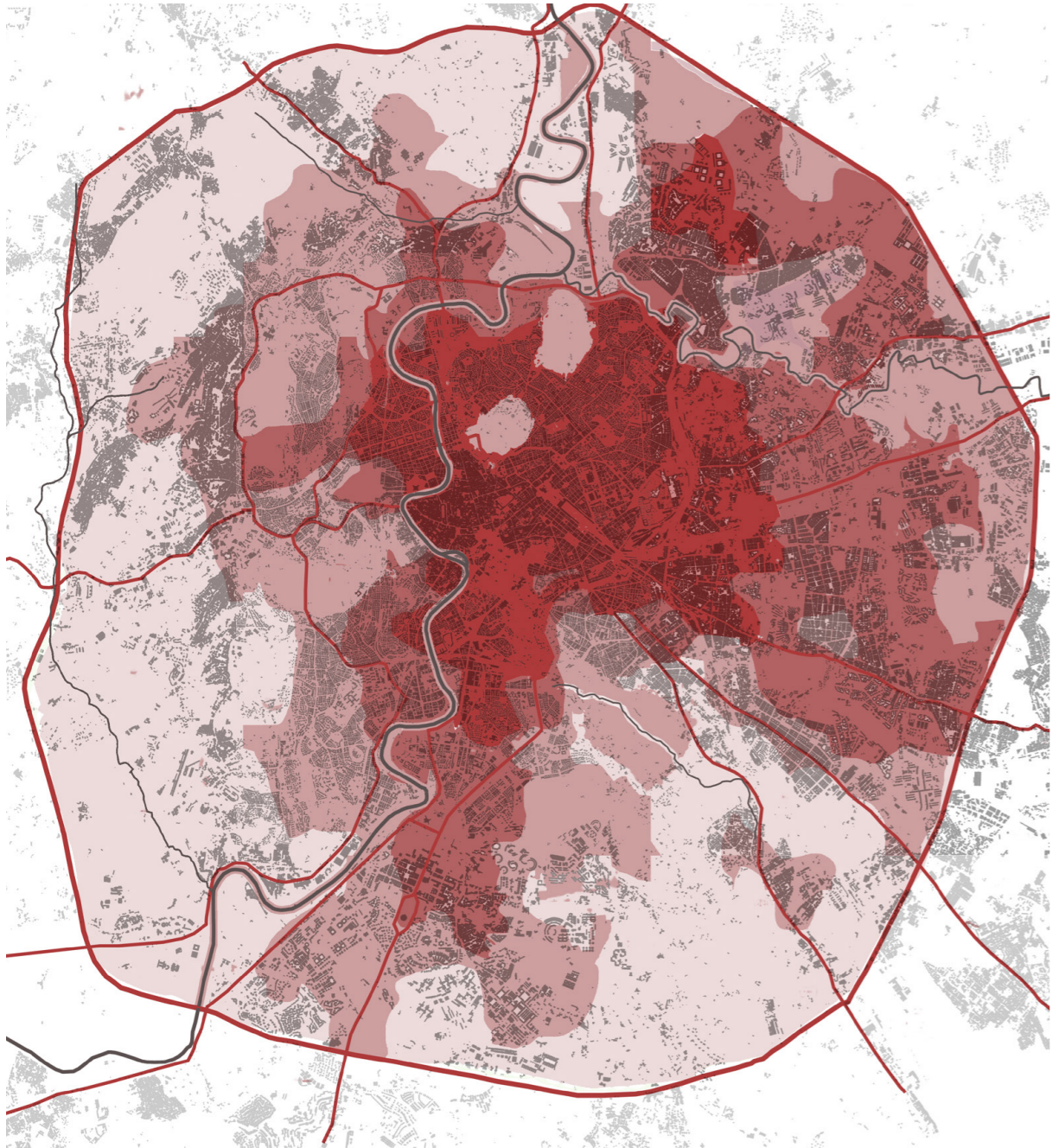
the surrounding rural areas during the daytime, but also remains high during the night, reducing the human organism's ability to recover from the extreme heat conditions to which it has been subjected during the day. The heat in urban areas sometimes becomes unbearable. The numerous waterproofed surfaces absorb solar radiation and overheat the surrounding environment. This is called the **urban heat island** effect (UHI). Days of heat-waves and tropical nights pose a threat to the health of the urban population.

In the month of July, temperatures throughout Italy were at least 2 degrees above average. (Legambiente, 2018)

The high temperatures due to climatic phenomena related to global warming have a considerable impact on large urban areas, where in cities like Rome the perceived temperature is over 40 degrees.

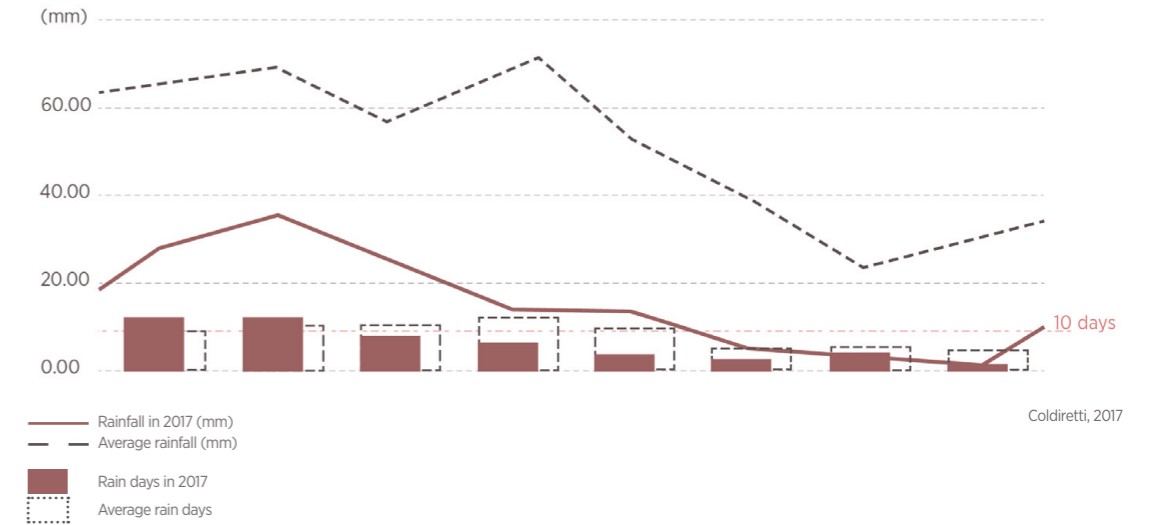
As can be seen in FIG 3.19, next page, in the most central and densely populated areas of Rome the problem of the heat island is real, reaching an average soil temperature of + 4 degrees. The roads and in particular the highway surrounding the capital (gra) are sources of extreme heat due to traffic and concrete. It is interesting to note that, within the city centre two areas remain significantly cooler: they correspond to the two parks of Villa Ada and Villa Borghese, the vegetation in fact provides important shading effects as well as cooling through evaporation.

FIG. 3.18  
Tiber river completely dry (G. Cipriani for New York Times, 2017)



### -52 % RAINFALL AVERAGE

In 2017 rainfalls decreased with respect to the historical averages.



### 31 °C HEAT ISLAND

A study carried out by the Institute of Biometeorology of the National Research Council established the risky situation created by heat islands amongst vulnerable people. In Rome the highest risk is recorded in the summer months when the ground temperatures reaches 31°C.

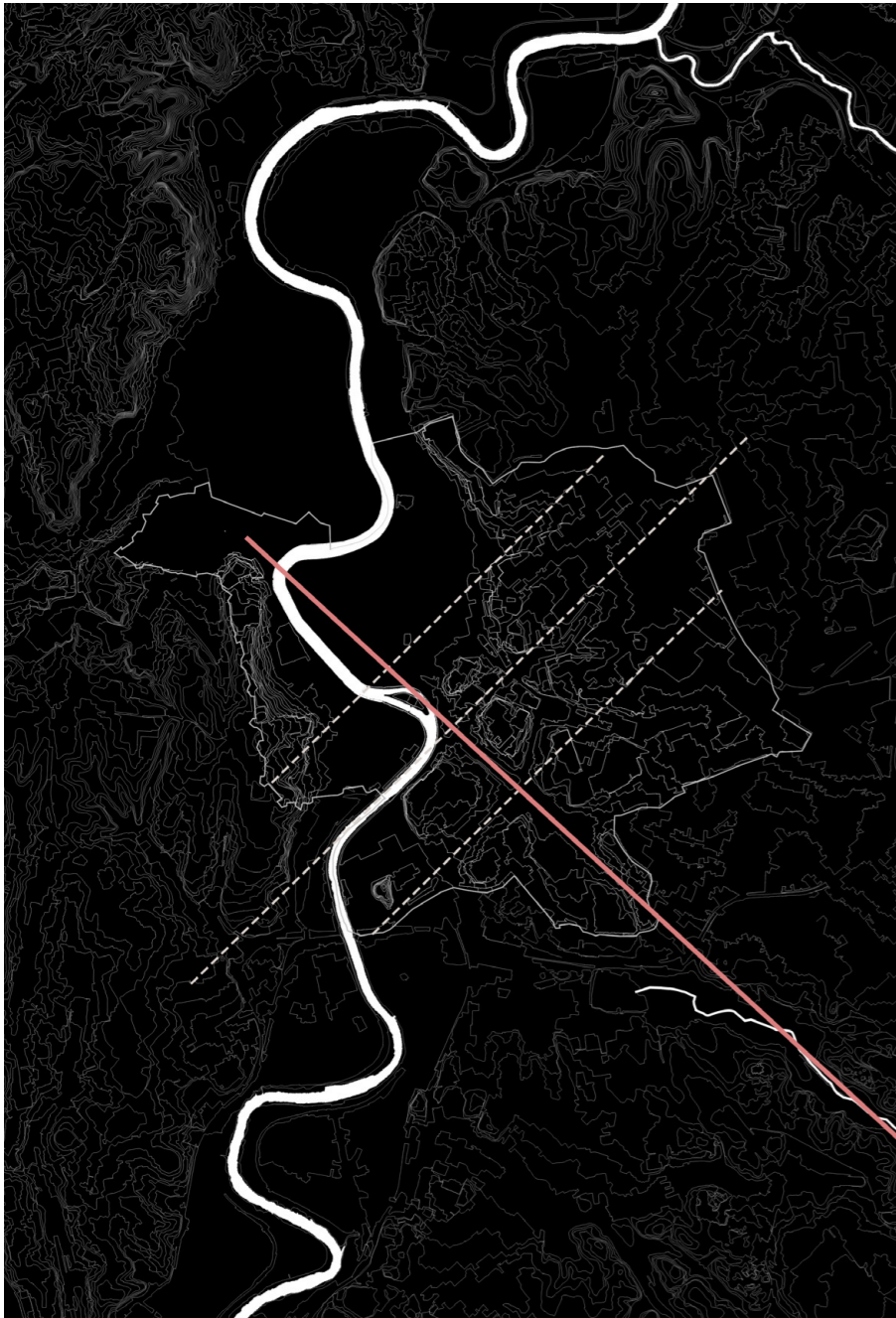
CNR, 2015

left FIG. 319

Retrieved from: <https://slideplayer.com/slide/10443989/>. Edited by the author, 2020

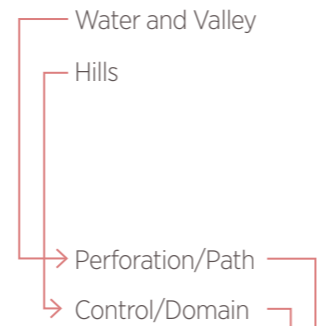
View of Cavour bridge, below runs the Tiber extremely dry during the water crisis (G. Cipriani for New York Times, 2017)



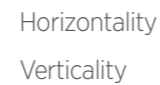


## DUALISM

### GEOGRAPHICAL MEANING



### GEOMETRICAL MEANING



## CITY AND GENIUS LOCI

### INTERPRETATION OF THE TERRITORY

“First of all man aims to specify the natural structure. Where nature suggests a delimited space, he creates a fence; where nature is “centralized”, man erects a mall, where it indicates a direction, he opens a path”. (Norberg-Schulz, 1981)

Norberg-Schulz’s quote is important in the next phase of my analysis, it highlights an intrinsic relationship between the natural and artificial landscape. What is this relationship in the specific case of Rome?

Looking at some of the main Italian cities we can notice in their structure a certain order and symmetry, the main axis divides the city by organizing it in sub axes (FIG 3.20). The same is not, however, applicable to the city of Rome. At first analysis, the city pattern seems chaotic and irrational, but, in reality, the primeval matrix of the city of Rome is to be found in the natural structure of the territory on which it was built.

The presence of the Tiber and the hills, on which it was founded, generate the natural matrices of the city and define its geographical order.

The main axes that synthesize the geography of the Urbe are therefore positioned according to the course of the river: the first with north-east / south-west direction crosses the valley between the Palatine and the Capitol; while the second, with north-west/south-east orientation, crosses the

valley of the Circus Maximus, at the foot of the Palatine and Aventine hills, and the Tiber Island.

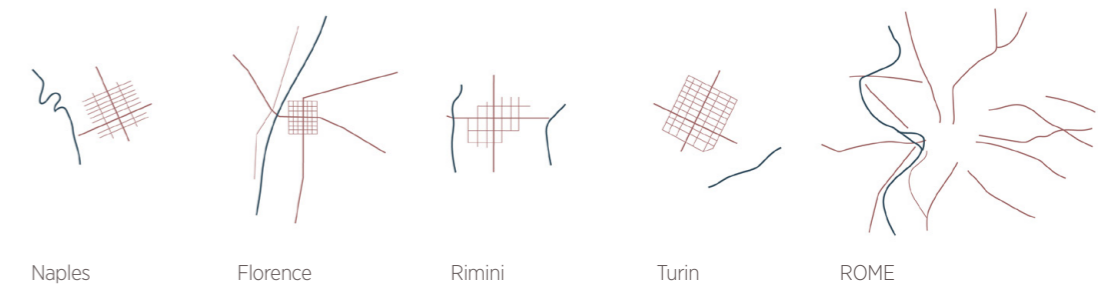
The scanning of the elements of the territory in the area of Rome according to the above-mentioned axes is therefore determined by the simultaneous presence of water, valley, island and hills, elements that characterize and define the area.

If, on the one hand, the river, the valley and the island determine the space and give it an orientation, on the other hand, the hill has a more complex meaning. It becomes, in fact, the point of control of the Urbe and prevarication over the valley.

Rome, therefore, presents a dualism in its intrinsic nature that links the concept of axuality with that of geographical dimensionality. The axes determine the penetration and the path, proper to the valleys and the river, which have a horizontal dimension. The hills, on the other hand, which are pickets of the territory, therefore have a vertical prerogative with the function of dominating the territory.

The geographic interpretation of the place led to the identification of axes capable of tracing a synthesis of the place itself.

When they say, “all roads lead to Rome”, it’s literally true. Precisely because of its configuration so linked to the territory, roads and buildings have developed around



left FIG. 3.19  
The axis with North-West/South-East direction (Author, 2020)

right FIG. 3.20  
Urban composition of some Italian cities (Author, 2020)



Revealing Rome's water-based culture

a centrality still clearly visible. In fact, the consular roads of ancient times, many of which still exist and function, connected the most disparate places of the Roman Empire with the city itself, converging all in the same point: the Palatine hill and not by chance, at the bottom of it, was located the Forum, one of the most important commercial, social and cultural places of the time.

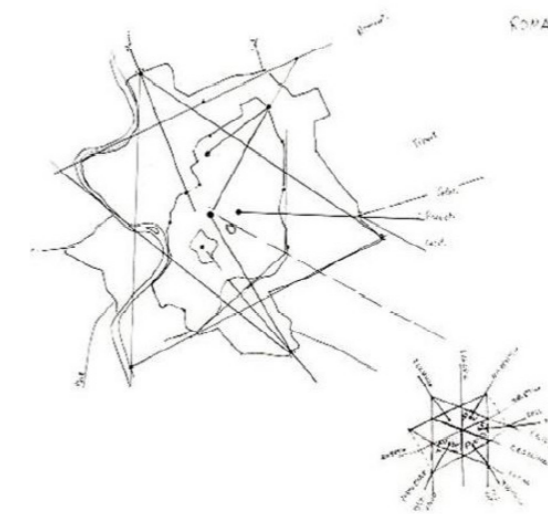
Saverio Muratori, an Italian architect, who focuses his study on the typomorphological investigations of urban form, in the early 60s hypothesized an urban geometry of the city (FIG 3.22), emphasizing also the role of the Aurelian walls that have influenced, and still influence, the geometric shape of the city. To the Aurelian walls was added, at the end of the '50s, the gra, literally Great Ring Junction, an important highway that surrounds the newly expanded metropolis, emphasizing the concentric organization of the city. (FIG 3.23)

It is an analysis of the city made not by the administrative borders but thinking the city as characterized by a continuous and uncontrolled growth, it is a metropolitan

organism with a territorial dimension and "tentacular" shape: a multi-city made by lineal system grown through the process of densification and extension on the consular roads as a radial infrastructure system. These linear and radial infrastructures configure an extended and discontinuous city organism that is crossed by landscape system- forests, humid areas, Agro Romano and rivers system - that penetrate the city reaching the archaeological center.

At the beginnings, Rome is a compact city with flows and mobility dynamics concentrated in a monodal system, then it evolves in the XX century into a city with a centralized system and innervated by central-periphery connections along with the radial infrastructures.

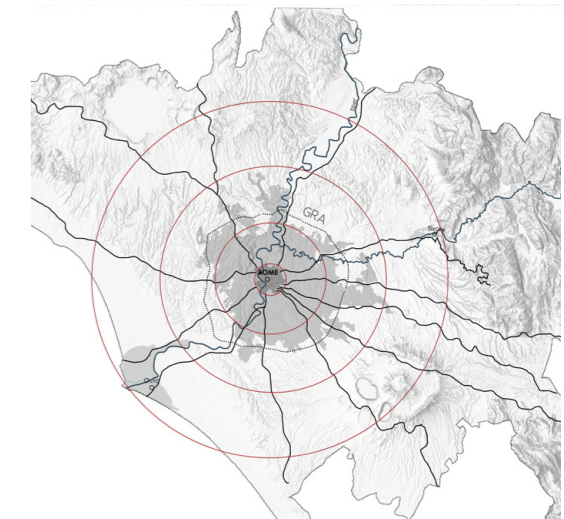
Today, it is necessary a next step to make the city's system more distributed and resilient by allowing transversal connections, passing from passive to active territory.



left FIG. 3.21  
The Circus Maximus and the Tiber River emphasize the structure of the axis (Afp Agence France Presse, 2020)

right page on the left side FIG. 3.22  
The geometry of Rome in a drawing from the early 1960s by Muratori (after Bollati S., 1984, p. 55).

right page on the right side FIG. 3.23  
Centrality of Rome. In the map in black are shown are the consular roads, still working today (Author, 2020)



# DESIGN



FIG. 41  
Roman Forum (Author, 2017)



Revealing Rome's water-based culture

## SITE SELECTION

The previous analysis of the territory -the identification of geometrical axes, the consular roads, the centripetal order of the city and the importance of the territory as an active component of the city- help into the determination of the area of study.

In fact, the chosen area is along the **axis north-west/south-east orientation**, that, not by chance, coincides with the consular road of via Appia Antica.

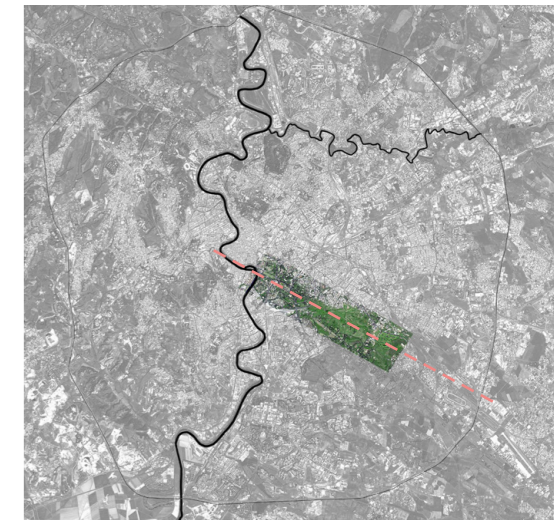
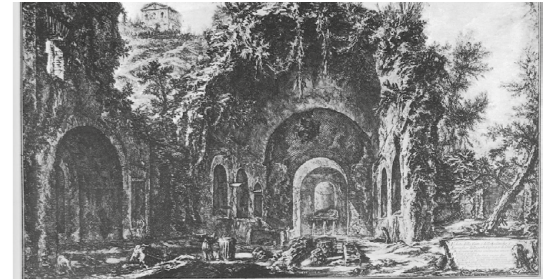
The via Appia Antica is one of the earliest and strategically most important Roman roads of the ancient republic. It connected the city of Rome to Brindisi, in southern Italy, for a total of 62 km. Along its entire stretch, you can find interesting archaeological artifacts that make this route even more important.

This axis is triggered in the Caffarella valley and in the valley between the Palatine and Aventine hills, taking advantage of the natural topography of the city. It is important because it symbolically connects the historic centre, the heart of the city itself, more urbanized made of relics, history, people and dynamism with an area of Rome, equally historically important, but defined by a more natural, wild and peaceful setup. At the beginning the **Palatine hill**, where the city of Rome originated, a symbol of control and superiority over the neighbouring populations, around which the most important historical events occurred;

on the other hand, the **Nymphaeum of Egeria**, linked to mythology, mystery, faith, traditions of the city of Rome. According to the myth, in fact, the second king of Rome, Numa Pompilius, had fallen in love with a nymph of the waters, Egeria. Then, Egeria helped King Numa in the development of newly founded Rome by composing laws and regulations, on which the city was grew.

After the king's death, Egeria wept in pain, until she became a spring on which his nymphaeum was built and from which the sacred water of the Romans lives, still drunk by the Romans today.

Therefore, it is an axis in which contrasting elements coexist, historical events with traditions, artificiality with naturalness, domination with submission; visitors who go along this axis will experience a gradient that leads them from urban to rural, from **history to myth**.



left FIG. 4.2  
Appian way (P. Hermans, 2017)

top right FIG. 4.3  
Veduta del Ninfeo Egeria (G.B. Piranesi, 1750)  
Retrieved from <https://www.rijksmuseum.nl/en/collection/RP-P-OB-39.375>

bottom right FIG. 4.4  
Chosen site highlighted in the map (Auhtor, 2020)

Palatine Hill



- Old river bed
- Consular Roads
- Axis

Nymphaeum Egeria

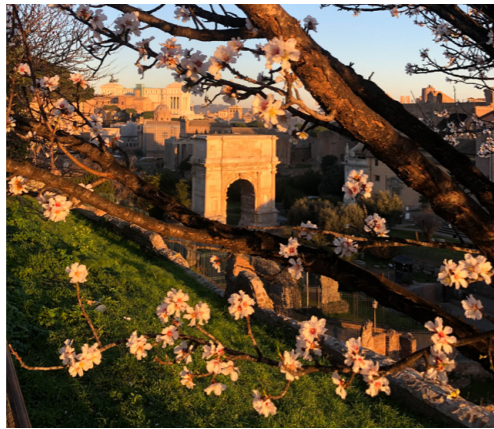
CITY CENTRE → SUBURBAN  
 GREY → GREEN  
 URBAN → RURAL  
 HISTORY → MYTH



top left FIG. 4.5  
 Overview of the site (Author, 2020)

bottom FIG. 4.6  
 Montage of the route, from urban to nature (Author, 2020)





This axis is important not only from a cultural and historical point of view, but also from an ecological one. In fact, until shortly before the construction of the railway in the 1990s, this axis formed a large urban corridor, one of the most important in the city of Rome, because it infiltrates all the way to the center of the city, allowing the entry of natural elements into the urban core.

The botanical investigation of the area revealed an extremely fragmented eco-mosaic, characterized by a huge variety of flora, usually difficult to find in urbanized areas (Grapow, 1995). As previously specified, the territory of the Appia Antica Regional Park is characterized by archaeological areas of considerable historical, archaeological and landscape value such as Villa dei Quintili, the Tombs of Via Latina, the Circus of Maxentius, the Nymphaeum of Egeria, the route of the Via Appia Antica, etc. These areas, initially suburban, have remained included in an urban territory impetuously built, their abandonment and degradation were followed by a gradual process of colonization: the plants have found niches favorable to their settlement. The demonstration that there is a matching that has never been so successful in any place as in Rome: the combination of archaeology and vegetation.

It is emphasized that some species, such as Lentisk (*Pistacia lentiscus*), Terebinth (*Pistacia terebinthus*) and Ilatro (*Phillyrea latifolia*), which are present in the most of the Tyrrhenian coast, can only be found on the top of some of the ruins of the Park; others related to cooler and wetter conditions such as aquatic orchids (*Orchis laxiflora*), Pond Water-crowfoot (*Ranunculus peltatus*) and Roman nettle (*Urtica pilulifera*) represent

unique presences not only in the Caffarella Park but in the whole city of Rome.

To date, the construction of the railway and other infrastructure and the increasing human presence in these areas has created interruptions in this corridor. Although the distribution of flora is still particularly rich both in the most central archaeological areas and in the uncultivated meadows and pastures of the suburban area, it is necessary to try to reduce the effects of isolation so as to ensure that the genetic exchanges, essential for maintaining the wealth of flora in these areas, can take place. Within these circumstances, it is important to consider in the design the restoration of the ecological corridor is considered necessary so that the species can penetrate in a tangential and radial direction towards the city of Rome, remaining in contact with each other and with the vegetation outside the urban area.

There is an interesting fact to note: the pandemic of the cov-19 virus occurred at the beginning of March 2020 which led to a total lockdown of the whole of Italy and, therefore, also of Rome, despite the serious health, economic and social consequences it inflicted on the country, flora and fauna have regained possession of their spaces. Pheasants, rabbits, mallards, wallowing among the fountains, hedgehogs, porcupines, even foxes and green parrots have been sighted in the archaeological park of the Colosseum, left without tourists but invaded by early spring blooms (FIG 4.7).

left FIG. 4.7  
Palatine hill invaded by the nature during the lockdown of the city in March 2020 (S. Murrone, 2020)



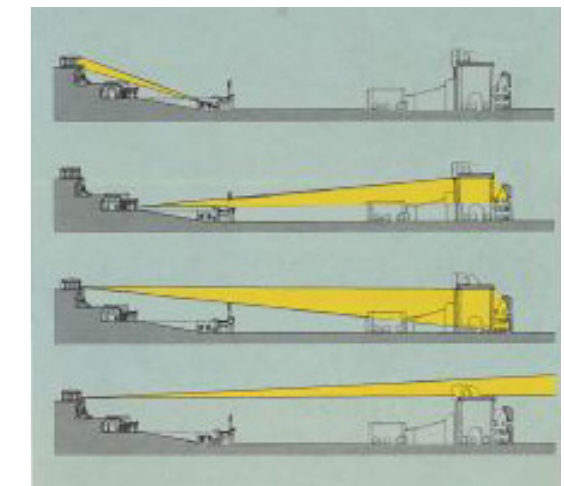
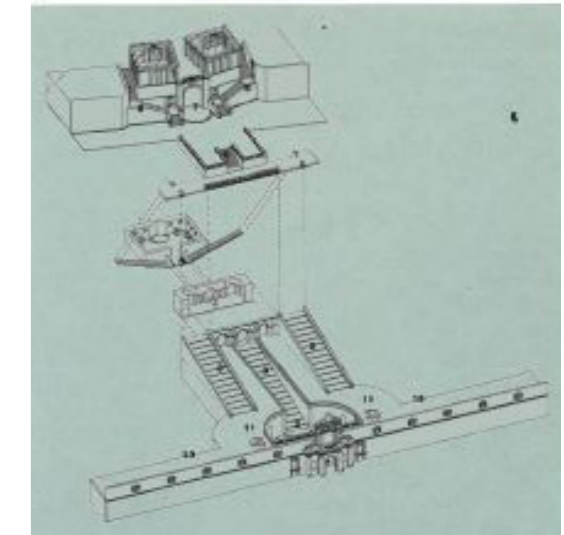
CASE STUDY:  
HORTI  
FARNESIANI

Built in 1573 on the Palatine hill, Horti Farnesiani are the first example of public urban garden in Europe. Horti, in fact, indicates a garden complex without any residential function, it was actually a city park in the modern sense of term. The architect was Giacomo da Vignola, one of the most influential mannerist architects of the XVI century, and in his treatise “Le due regole della prospettiva” he investigates the way which architecture could play with the constructions of perspective. The central point was the creation of tension between perspective and motion. For Vignola, the architectonic construction was defined by a perspectival visual axis, but the route from one space to another always diverged from this. (C. Steenbergen and W. Reh, 2011)

In the construction of the Horti Farnesiani he put into practice the theory of his treatise by designing a spatial composition along the slopes of the palatine that gave a different perspective of the city of Rome: the Palatine hill is transformed into a urban balcony in which the panorama of the city was opened up.

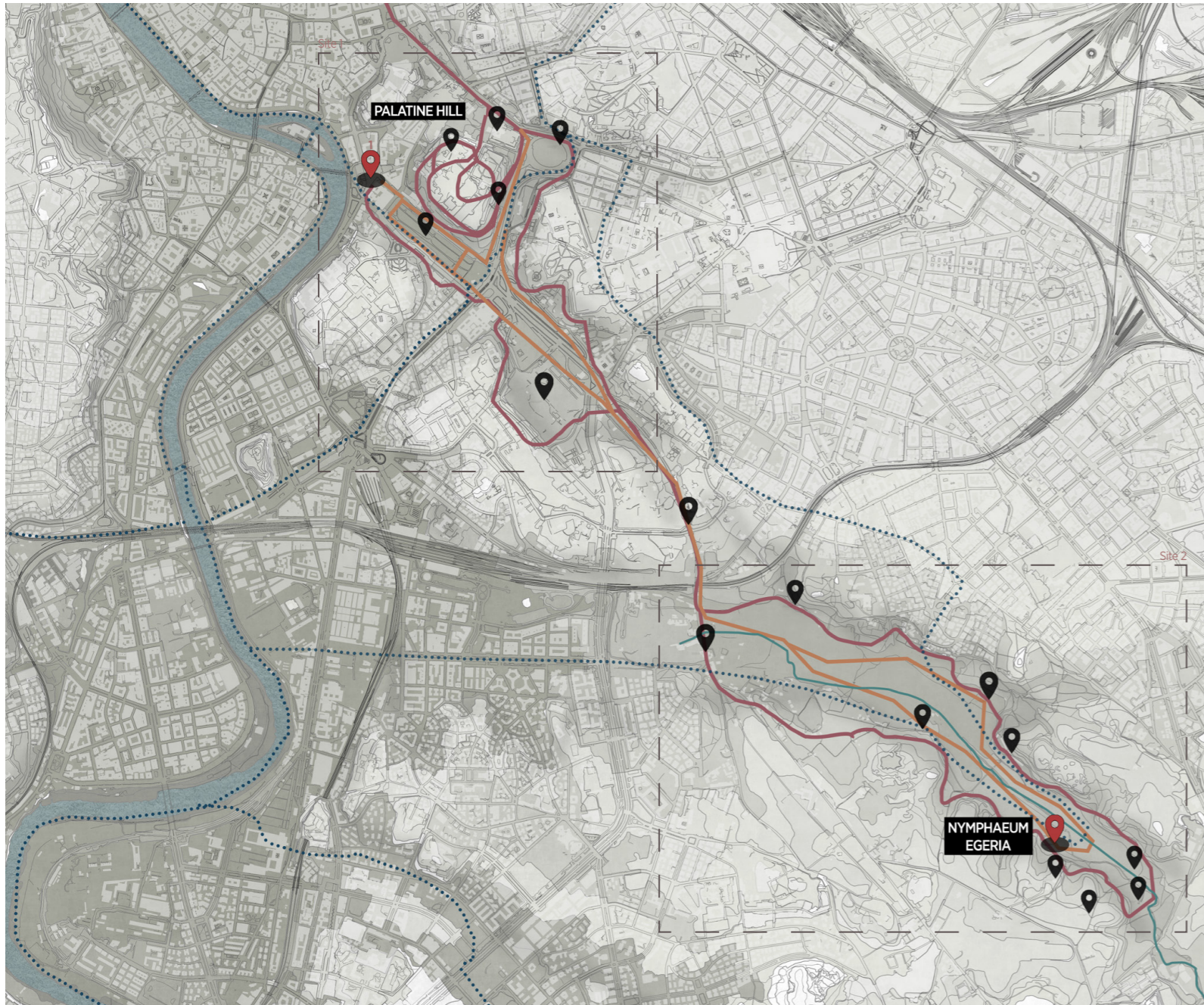
The design of the Horti Farnesiani was carefully balanced with the study of topography, so as to ensure control over the visitor’s movements and perspective. One of the most important axes is the one with the Colosseum, the basilica of Massenzio and the domus Tiberiana. The spectator, in fact, as he climbed up the mountain could catch a different visual relationship between these three elements. The composition is a crescendo in which elements of light/dark, light/dark, descent/ ascent, silence/noise alternate: the experience of time and space is coupled to an architectonic route through the landscape.

The Horti Farnesiani is a keystone in a network of visual relations the link the outstanding place in th urban landscape of Rome with one another. With it, the city was connected with the topography of the city, in which the genius loci of Rome lies hidden, in a new, landscape architectonic manner. (C. Steenbergen and W. Reh, 2011)



left FIG. 4.8  
Farnese Gardens, Palatine hill, Rome,  
south view (Wikimedia Commons, 2010)

right FIG. 4.9  
Horti Farnesiani prospectives and  
composition. Retrieved from Metropolitan  
Landscape Architecture Urban parks and  
landscapes by C. Steenbergen and W.  
Reh (2011)



## DESIGN CONCEPT

Through careful study of Vignola's work, I understood how to develop the concept of my design project. Resuming the idea of the city of Rome as a scenography, passing from the concept of *locus* to *panorama*, I decided to develop different routes thanks to which visitors can experience Rome from different points of view.

These routes, which will guide the tourist towards the discovery of the aquatic elements of the city, will take advantage of the topography of the terrain to discover the city in its different perspectives.

All routes have as their starting point the Foro Boario (number 1 on the map on the left), a particularly important place for its strategic position between the Palatine and the Tiber. Here will be set up an info desk, where visitors will be informed about the different routes and how they are organized. The first road is the one that can be covered by bicycle. This route is the longest and involves several places in the city, connecting them. It is a route that also runs along the river Tiber and following the ancient hydrographic grid of the city reaches the Nymphaeum. The project will then be discoverable also entirely by feet with two different paths that will involve two different types of experiences.

Route A, in red on the map, is the one with a more historical-cultural prerogative, in fact, it will combine all the historical water elements (fountains, aqueducts, thermal baths, nymphaea, etc.) and visitors, with the guide in hand, will be able to understand the meaning of those ruins and their connection with the ancient city. This route is characterized by curved and irregular lines that follow the trend of the contour lines, it

will often be at a higher level than the other, giving visitors magnificent viewpoints, being able to observe the valley and the city below them.

Route B, in orange in the map, will be characterized by straight and regular lines often in the lowest areas of the valley. Here the relationship is reversed: from see to be seen.

This route connects the more technical elements of the green and blue system such as bioswales, watersquares etc. and natural elements such as wetlands and streams. Along this route, visitors will be able to understand how this proposed layer can benefit the city by working with water and greenery.

This route is designed not only for tourists but also, and especially, for citizens. In fact, the straight lines and multiple connections with neighborhood will give the Romans more direct access to the route and then they will be more involved, through the organization of workshops and the care of community gardens and greenhouses. Making citizens directly involved in the management of the site is a fundamental step to obtain a better understanding of the principles of the green and blue system and then a greater chance of success.



left FIG. 4.10  
Complete map of the three routes  
(Author, 2020)



Revealing Rome's water-based culture

## SITE 1

### HISTORICAL CITY CENTRE

The area of the historic centre is the most famous thanks to the presence of the Colosseum, the Baths, the Circus Maximus and the Roman Forum, all common elements in the imagination of most. The area is characterized by the presence of the hills, Palatine Celio and Aventine, and the many Roman archaeological remains that make the area unique in the world. At the same time, the area is highly critical for flooding: the historic centre is, in fact, one of the lowest areas of the city and storms often flood the area, putting at risk even the ruins present. The single sewage system, both for rainwater and for the wastewater of the houses, is not able to withstand the great amount of water during the winter rains, and the area often at risk of flooding.

Inside the site, starting from the Boarium forum, the two pedestrian paths wind, the first one running along the Palatino and the Aventino going to discover the ancient Roman ruins and offering breathtaking views. The second in the lower area where instead places of leisure and relax are created that in the event of storms change their function by collecting rainwater, to help the sewers, while creating at the same time suggestive public spaces.

Interesting is also the material used to compose the routes, for route A are mainly used large blocks of stone, tuff typical stone of the Roman soil, and *sampietrino*, cobblestone for route B, which in addition to being a typical element of Roman roads allow the permeability of water.

In some stretches the stones are dispersed in the lawn becoming increasingly rare. this suggests a double function: both leaves more permeable area allowing the

transpiration of water and at the same time translates for the visitor a less accessible place where nature prevails.



left FIG. 4.11  
View of the Colosseum (S. Murrone, 2018)

right FIG. 4.12  
Identification site 1 (Author, 2020)

## OPPORTUNITIES



FIG. 4.13.1  
Circus Maximus with its wide green areas

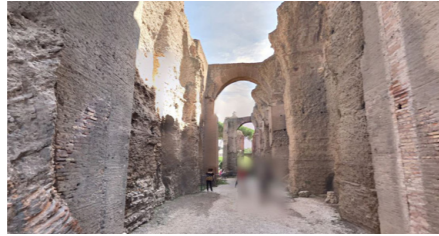


FIG. 4.13.2  
Domus Severiana: here the enclosed space give a different perception of the area



FIG. 4.13.3  
Colosseum plaza with the Arch of Constantine: the space is suitable for a design intervention



FIG. 4.13.4  
View of the Colosseum from the Palatine Hill



FIG. 4.13.5  
Wonderful view of the Roman Forum from the Palatine hill



FIG. 4.13.6  
View of the Circus Maximus from the Palatine hill

## CRITICAL ISSUES



FIG. 4.14.1  
Large unused spaces in front of the Colosseum



FIG. 4.14.2  
Traffic areas



FIG. 4.14.3  
High presence of cars and parking lots, little green



FIG. 4.14.4  
Low maintenance of green areas



FIG. 4.14.5  
The fences physically separate the visitors



FIG. 4.14.6  
Large bare spaces of trees increase the perception of emptiness and warmth

top FIG. 4.13  
1. Afp Agence France Presse, 2020  
2-3-4-5-6. Google Maps street view, 2018

bottom FIG. 4.14  
1-2-3-4-5-6. Google Maps street view,  
2018

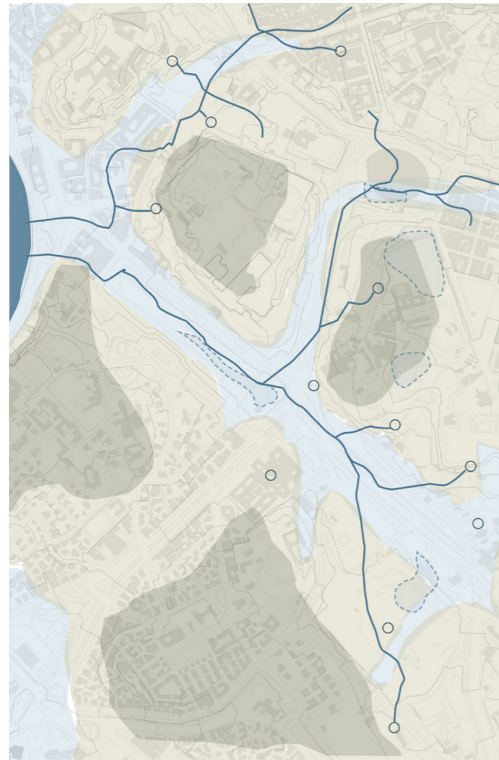


FIG. 4.15.1

- alluvial deposit - high permeability
- silt, clay and gravel - medium high permeability
- tuff - low permeability
- old aquifers
- old streams
- old springs

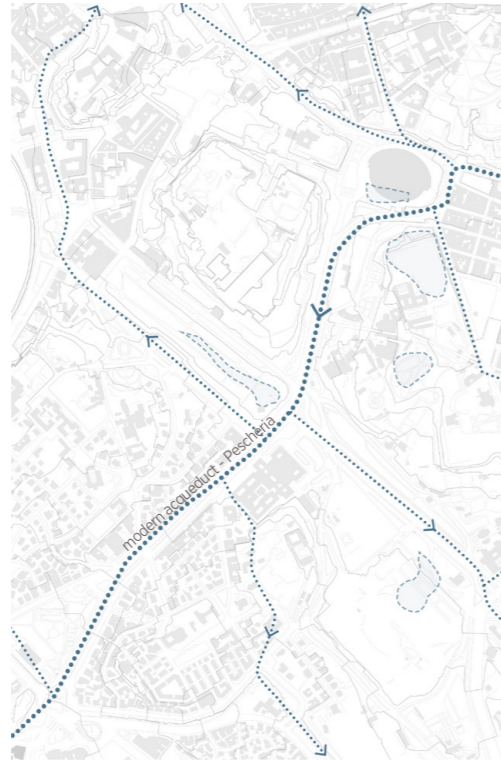


FIG. 4.15.2

- old aquifers
- modern aqueducts



FIG. 4.15.3

- stormwater inlet /manholes
- cloache - old sewers
- modern sewers

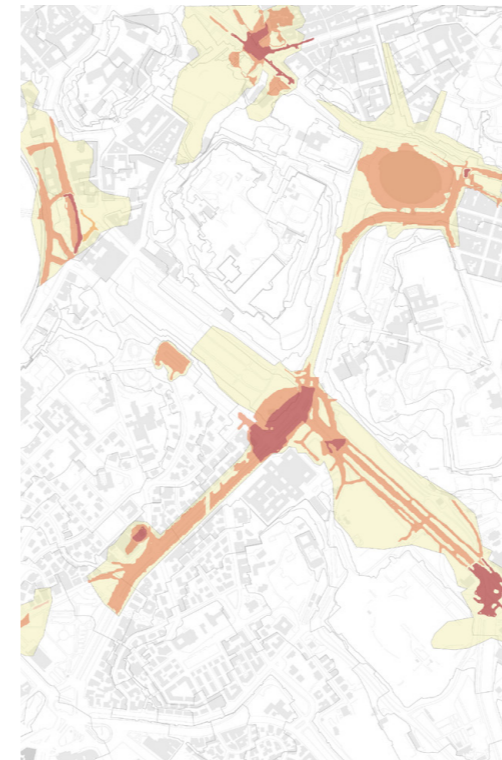


FIG. 4.15.4

- high pluvial flood hazard
- medium pluvial flood hazard
- low pluvial flood hazard

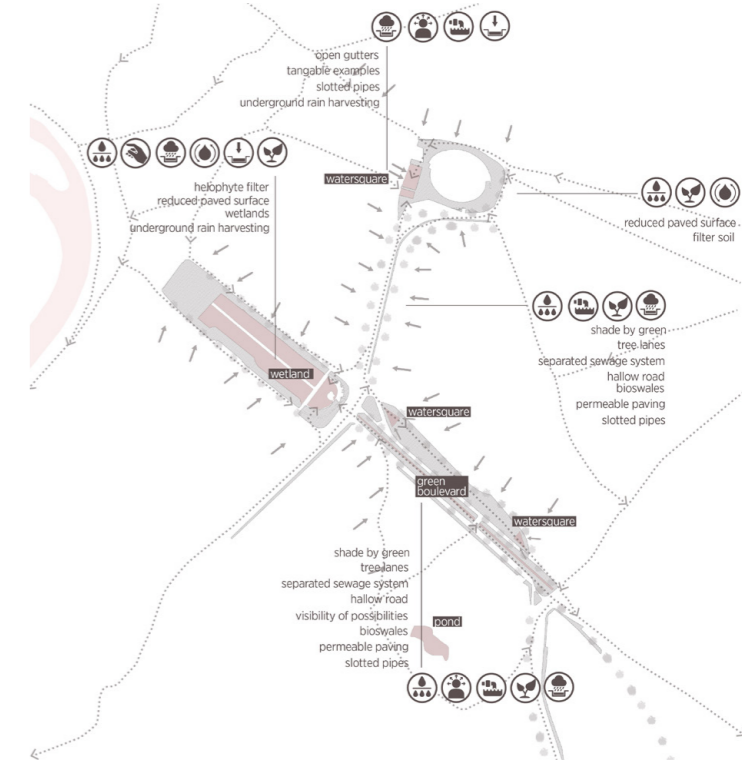


FIG. 4.16

- green areas
- blue areas/buffers
- bioswales direction
- rain water direction

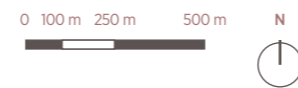
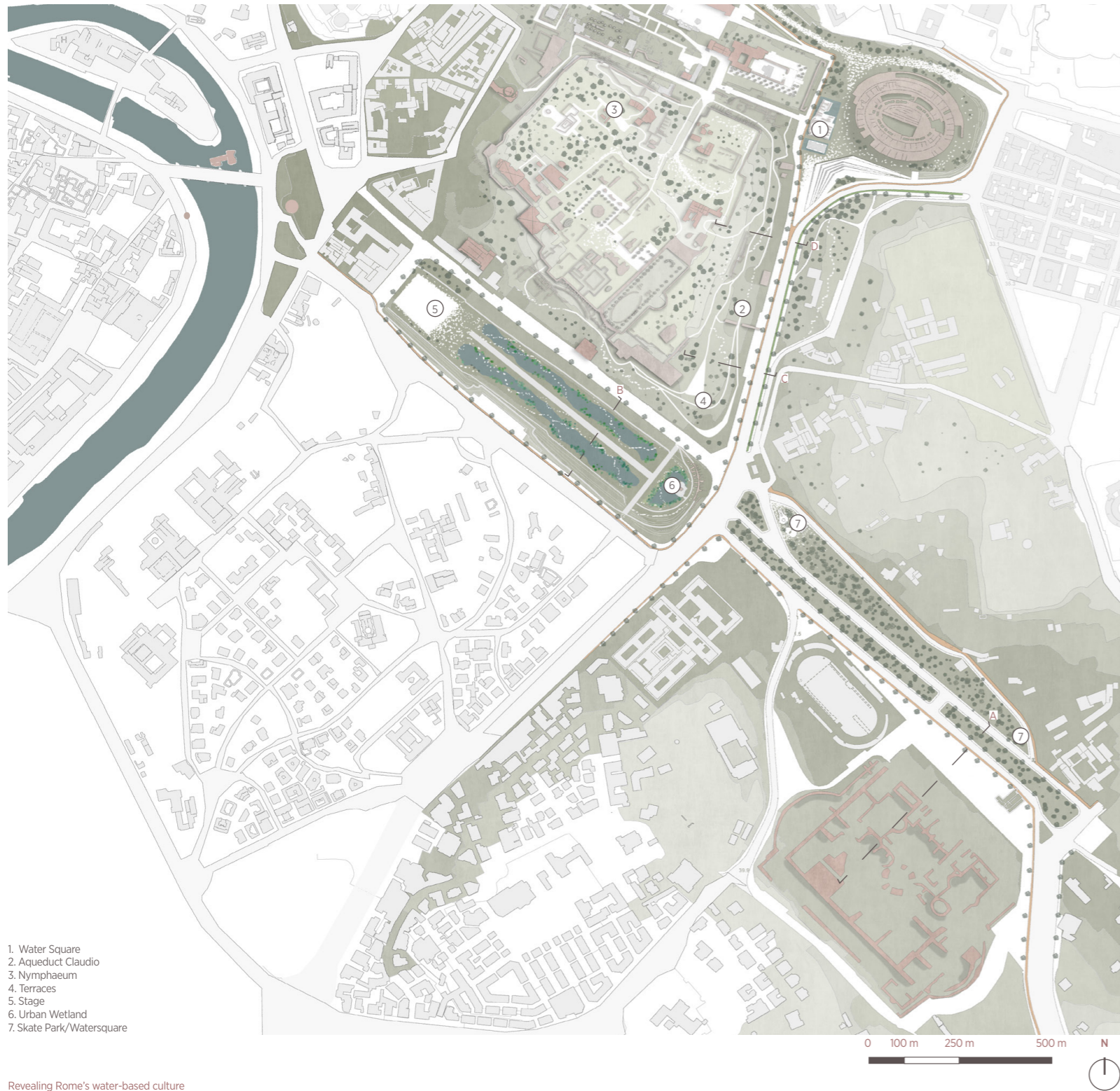


FIG. 4.15  
 1. Soil Map  
 2. Modern Water-system in Rome  
 3. Sewage System  
 4. Pluvial Flood Hazard  
 (Author, 2020)

right FIG. 4.16  
 Proposed green and blue system  
 (Author, 2020)



- 1. Water Square
- 2. Aqueduct Claudio
- 3. Nymphaeum
- 4. Terraces
- 5. Stage
- 6. Urban Wetland
- 7. Skate Park/Watersquare

In order to design the final masterplan, the study of the soil type of the site was essential. As can be seen in FIG 4.15.1, in the previous pages, the historical centre is mainly formed by three types of soil: in the lower areas - where once the Tiber river flooded and ancient watercourses ran - it is purely alluvial deposit, therefore formed by very fine-grained debris, here the soil is extremely permeable. The second layer is a mixture of silt, sand and gravel with average permeability. Finally, the seven hills are mainly formed by tuff, a scarcely permeable and very resistant material used during ancient times for many buildings. It is precisely because of these soil properties that large aquifer basins have formed underground along the chorus of the years. They are often cavities of considerable size that retain rainwater, very clear because it is filtered by soil. Some of these aquifers are still existing and have been exploited in this thesis project as water storage, their water is then used during the hot summer months to cool the environment.

In the FIG 3.15.2-3 it is explained the modern water-system, both the aqueduct system and the sewage system, that today is a combined sewer system, which means it collects rainwater runoff, domestic sewage, and industrial wastewater in the same pipe. Thanks to the scheme FIG 3.15.4, we can notice that especially the lower areas are incredibly prone to pluvial flooding. In some cases, flooded areas develop along "river-road", that is, along road axes that insist on old river beds (as in the case of the Murcia Valley-Circo Massimo).

Furthermore, particularly floodable areas are the confluence areas of several drainage axes (for example the Fosso Labicano-Colosseum area).

It is thanks to the study and combination of all these maps that the green and blue

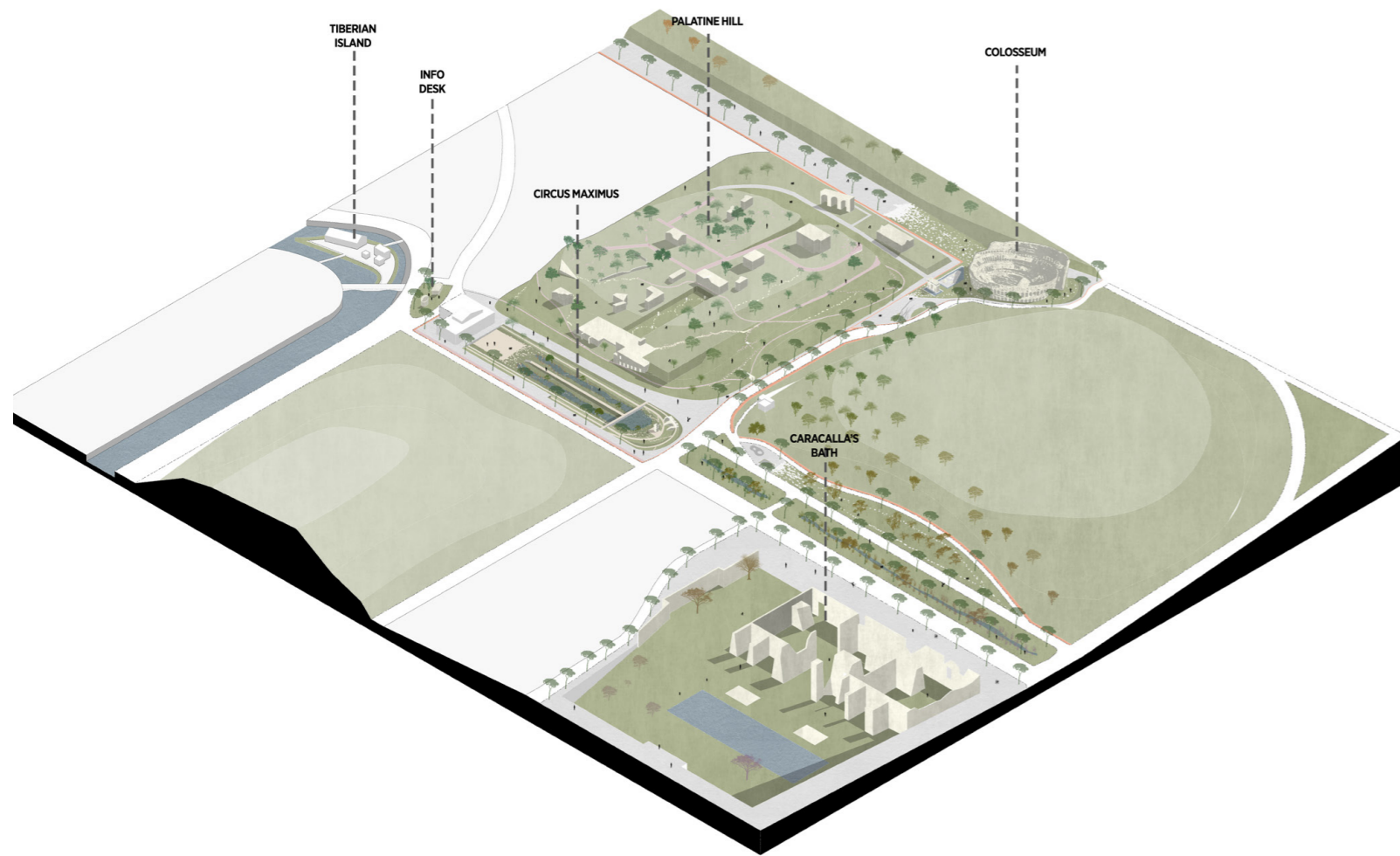
system has been designed, going to fix the most vulnerable areas. First of all, it has been thought of a sewer system that is no longer combined but rather separate: in this system, the sanitary sewage and storm water are carried separately in two sets of sewers, the black water will have a special treatment, while rainwater can be filtered through helophyte plants and/or absorbed into the soil. Rainwater from nearby houses is collected in the bioswales system, which partly filters the water into the ground and the rest is carried to storage areas such as water squares or urban wetland. Here the water is collected and maintained until the end of the flood, so as not to overload the sewage system. Green areas will also be expanded to increase water filtration during rainy periods and to cool the air in summer.



- FIG. 4.15.6
- route A
- route B
- bike Route

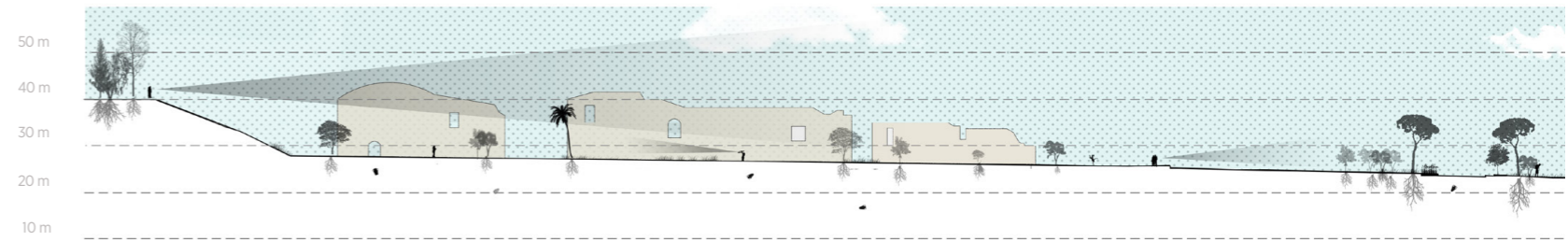
left FIG. 4.17  
Masterplan of Site 1, the historical city centre (Author, 2020)

bottom right FIG. 4.18  
Map of the routes (Author, 2020)

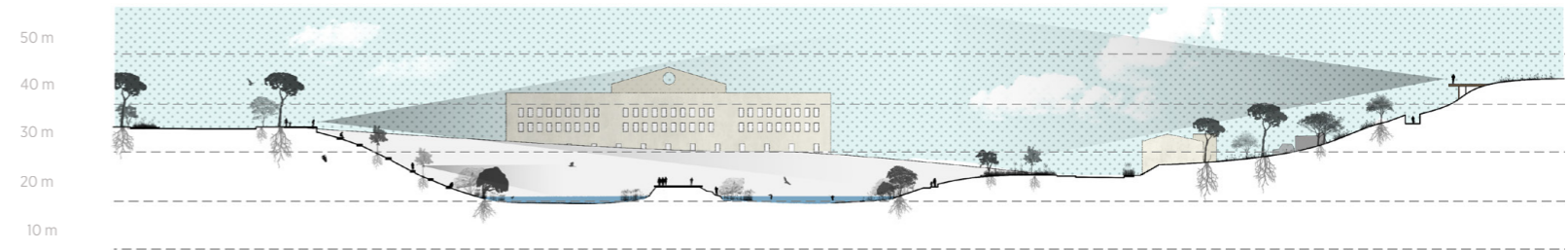


left FIG. 4.19  
Axonometry showing the spatial quality of the site (Author, 2020)

right FIG. 4.20  
In the sections is clear the different views that the visitors could have in the valley thanks to the height differences (Author, 2020)



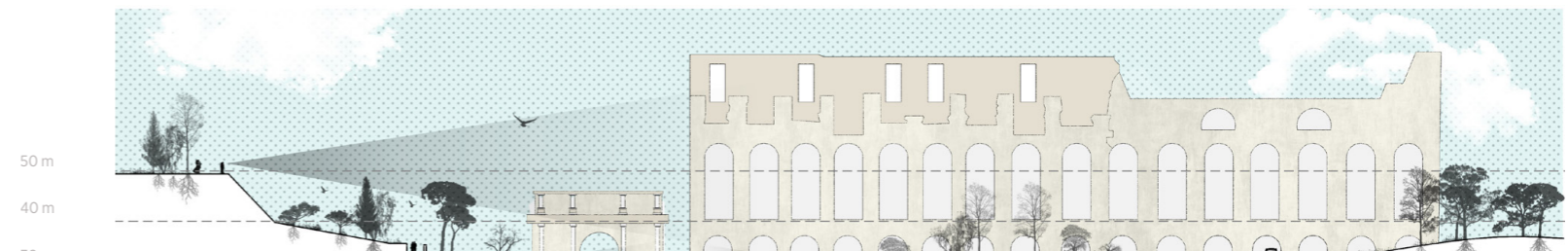
Section A



Section B

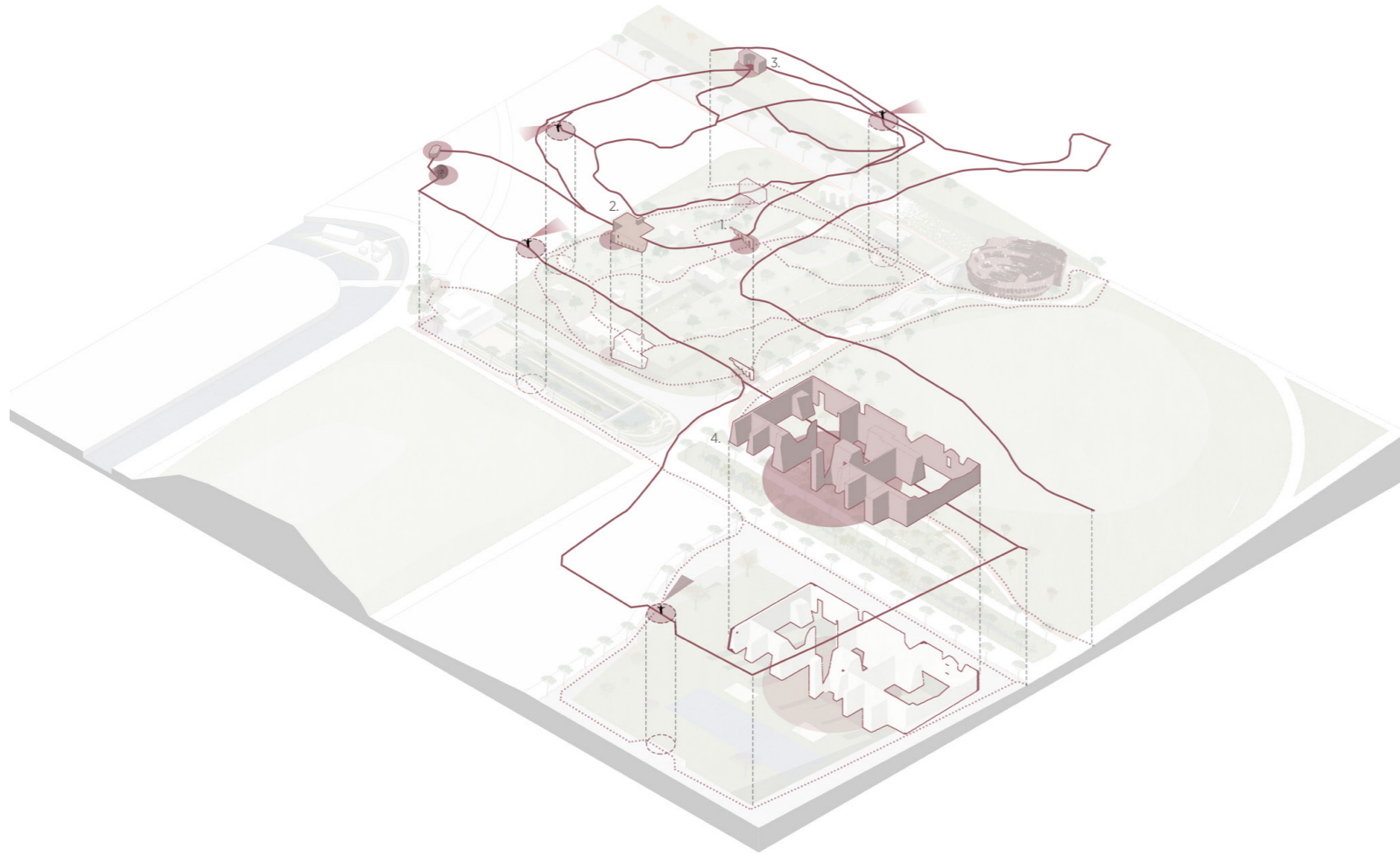


Section C



Section D





1. Aqueduct Claudio



2. Settimio Severio's Bath



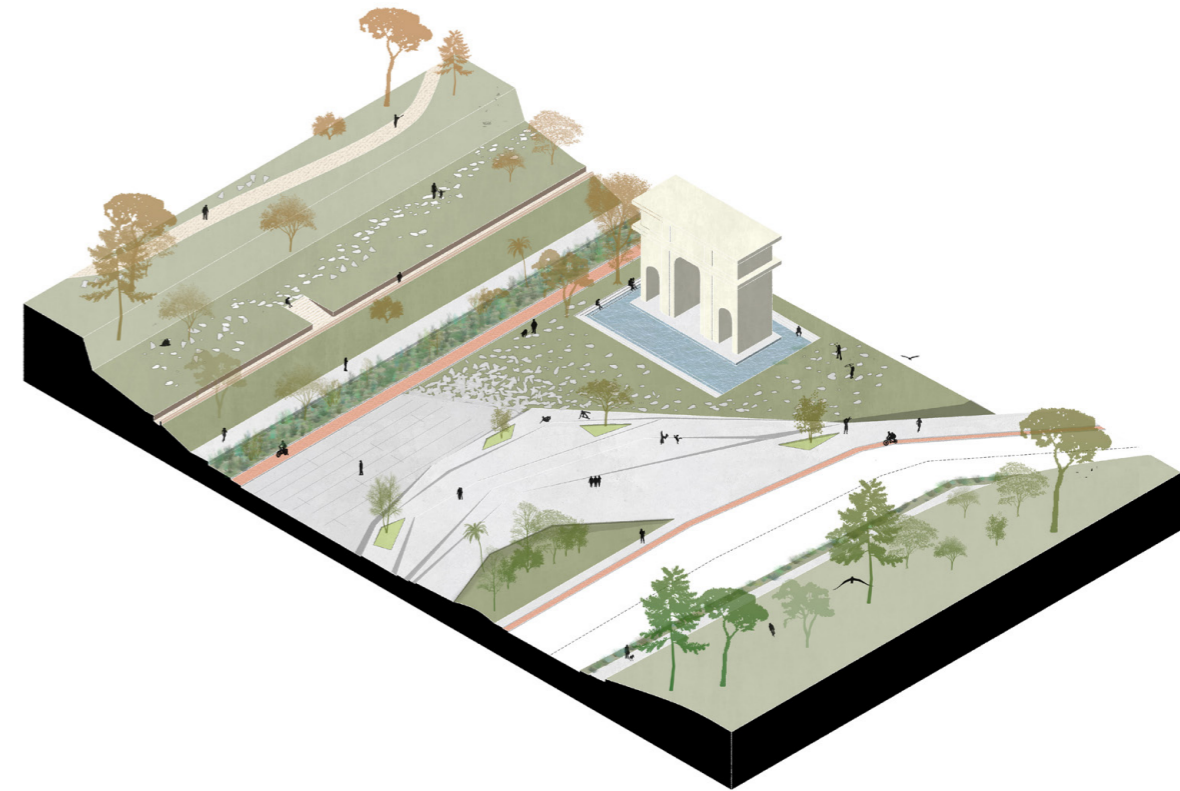
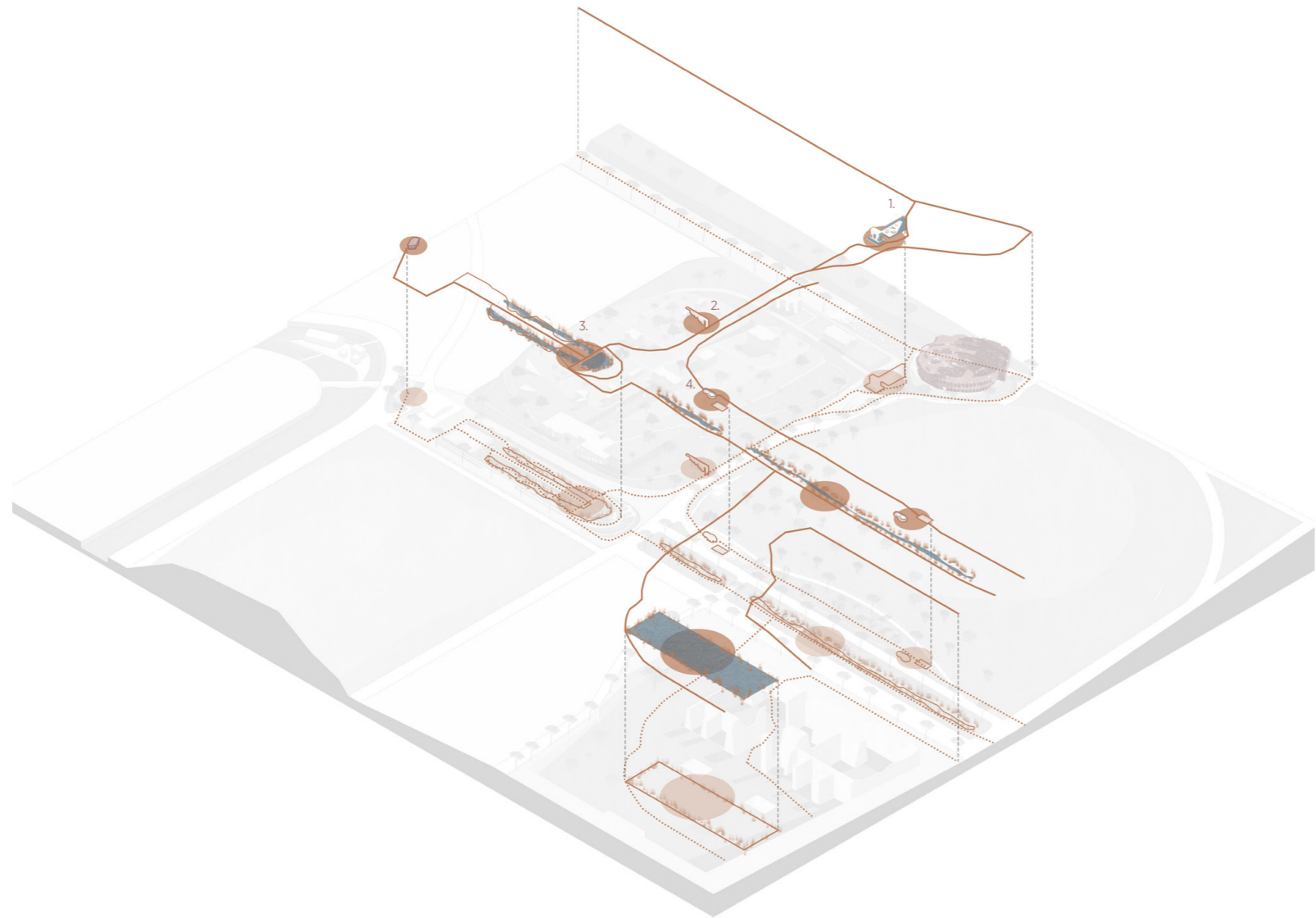
3. Nymphaeum



4. Caracalla's Bath

left FIG. 4.21  
Route A shown in axonometry. Highlighted the panoramic points and the archaeological water elements (Author, 2020)

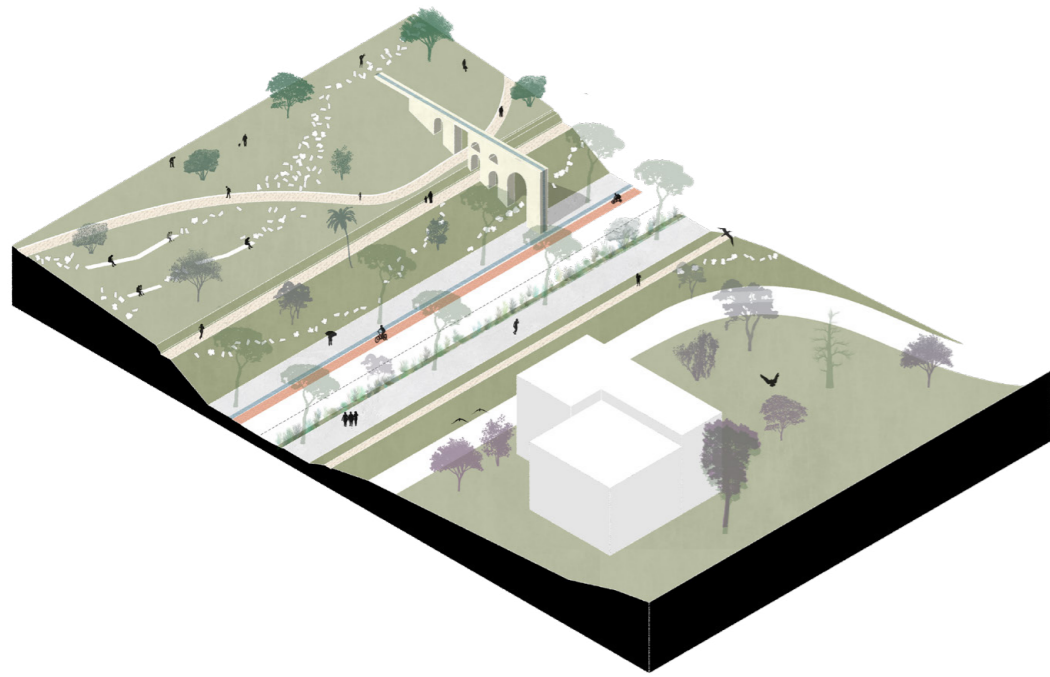
right FIG. 4.22  
Pictures show the most important water related ruins, that the visitors could find along the route  
1.-2. (S. Murrone, 2019)  
3. (Unknown) Retrieved from <https://liveromeguide.wordpress.com/2019/06/28/ninfeo-degli-specchi-giochi-e-scherzi-dacqua-al-palatino/>  
4. (E. D. White, 2011)



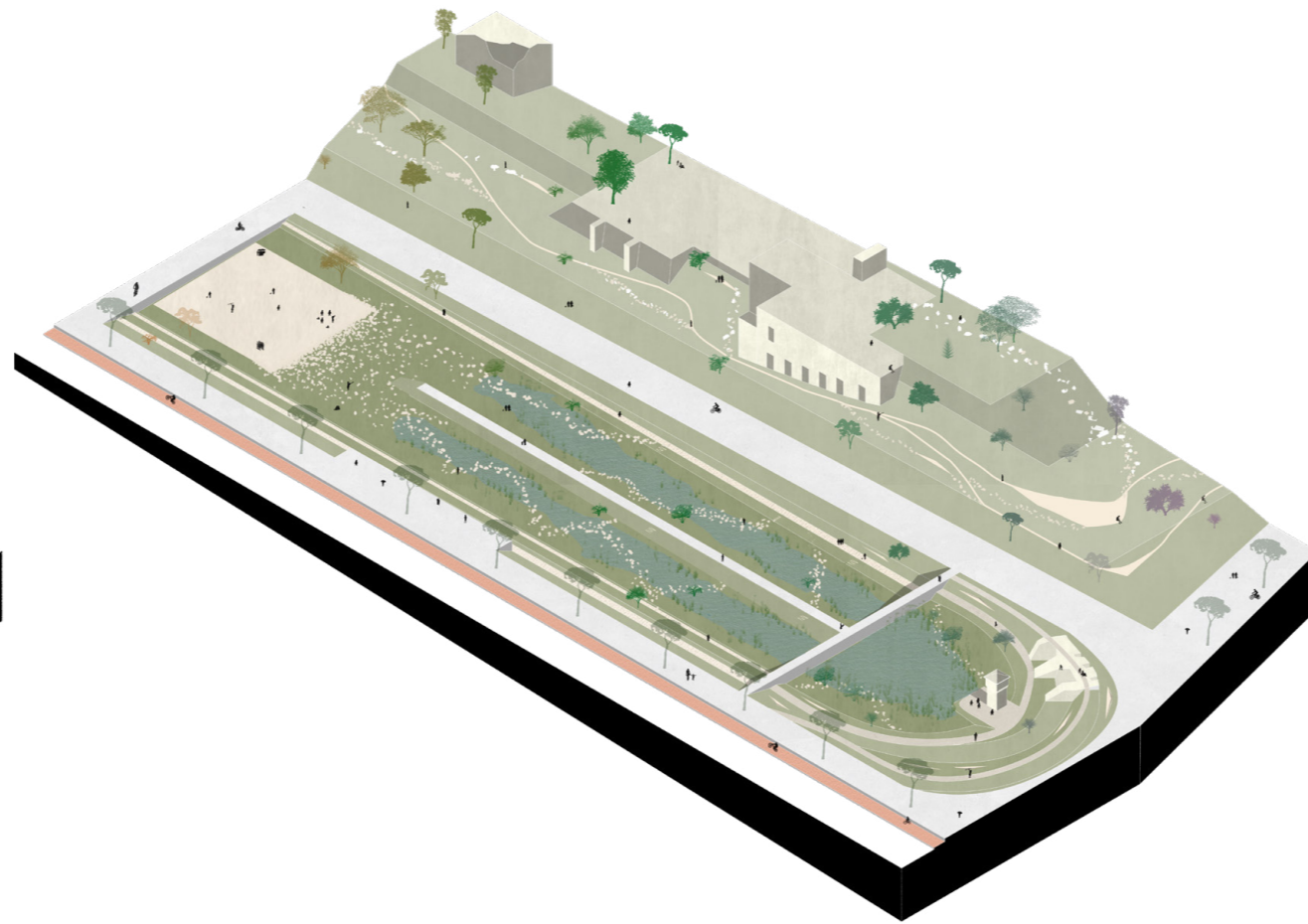
1. Watersquare around the Arch of Costantine in the Colosseum square

left FIG. 4.23  
Route B shown in axonometry. Highlighted the green and blue strategies of the site (Author, 2020)

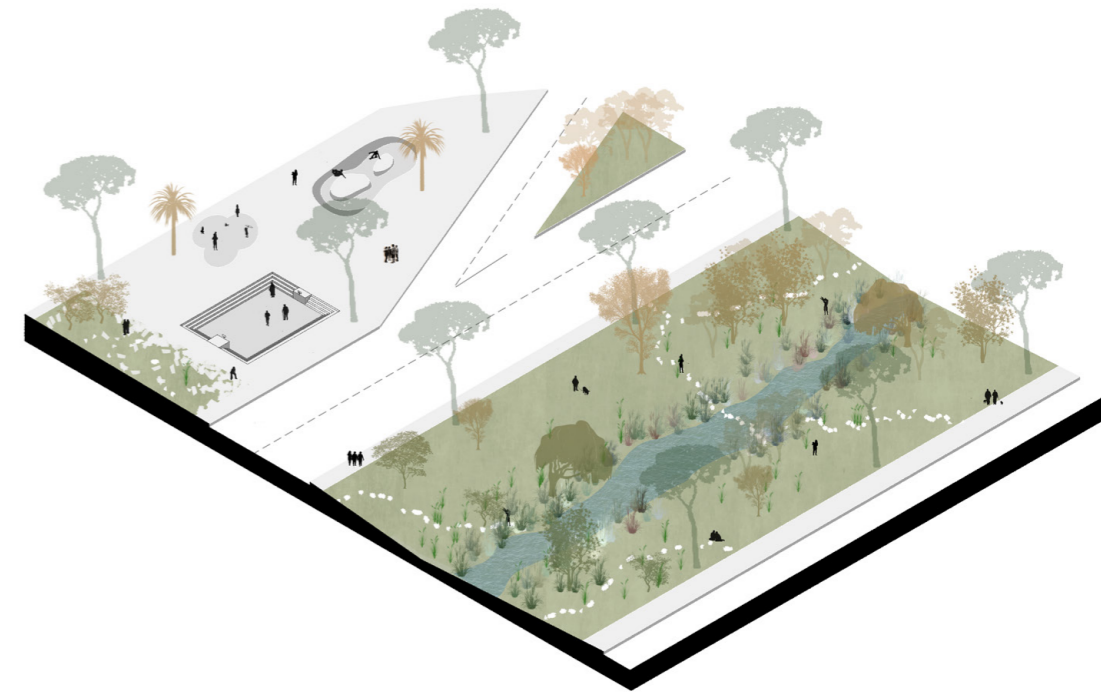
right FIG. 4.24  
Axonometry shows the design intervention in the Constantine Arch area (Author, 2020)



2. Green street and Claudio aqueduct redesigned as water channel



3. Circus Maximus as urban wetland

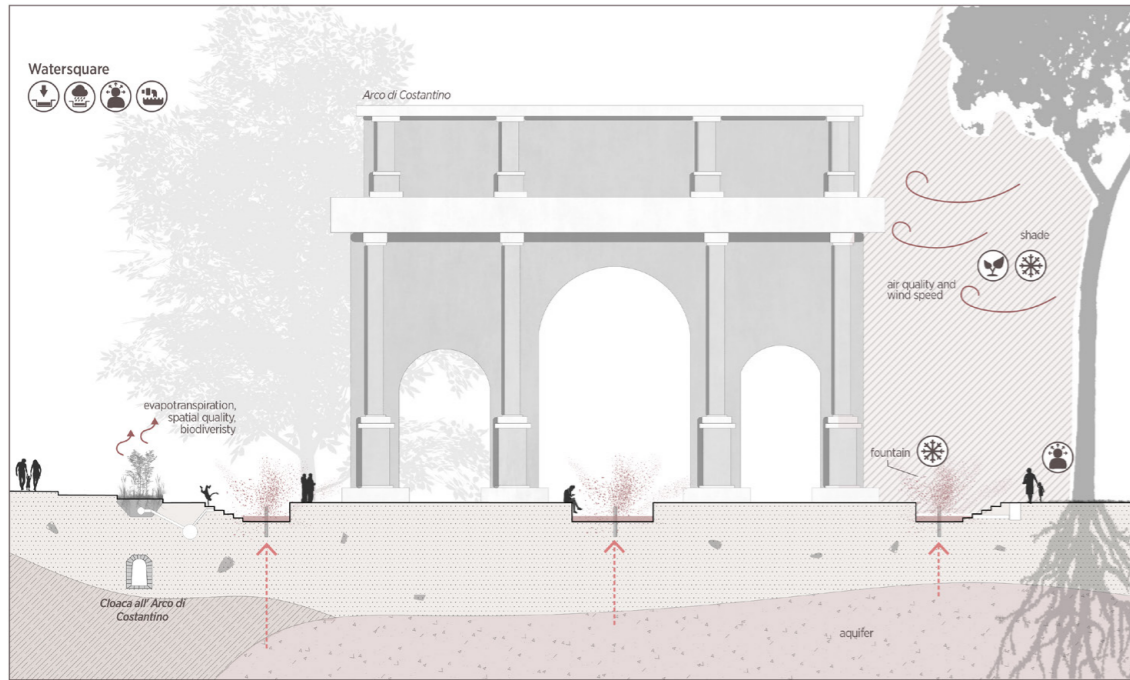


4. Watersquares and the green boulevard in Via delle Terme di Caracalla

*left* FIG. 4.25  
 Axonometry shows the design intervention in Via di San Gregorio. The profile of the street is redesigned following the green and blue principles (Author, 2020)

FIG. 4.26  
 Axonometry shows the design intervention in the Circus Maximus (Author, 2020)

*right* FIG. 4.27  
 Axonometry shows Via delle Terme di Caracalla designed as green boulevard and the watersquare (Author, 2020)



sunny day



rainy day



# 1. Arch of Costantine in the Colosseum square

The Colosseum square is one of the most iconic places of the city of Rome but also one of the most prone to flooding.

To overcome this problem, the lower area around the arch of Constantine and the Colosseum has been made completely permeable with the grass: the central path near the arch, in fact, is gradually dispersing, declaring a different situation to the visitor who will realize the important material change.

The bioswales run along the sidewalks and the main roads, they play an important role in enhancing the city's biodiversity and in creating a more pleasing environment. At the same time, they are useful in collecting the water from the streets, which will have a V-shaped profile, the water will then gradually flow it into the sewage system. To solve the difference in height on the right side of the Arch, seating/stairs have been designed to allow visitors to rest and enjoy the beautiful square below.

It is interesting to note that due to the permeable characteristics of the soil where the arch and the Colosseum are located, a vast aquifer has formed over the centuries. Its size is not certain but numerous ancient sources and recent inspections of the subsoil indicate its presence. It is an aquifer of very pure water, since rainwater takes over the soil and all its impurities is filtered from the soil.

The aquifer is exploited in the project as natural water storage, during rainy days the water is collected inside and during the hot summer months that same water is used for irrigation and as watersquare fountains to cool the air and refresh passers-by.

In conclusion, the watersquare has been set up around the arch that protects the arch from flooding and collects water during storms; at the same time this area becomes a symbolic point of connection between the two routes where a historical architectural element such as the Arch of Constantine joins the green and blue system becoming an integral part of it.

left FIG. 4.28 Section of the watersquare around the Arch of Constantine. In the drawing are explained the strategies and principles of the watersquare in the context of the city of Rome (Author, 2020)

bottom right FIG. 4.29 View of the Colosseum square and the Constantine Arch from above (Afp Agence France Presse, 2020)



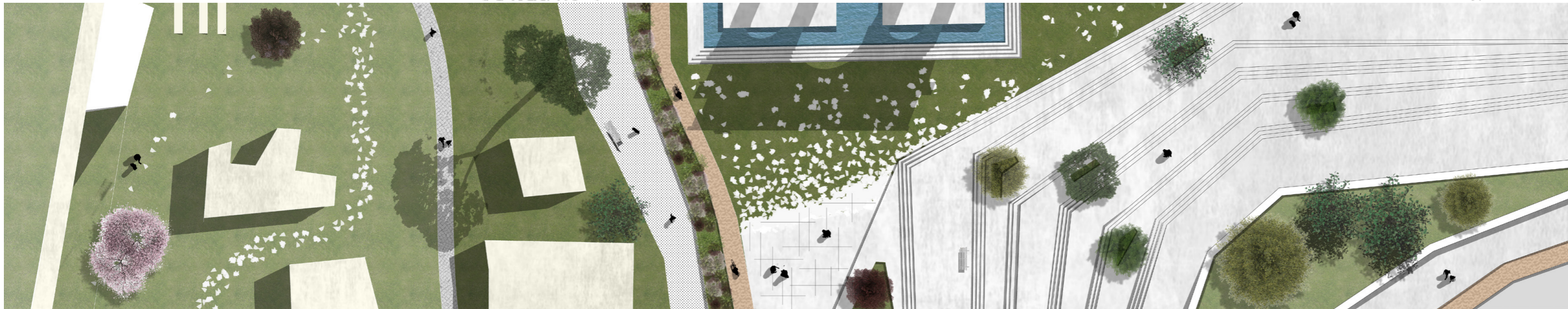
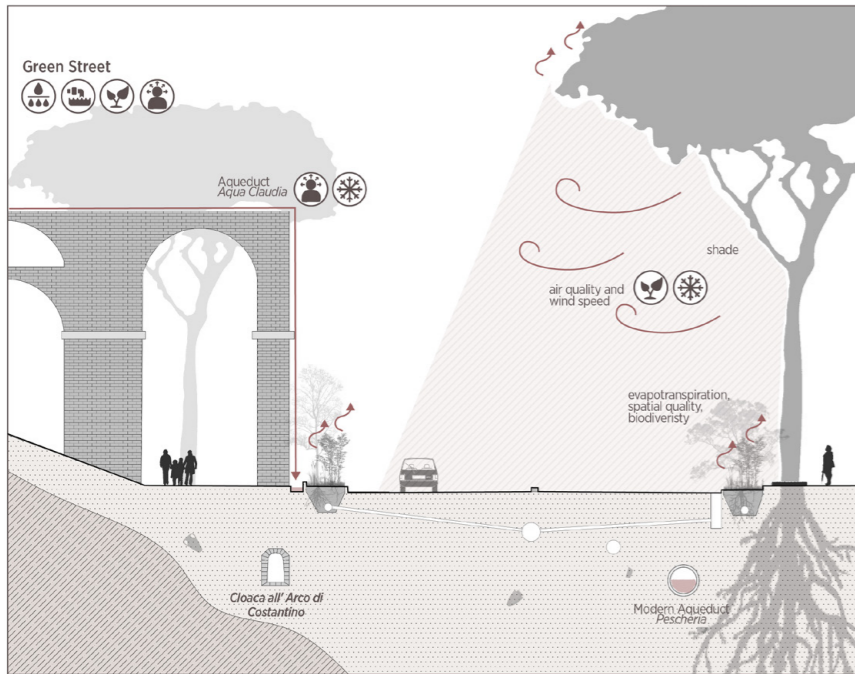


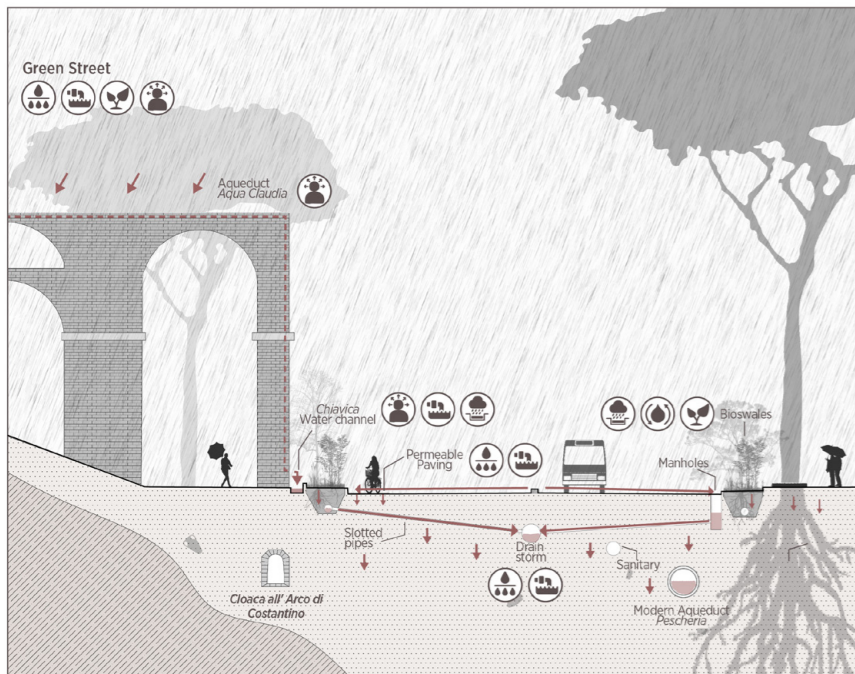
FIG. 4.30  
Section and plan of the area around the Arch of Constantine (Author, 2020)

top right FIG. 4.31  
In red is highlighted the location of the section and plan (Author, 2020)

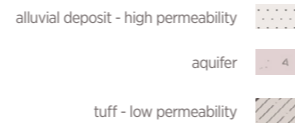
SITE 1



sunny day



rainy day



## 2. Green street and Claudio aqueduct

Via di San Gregorio is a street designed between the two hills of the Palatine and Celio, for its location is extremely important as it connects the Colosseum with the Circus Maximus and the southern area of Rome. Today it looks like a 4-lane street, extremely busy and with few spaces reserved for tourists and passers-by. The project foresees the arrangement of the profile of the street according to the principles of green and blue, the streets are maintained but the lanes are reduced so as to give more space to greenery and citizens. The Claudio aqueduct once crossed this valley, supplying water to the Celio and Palatine hills, today you can still see its remains.

The aqueduct has been integrated into the system: in fact, partly recovering its original function, it collects water during rainy periods and then redistributes it to the open-air channel below in sunny moments. The aqueduct here is no longer just an old ruin but it takes on a new and modern purpose: the water that descends like a small waterfall directly into the canal will become clearly visible to visitors who will realize the new function assumed by this important historical monument.

left FIG. 4.32  
Section of Via di San Gregorio. In the drawing are explained the strategies and principles of the green street with a renovated function of the aqueduct (Author, 2020)

bottom right FIG. 4.33  
Picture of Via di San Gregorio from above. The aqueduct is visible and in the background the Colosseum (Afp Agence France Presse, 2020)



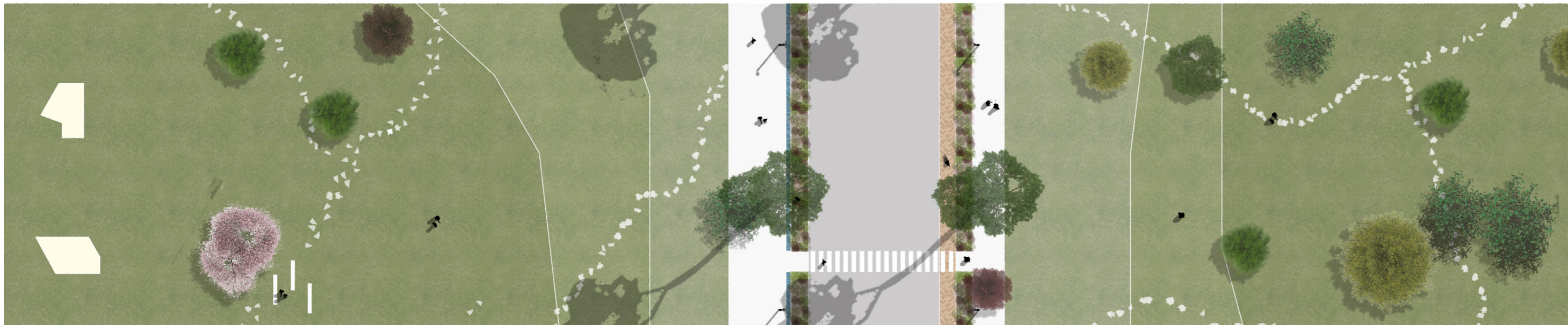
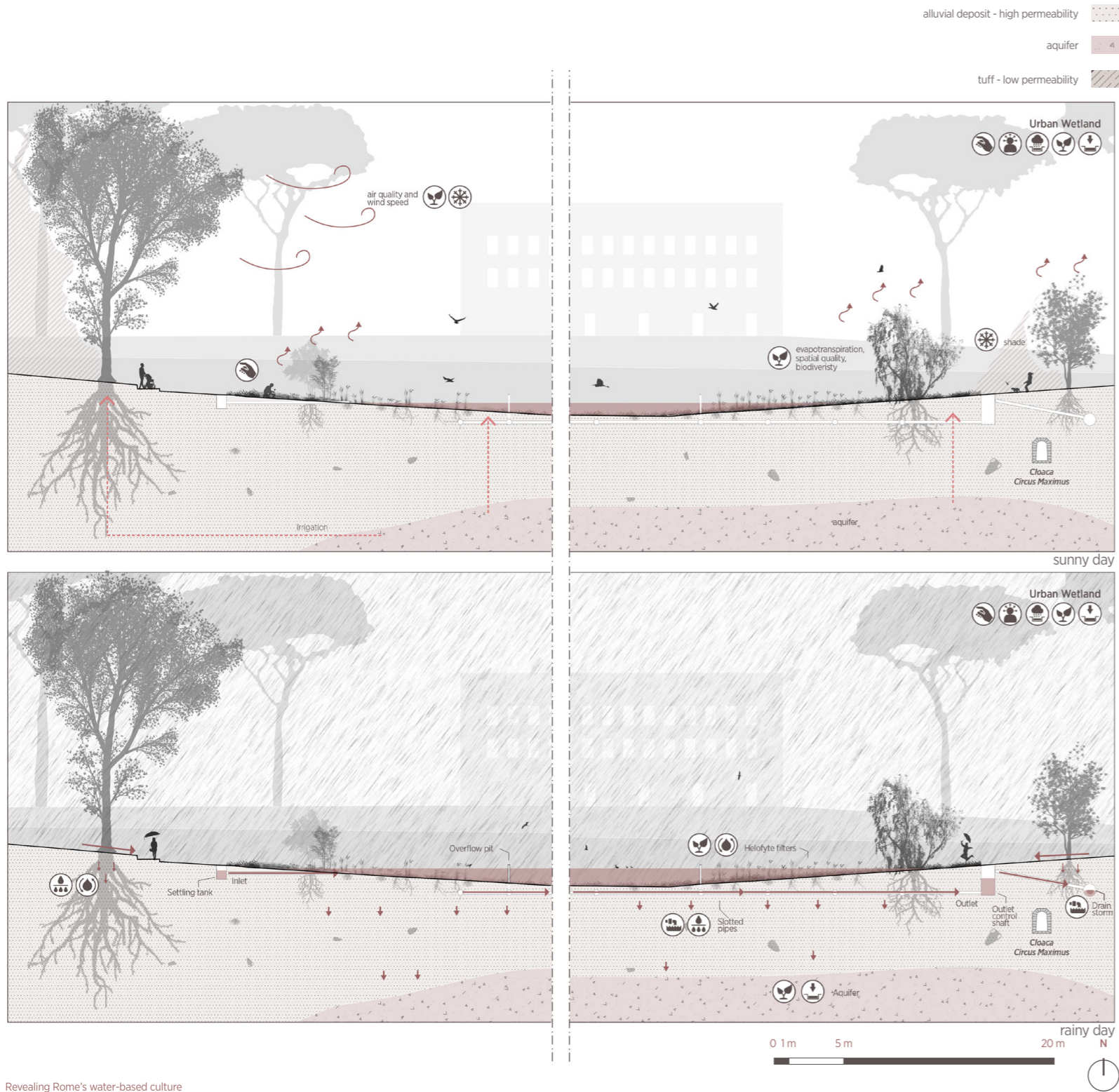


FIG. 4.34  
Section and plan of Via di San Gregorio  
with Claudio aqueduct (Author, 2020)

top right FIG. 4.35  
In red is highlighted the location of the  
section and plan (Author, 2020)

### 3. The urban wetland in the Circus Maximus



The Circus Maximus is situated between the Palatine and Aventine hills, in the Murcia valley. At its origin the valley was rich in watercourses and agricultural fields, subject to many flooding by the Tiber.

With the advent of the Roman Empire the site was transformed into a vast chariot-racing stadium and mass entertainment venue. Its dimensions were exceptional 620m in length and 118 m in width and could accommodate over 150,000 spectators, forming the first and widest stadium in the Roman era (J. Humphrey, 1986).

Since the fall of the Roman Empire, the circus has acquired many different functions. In the Middle Ages the surrounding area gradually went underground and was used for agricultural use.

In the Renaissance we know that the area was reduced to a swamp, water gushed from all over the valley, making it suitable for cultivation and facilitating the creation of gardens, which in fact were numerous and contiguous to one another. After the 6th century, the Circus fell into disuse and decay, and was quarried for building materials. The lower levels, ever prone to flooding, were gradually buried under waterlogged alluvial soil and accumulated debris, so that the original track is now buried 6 meters beneath the modern surface (F. Choay, 2001).

From 1645 to 1934 part was used as a Jewish

cemetery. In 1852 a gas works was built on the site by the Anglo-Italian Gas Society. Only in the first half of the twentieth century, all buildings dismantled and archaeological excavations finally started.

Today it is presented as a huge city park, sometimes used for concerts or public events.

The history of the Circus Maximus is therefore long and complex, which hides many different aspects. In the thesis project it is completely reassessed and exploited for its morphological and geological characteristics. It becomes a large urban wetland: the water is collected and purified by helophyte plants creating a large green and clean space where water and nature, with their many benefits, are the new protagonist of the stadium that people come to watch. As can be seen from its history, the Circus Maximus has a not very deep aquifer -about 3-4 meters underground- here then the aquifer is used in summer for irrigation and to fill the wetland in case of water crisis (FIG 4.36).



left FIG. 4.36  
Section of Circus Maximus. In the drawing are explained the strategies and principles of the urban wetland in the special context of the site (Author, 2020)

bottom right FIG. 4.37  
View of the Circus Maximus from above (Afp Agence France Presse, 2020)



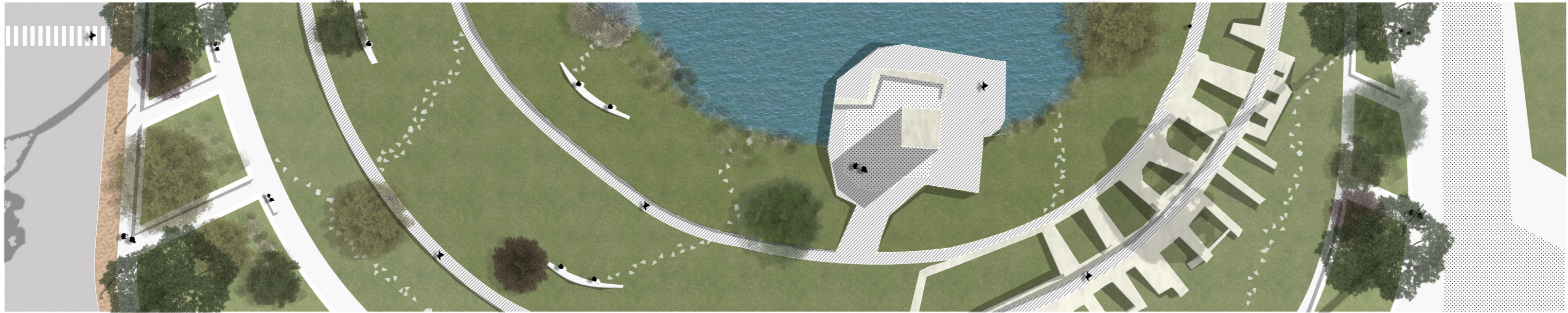
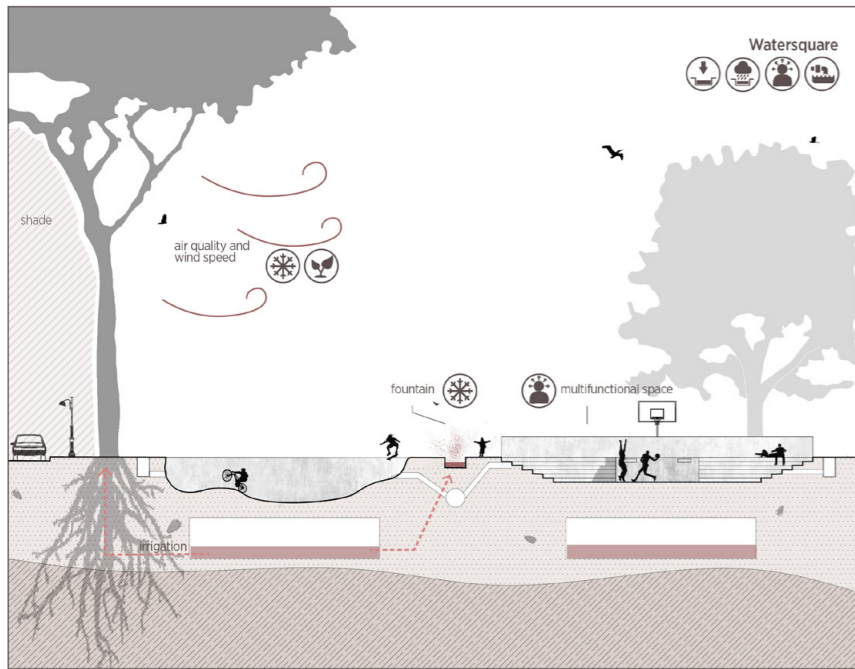
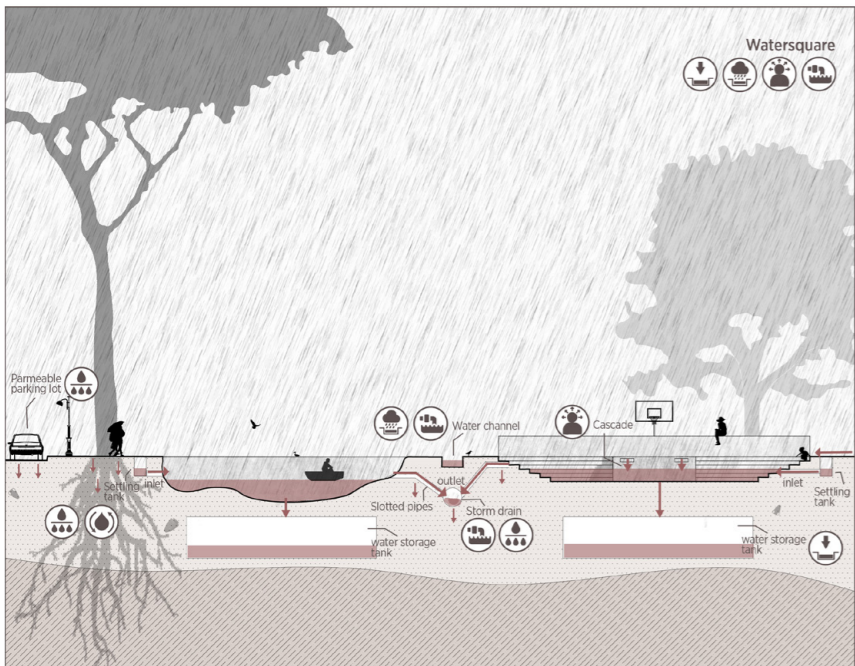


FIG. 4.38  
Section and plan of the area around  
Circus Maximus (Author, 2020)

top right FIG. 4.39  
In red is highlighted the location of the  
section and plan (Author, 2020)



sunny day



rainy day

alluvial deposit - high permeability  
 aquifer  
 tuff - low permeability



#### 4. Green boulevard and watersquare in Via delle Terme di Caracalla

Via delle Terme di Caracalla is an important historical street because it connects Appia way with the Tiber and the historical centre.

In a subchapter called “Trees Alone” of the book “Great Streets”, the urban designer Allan Jacobs addresses the Viale delle Terme di Caracalla explaining the importance of this street and the role of the city’s iconic umbrella pines in defining the space: “Their height and linearity can be seen from a distance. In a city full of stone landmarks, these rows of pines are yet another way to understand the city and one’s location in it. Below, closer to the ground, there is another ceiling made of dark, spreading *Quercus ilex*. Some of their branches meet, other do not, so there is both light and shade, mostly the latter. Against the bright, hot Roman sun and in welcome contrast to the undefined large spaces at the street’s beginning [i.e., the Circo Massimo] the tree-covered medians attract walkers with a promise of coolness [...] During the winter months, when there is less sun, it is pleasant to walk on the side paths. If the design of the Viale della Terme di Caracalla was meant to attract walkers from central Rome [...] to the Baths of Caracalla another half mile or so distant, then these dark, cool, tree-lined paths are the way to do

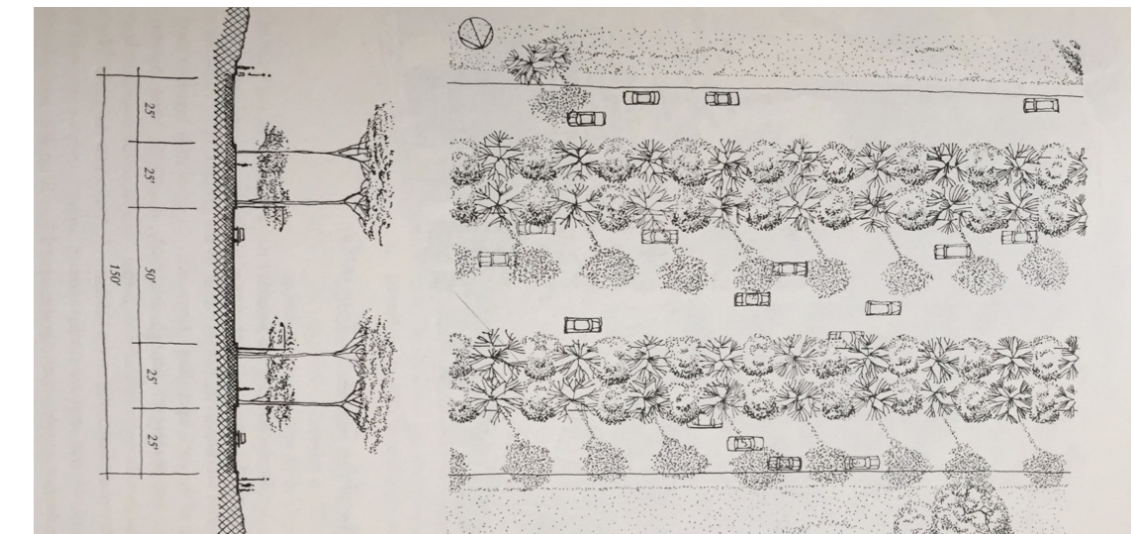
it.” (A. Jacobs, 1993)

Thinking back to the historical stratification, how Via delle terme di Caracalla manages to combine the ruins of classical antiquity - the thermal baths of Caracalla -, the romantic landscape of the Italian countryside with the Pines and the modern functionality of highway engineering, all while assuring with the ancient course of the Appian Way.

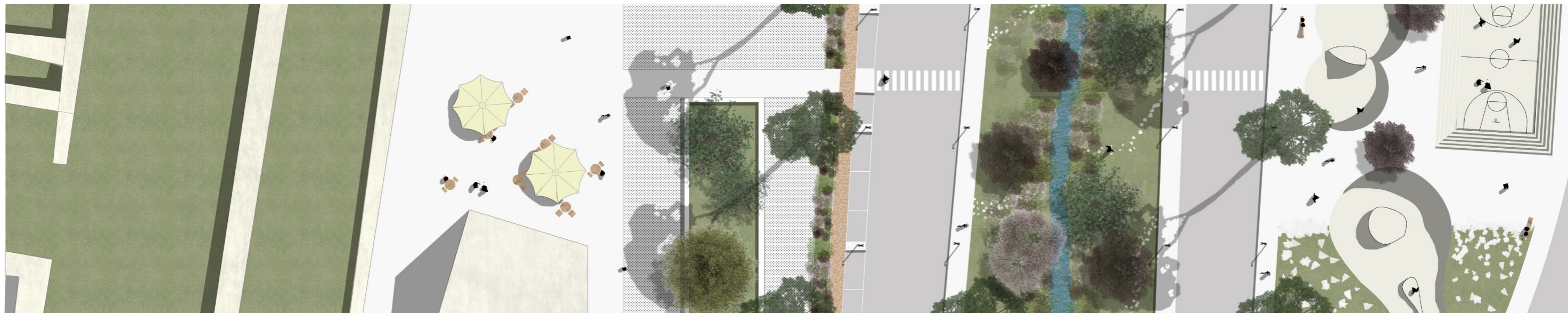
Having this in mind, in the proposed design the Italian stone pines, *Pinus pinea*, symbol of the city, have been maintained their original location: their bare and regular shaft emphasizes a strong verticality in contrast to the horizontality of the mainly flat street. The two driveways have also been maintained, so as not to upset the city’s traffic, but the central area, bare and useless to date, has been transformed into a green boulevard embellishing the street with an important green element. At the same time, a water square and a skate park have been installed to involve citizens in sports and social activities and to collect as much water as possible during storms. (FIG 4.40)

left FIG. 4.40  
 Section of Via delle Terme di Caracalla. In the drawing are explained the strategies and principles of the watersquare in the special historical context of the site (Author, 2020)

right FIG. 4.41  
 Jacobs’ plan and section drawings of the Viale delle Terme di Caracalla, Rome (A. Jacobs, 1995)  
 Retrieved from <https://www.theamericanconservative.com/urbs/what-makes-a-great-street/>



SITE 1



0 5 m 20 m 50 m N



FIG. 4.42  
Section and plan of Via delle Terme di  
Caracalla (Author, 2020)

top right FIG. 4.43  
In red is highlighted the location of the  
section and plan (Author, 2020)

SITE 1

Materialization - Route A

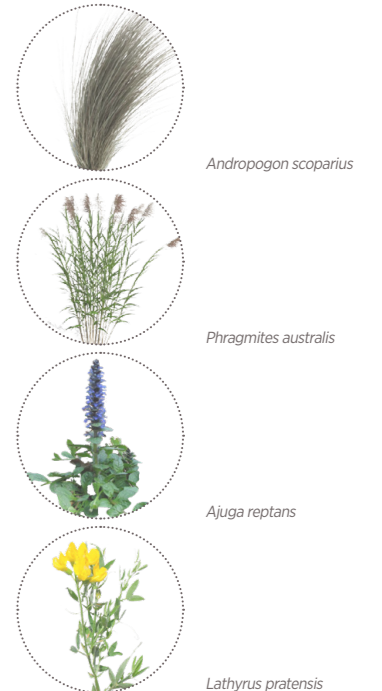
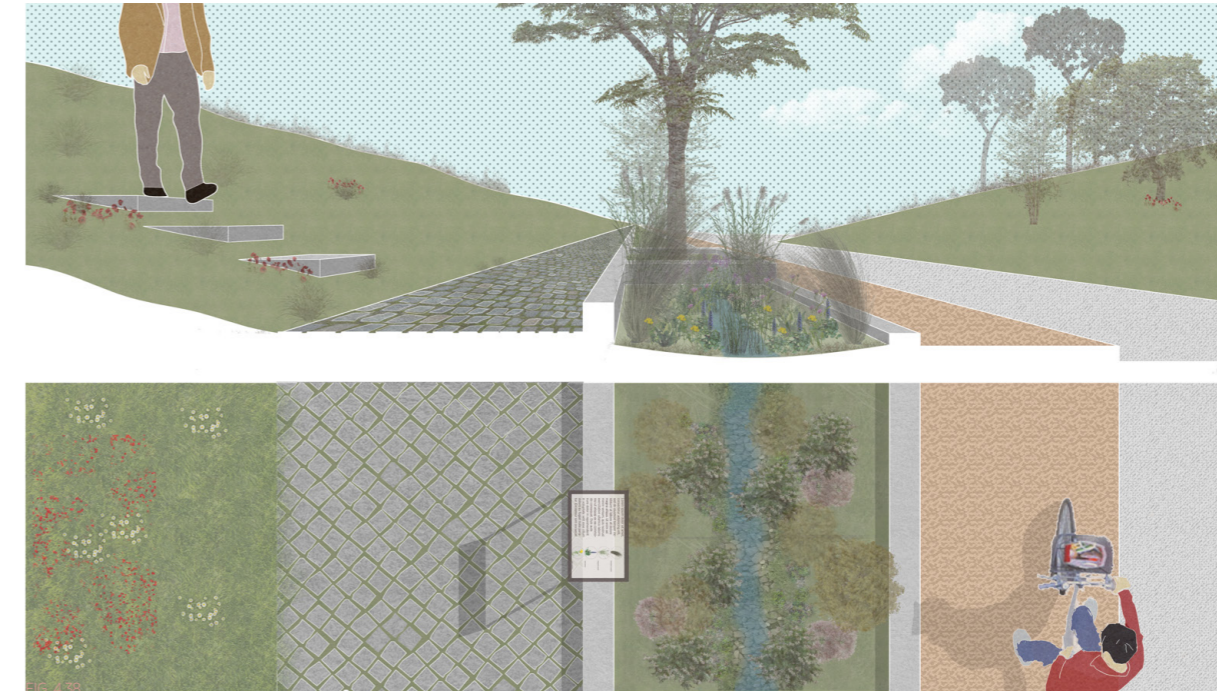


left FIG. 4.44  
Detail section and plan in scale 1:50 of route A.

Since the routing is a crucial part of the project, the material of the paving is designed keeping in mind the typology of the route. For the route A large blocks of Roman marble travertine stone were chosen, alternating with waste material, ancient amphorae or urns, found during the work and not of value, they find here a new function. The path is sometimes accompanied by a red brick wall, a typical element of the palatine (Author, 2020)



Materialization - Route B



right FIG. 4.45  
Detail section and plan in scale 1:50 of route B.

For the route B the paving is made of Sampietrini, cobblestones, which are small geometrically cut stones. They are very resistant and allow a good percentage of permeability. The cycle path is also made of a recyclable material with high permeability. In the middle the bioswales that with special helophytes plants allow the capture and purification of water (Author, 2020)



FIG. 4.46.1



FIG. 4.46.2



FIG. 4.46.3

FIG. 4.46  
 Montages of the route A  
 1. Walking in the Palatine Hill on the new paved route  
 2. On the top of the hill visitors has the view on the city  
 3. Wild area of the site where the nature prevales, on the right you can see the Nymphaeum and in the background the aqueduct (Author, 2020)



FIG. 4.471



FIG. 4.472



FIG. 4.473

FIG. 4.47

Montages of the route B.

1. Proposed water square around the Arch of Costantinte, people can sit all around and enjoy the view

2. Wooden path in the Circus Maximus that is transformed in an urban wetland

3. Watersquare in Vi delle Terme di Caracalla (Author, 2020)



## Transition Area

Via di Porta San Sebastiano is the initial urban stretch of the via Appia Antica that then continues outside the city.

Along its route are the remains of the Antonine aqueduct that was used to feed the Caracalla bath in 217 AD.

Its final stretch ends with the gate of San Sebastiano one of the best-preserved gates passing through the Aurelian Walls, the walls of ancient Rome.

To date, this route is a driveway, which has many flooding problems and low maintenance, making it an unsafe road to cross.

Within the thesis project this road is placed as a transition area between site 1 and site 2 and in order to be consistent with the project a design model has been proposed.

The project, in fact, plans to make the road completely pedestrian, the traffic will be diverted to the nearby via di Porta Latina. Its profile is redesigned and enriched by bioswales and a cycle path; moreover, two different routes will be created, one that follows the original route of the road and another one that rises up following the natural course of the terrain. Ramps and stairs will allow access to the two routes along the way.

An interesting feature of this route, in fact, is that the walls on either side of the road, which at the beginning of the route are only 1.5 m high, rise up to 15 m along the way, as you can notice in the next page, FIG 4.51.

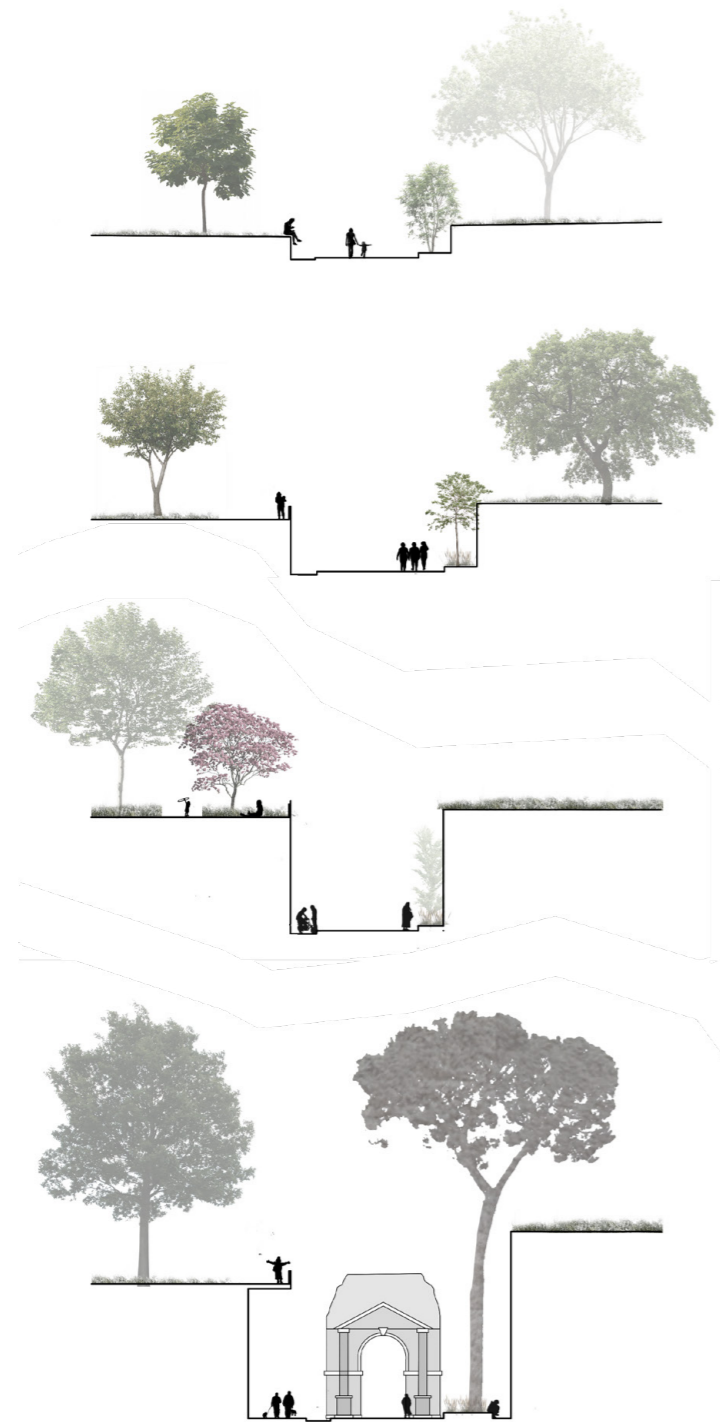
This characteristic therefore creates different perceptions for the visitor depending on whether he is in the lower section or on the contrary he chooses to follow the elevated route. Also in this case the theme of “seeing and being seen” is fomented by following the natural orography of the terrain and the urban composition of the city.



left FIG. 4.48  
Antonine aqueduct and Porta San Sebastiano (Wikimedia Commons, 2017)

top right FIG. 4.49  
Identification transition area (Author, 2020)

bottom right FIG. 4.50  
Present situation of Via della Porta di San Sebastiano (Google Street view, 2019)



left FIG. 4.51  
Sections along via di Porta San Sebastiano. They show the gradually growth of the walls (Author, 2020)

right FIG. 4.52  
Montage of the proposed design for the street (Author, 2020)







Revealing Rome's water-based culture

## SITE 2

### CAFFARELLA VALLEY

The valley of the Caffarella belongs to the Regional Park of the Appia Antica and is located outside the Aurelian Walls, between the via Latina and via Appia Antica, cut to the south by Via dell'Almone. The valley of alluvial origin consists of tuff plateaus, slightly sloping steep and of a valley floor rich in aquifers and of numerous mineral water springs. Particularly relevant is the presence of river Almone sacred to the Romans, third river of Rome by flow, and ditches fed from the numerous local springs. In ancient times the Caffarella valley was composed by a much more complex and rich hydrographic network, than the current one. The original marshy areas, innate to the geomorphology of the valley, have been reclaimed over the centuries through a series of hydraulic works, such as conveyance channels and ditches of various eras. The ancient exploitation of the water in the valley is attested by a dense network of water elements (hydraulic tunnels), channels, preserves (Roman tanks and basins) and architectural elements (nymphaeum, baths). Many of these ancient artefacts are still visible or traceable today and testify to the numerous activities anthropogenic made for the control of water since Roman times.

The park stands out not only for its a historical-archaeological elements, but also for a geological and ecological importance. This area, at the beginning of the 20th century, was immediately subject to landscape restrictions, meanwhile all around the territory was impetuously urbanized. The typical hilly morphology of the Roman countryside has been largely destroyed by the rise of large settlements in the peripheral

areas that have operated large movements of land. Even the intubating of the streams for the construction of civil sewage collection works, or hydraulic defence works, or infrastructures has led to the loss of the original orography. The territory of the park, however, still preserves the characteristics of the original physical landscape, which together with the presence of important floristic elements, centuries-old trees, rare plants, offers a unique glimpse of what the landscape of the Roman countryside must have looked like before the massive urbanization of the 1960s.

The vegetation is composed of various entities, most of which represent species of flat and walled areas in and around Rome. Many plants are invasive, due to the massive anthropization that has operated on the area with intensive crops since ancient times. The spontaneous vegetation occupies few areas of the territory and usually it appears only where the morphological conditions of the soil, their chemical-physical factors and archaeological presences do not encourage the extension of crops.

The flora of the Caffarella park includes some entities considered rare or endangered as the *Berteroa obliqua* (false madworts), *Biarum tenuifolium*, *Linaria purpurea* (purple toadflax) and *Sternbergia Lutea* (winter daffodil). (Buccomino, 2000)

Walking in the park, you will be surprised by the fusion between history and nature, between green and urban, by the beautiful views of the valley and of the city and by the richness of flora and fauna such as sheep, cows, fox, rabbits and an incredible variety of birds.

left FIG. 4.53  
Caffarella Park. In some higher points of the park it is possible to see San Peter Church, more than 8 km far (S. Cangiano, 2017)

## VIEWS AND PANORAMAS



FIG. 4.54.1



FIG. 4.54.2



FIG. 4.54.3

## NATURE AND HISTORY



FIG. 4.55.1



FIG. 4.55.2



FIG. 4.55.3

top left FIG. 4.54

The beautiful panoramas you could assist in the park thanks to the configuration of the valley

1. (A.Chellini, 2015)
2. (A. Esse, 2012)
3. (Author, 2019)

bottom left FIG. 4.55

The combination of nature and history present in the park

- 1.-2.-3. (Author, 2019)

Revealing Rome's water-based culture

## FAUNA



FIG. 4.56.1



FIG. 4.56.2

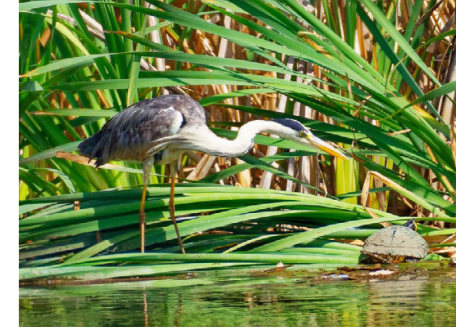


FIG. 4.56.3

## FLORA



FIG. 4.57.1



FIG. 4.57.2



FIG. 4.57.3

top right FIG. 4.56

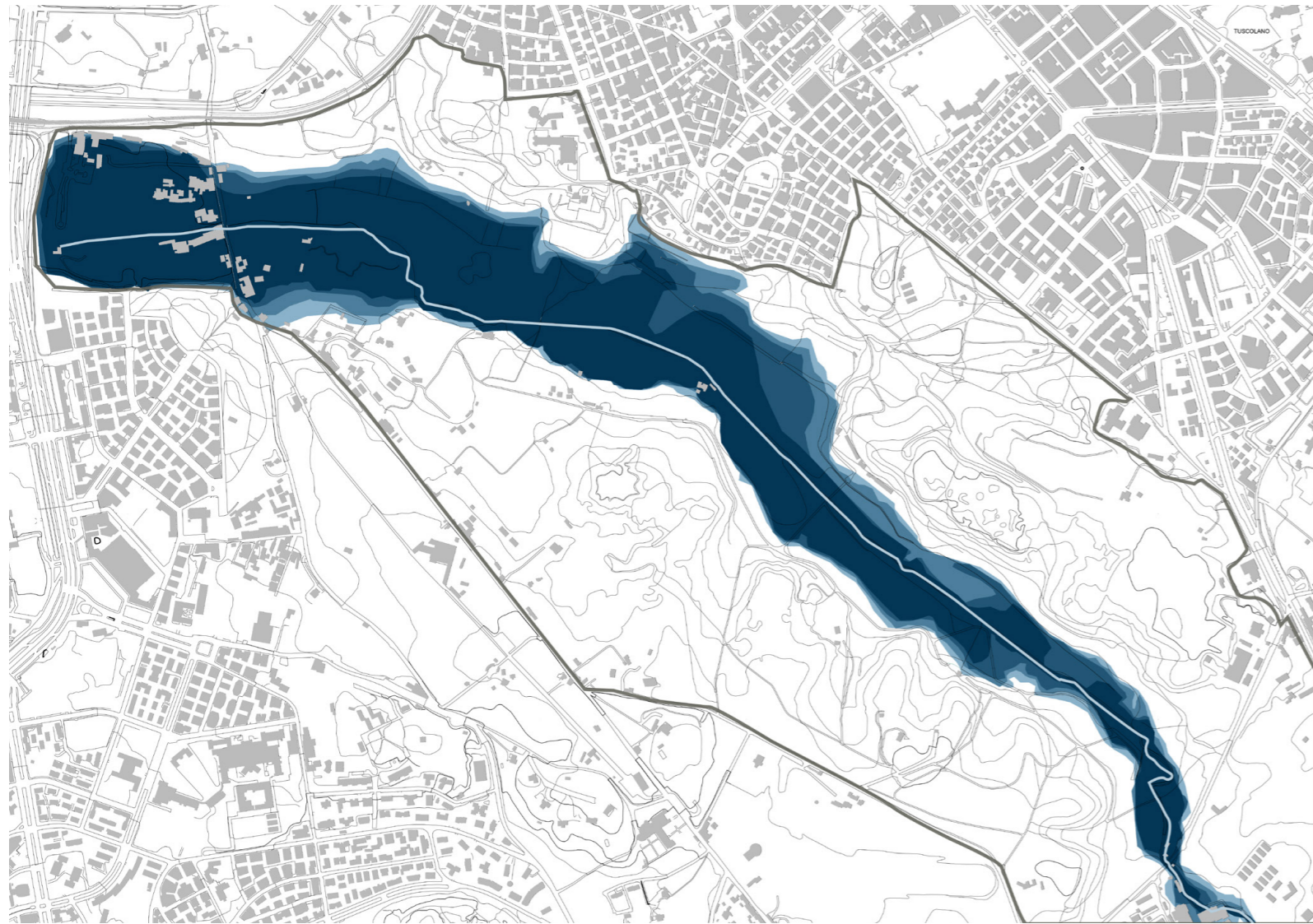
Some of the fauna present in the park

1. (S. Iovine, 2019)
2. (S. Bertaiola, 2020)
3. (F. Zizuma, 2019)

bottom right FIG. 4.57

Some of the flora present in the park

1. (A. Chellini, 2019)
2. (S. Loreti, 2017)
3. (F. Viviani, 2020)



left FIG. 4.58  
Map of the return period of flood of Almone River in the Caffarella Valley (Author, 2020)

right FIG. 4.59  
Pictures shown the present situation of the Almone. It is unmaintained and it often causes the flooding of Via Appia (Author, 2020) (RomaToday, 2018)

As mentioned above, the valley is characterized by a conspicuous superficial and hypogean hydrographic network and by the presence of numerous springs.

The main watercourse is the **Almone**, also known as the Caffarella marrana, flanked by two minor ditches fed by springs, which spring up at the foot of the hills.

Already in ancient times the Almone river was known for its inconstant and torrential regime, as defined by Ovid, a famous Roman poet of the first century after Christ: *lubricus, cursusque brevissimus* (Ov., Met., XIV, 329).

Intubated in the final stretch for the urbanization of the Ostiense district, the river still flows in the open air in the valley of the Caffarella, and then disappears from sight near the Latin paper mill on the Appia Antica road.

If in antiquity the Almone River was considered sacred, as it is revealed by the numerous literary sources that celebrated its purity and the archaeological remains along its course, today this memory is disappearing.

Its course has been changed and reduced several times over the years. The section of the river along the valley has been restricted, the riparian vegetation is left uncultivated and not maintained and the pollution rate is very high. Walking along the park is difficult to see the course of the river, his status as the protagonist of the valley is now gone.

A serious consequence of the anthropic work on the river are the floods that are now more and more frequent. The river, with an average flow of 300 and 390 m<sup>3</sup>/s, (Campolunghi et alii, 2008), does not have enough space to flow freely and often, during storms, overflows, flooding a good portion of the valley and reaching the

Appian Way (FIG 4.59) and other nearby roads that become unusable, with all the inconvenience that this entails.

In the map on the left page (FIG 4.58) is shown the map of Caffarella Park with the flooded area according to different return period of 50, 100, 200 and 500 years -the return period is the average length of time in years for an event (e.g. flood or river level) of given magnitude to be equalled or exceeded (McCuen, 1998)- and mostly all the valley could be entirely flooded.

As illustrated, therefore, it is necessary an intervention within the park considering a requalification of the river, giving more space to the river so that it can overflow when it is necessary and, at the same time, creating wetlands that will enrich the park of important ecological areas.





FIG. 4.60.1  
Actual Situation - Phase 1

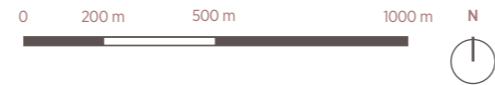
As we have said, the park today is characterized by the Almona river that runs along the valley; unfortunately the river has an incredibly small section despite its flows and its banks are covered with vegetation. Moreover, as you can see in the map (FIG 4.60.1) there are very few entrances especially on the west side and few crossings. Moreover, the park does not have any kind of equipment for visitors.

Initially the work has foreseen the enlargement of the section of the river in order to allocate more space for water in case of flooding and a cleaning of the banks, so as to make it clearly visible inside the park. Wetlands were then created and existing lakes were enlarged in order to emphasize the biodiversity of the park. Thanks to ancient maps, the old watercourses have been recovered and retraced (4.60.2).



FIG. 4.60.2  
Phase 2

In the final phase that led to the completion of the master plan, more crossings were added in order to make the crossing of the valley smoother. Many routes have been raised in order to ensure the passage even in case of flooding of the river. The central area, the most anthropicized, has been equipped with a barbecue area, picnic areas and community garden (FIG 4.61).



left FIG. 4.60  
1. Phase I

2. Phase II of the development of the masterplan  
(Author, 2020)



- 1. Elevated Path
  - 2. Wetland
  - 3. Floating Gardens
  - 4. Artificial lake
  - 5. Fishing pond
  - 6. Community Garden and greenhouses
  - 7. Pic Nic Areas
  - 8. Lawn
  - 9. Wetland
  - 10. Nymphaeum Egeria
- Route A  
 Route B

FIG 461  
Masterplan site 2 (Author, 2020)



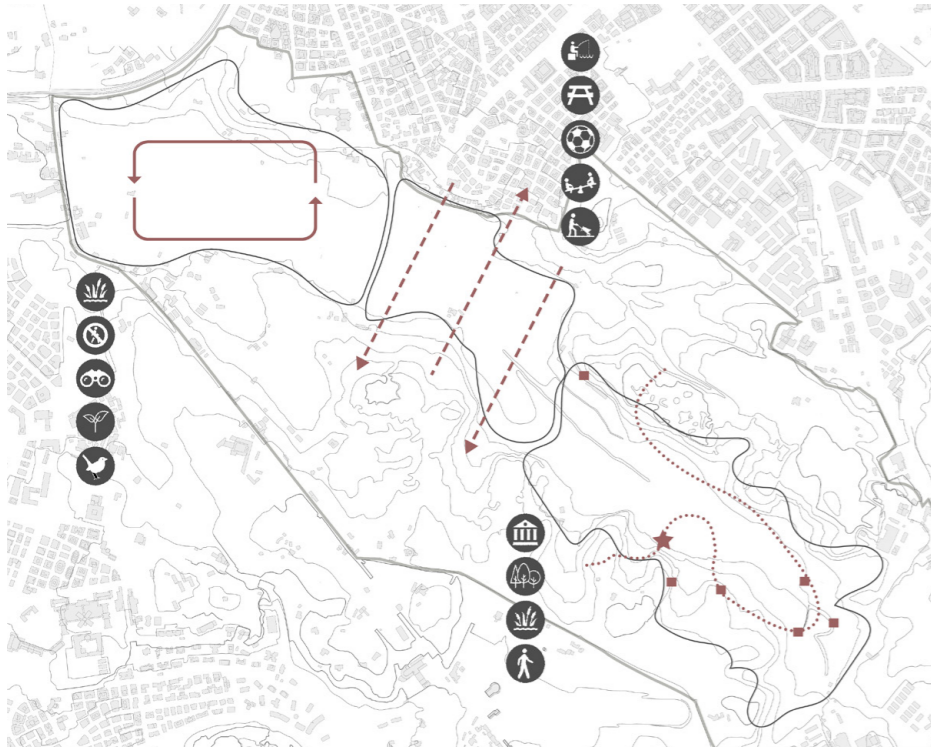


FIG. 4.62.1  
Functions-Accessibility

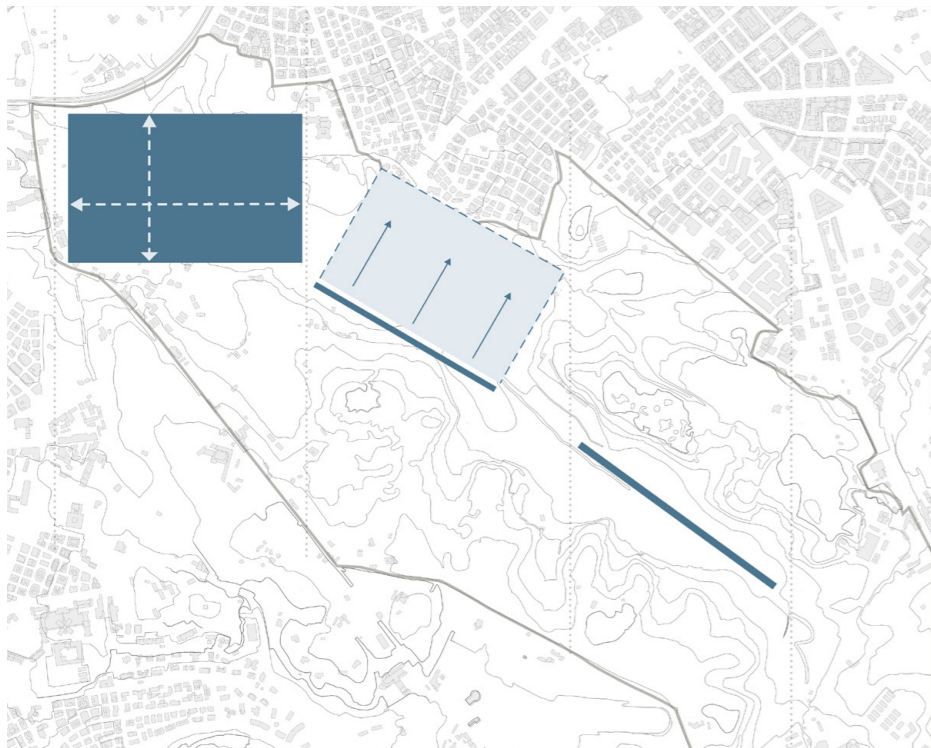


FIG. 4.62.2  
Water behaviour

The area of the project site has been redesigned by dividing the park into three main areas (FIG 4.62.1). The first area is the most natural and ecological; this space, which is the lowest area of the site, the pre-existence of a small lake is being enlarged in order to create an important wetland and the section of the river Almone enlarged. The area is almost inaccessible to people, except for an elevated path equipped with terraces and birdwatching from which people can see the animals and enjoy nature. This route is necessary so that this area remains as natural as possible leaving space for nature to take its course and, at the same time, the elevated path will allow people during flooding of the river to access the other side of the valley meanwhile see directly how the landscape changes once flooded.

The second area on the contrary is more “anthropicized” and completely accessible to visitors. In fact, already historically the area shows signs of artificial crops and canals for agriculture. These canals will be used to create small community gardens and greenhouses, involving residents of nearby neighbourhoods, and the large lawn will be equipped with picnic areas, barbecue, sports equipment and playgrounds. Even the creation of a small pond will allow people to fish. In this area, therefore, the park takes on a whole new function that directly involves and interacts with the visitors. The last area is rich in ruins and archaeological elements, it is here that the Egeria Nymphaeum resides and where the routes end. This area summarizes the principles of the two previous ones with a mixture of natural and anthropic areas, accessible and semi-accessible, bringing the

visitor’s experience to a conclusion.

If people have to behave differently depending on the area of the park they are in, so the water is managed differently along its course (Fig 4.62.2). At the beginning, the slope of the valley is very steep and the river has little space to expand and therefore it “behaves” in a controlled and linear way. In the second area its normal course will always be linear but depending on the needs it will have the space to flood in the large lawn. The third area, the most natural one, is where water is the protagonist: large wetlands have been created so that nature will benefit from it.

left FIG. 4.62  
1. Three different levels of functions within the park, of walkability and of experience for visitors

2. The different water behaviour in the three areas of the park (Author, 2020)

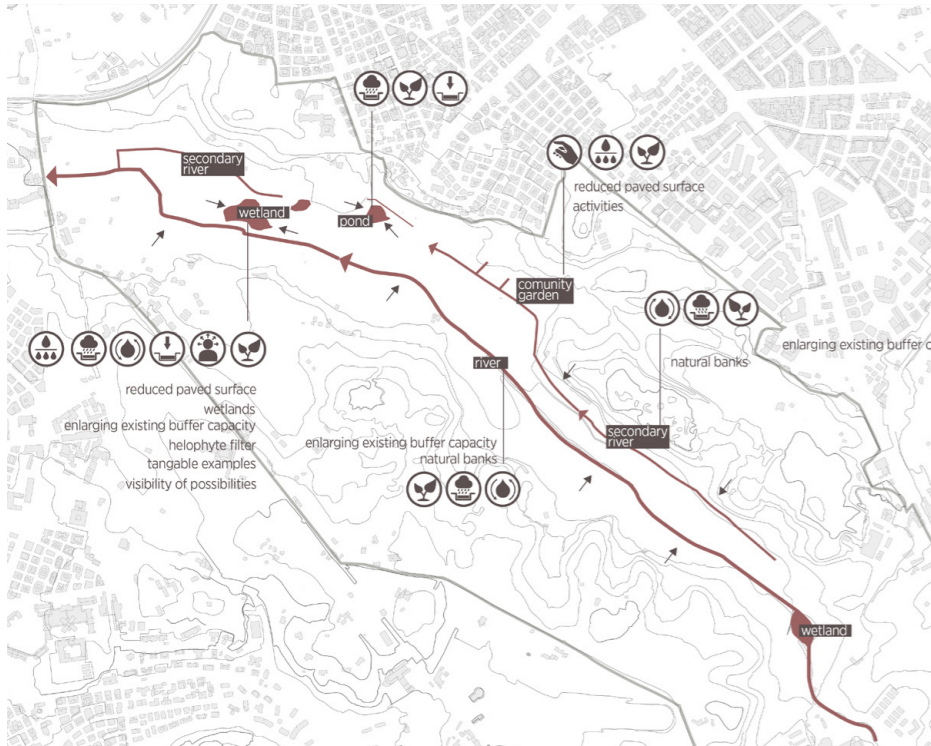


FIG. 4.631  
Green and blue principles

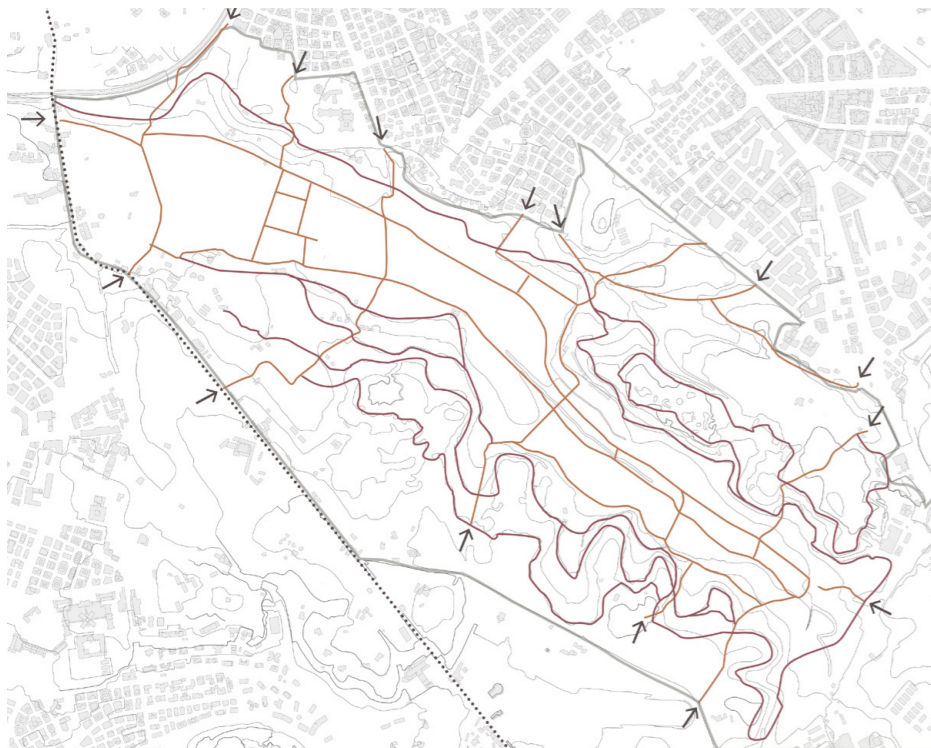


FIG. 4.632  
Routes and entrances

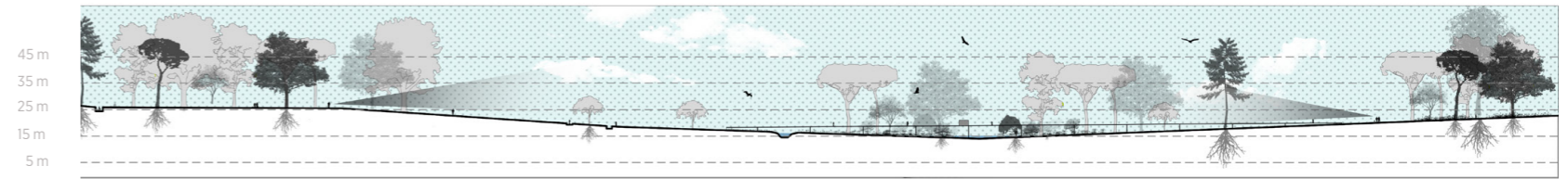
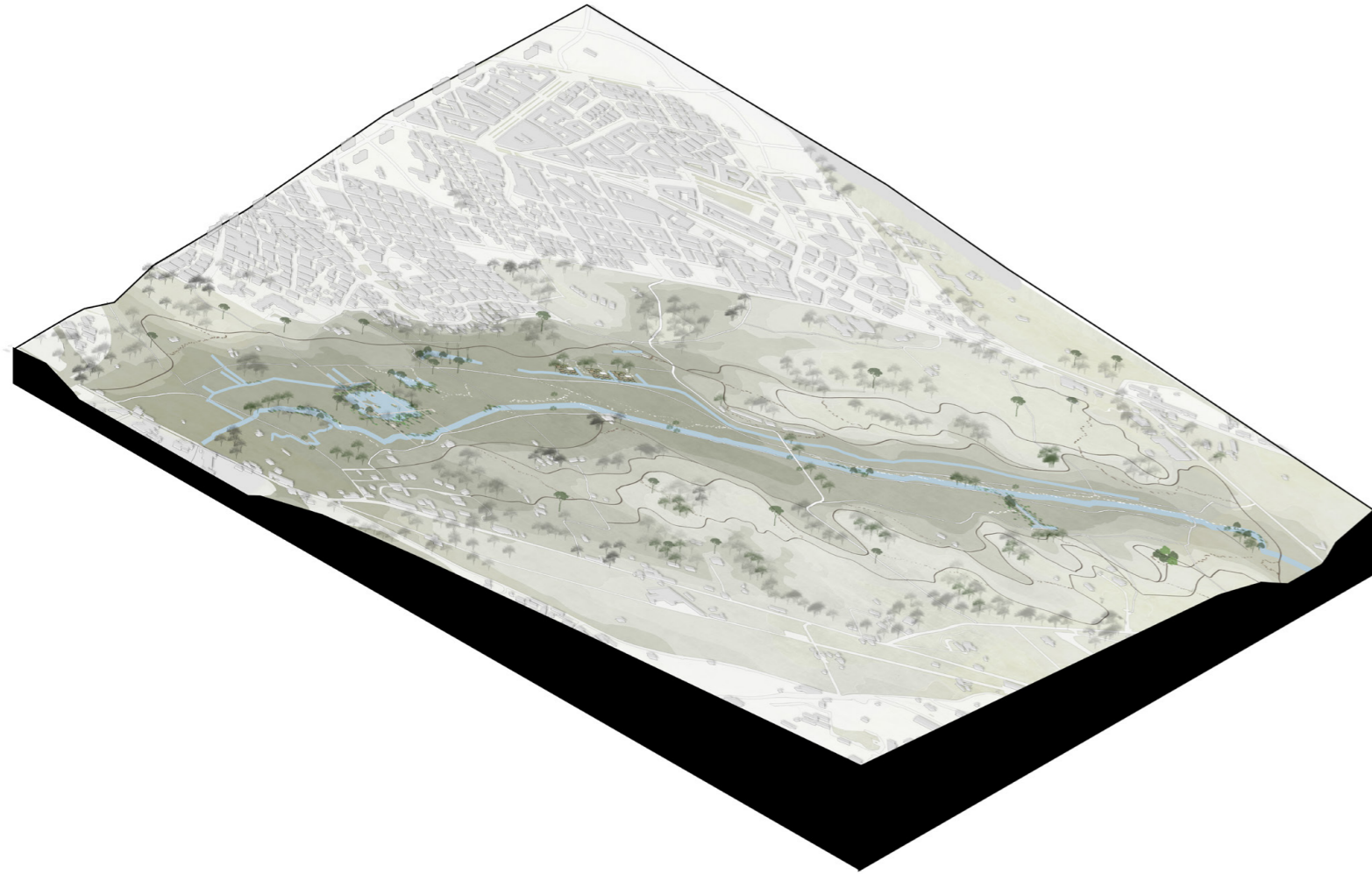
The principles -explained in FIG 2.12 page 60- are applied in Caffarella Park: the use of helophyte filters, enlarging existing buffer areas, etc. Also important is the involvement of the locals thanks to community gardens or maintenance projects of the wetlands and the river banks (FIG 4.63.1)

The second diagram (FIG 4.63.2) shows the two different routes. As already explained, they are thought in different ways for two very different functions. Route A follows the lines of the terrain and guides the visitor into a dive into the past, where the close relationship between water, valley and man is explained. The dozens of ruins along the valley dating back to Roman, Medieval and contemporary times, demonstrate a relationship between man and the Caffarella that has never ceased to exist. It becomes clear the ability already in ancient times to govern the waters present in the valley to exploit them for agricultural reasons but also for pleasure. On the contrary, route B, designed in a more linear way that directly connects the neighbourhoods, tries to show a new point of view in which water is designed to create magnificent landscapes where nature and man live together. Here the visitor is invited to interact, study and understand the valley in all its facets.

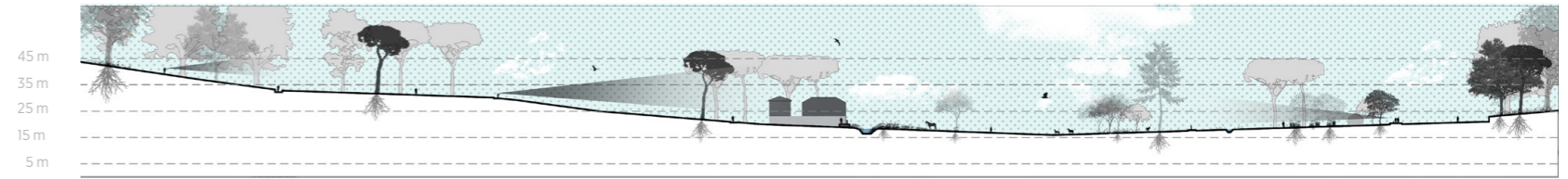
The final object is then to enhance the valley from a naturalist and archaeological point of view, promoting the culture of water both for understanding and respecting this resource and for emphasizing the value of historical testimonies related to its use.

left FIG. 4.63  
1. Green and blue principles applied in the park

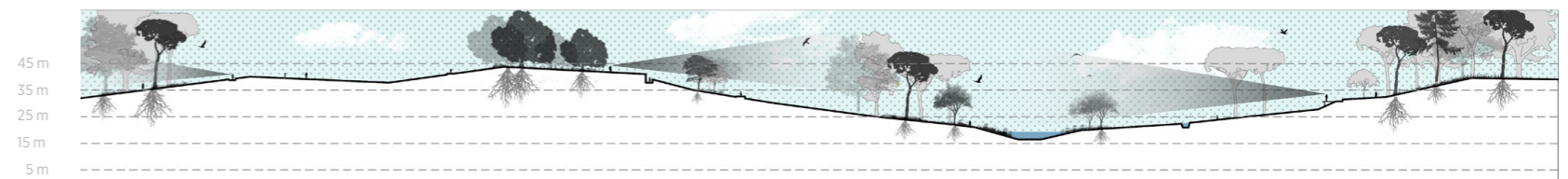
2. Route A and Route B and the new entrances in the park (Author, 2020)



Section A



Section B



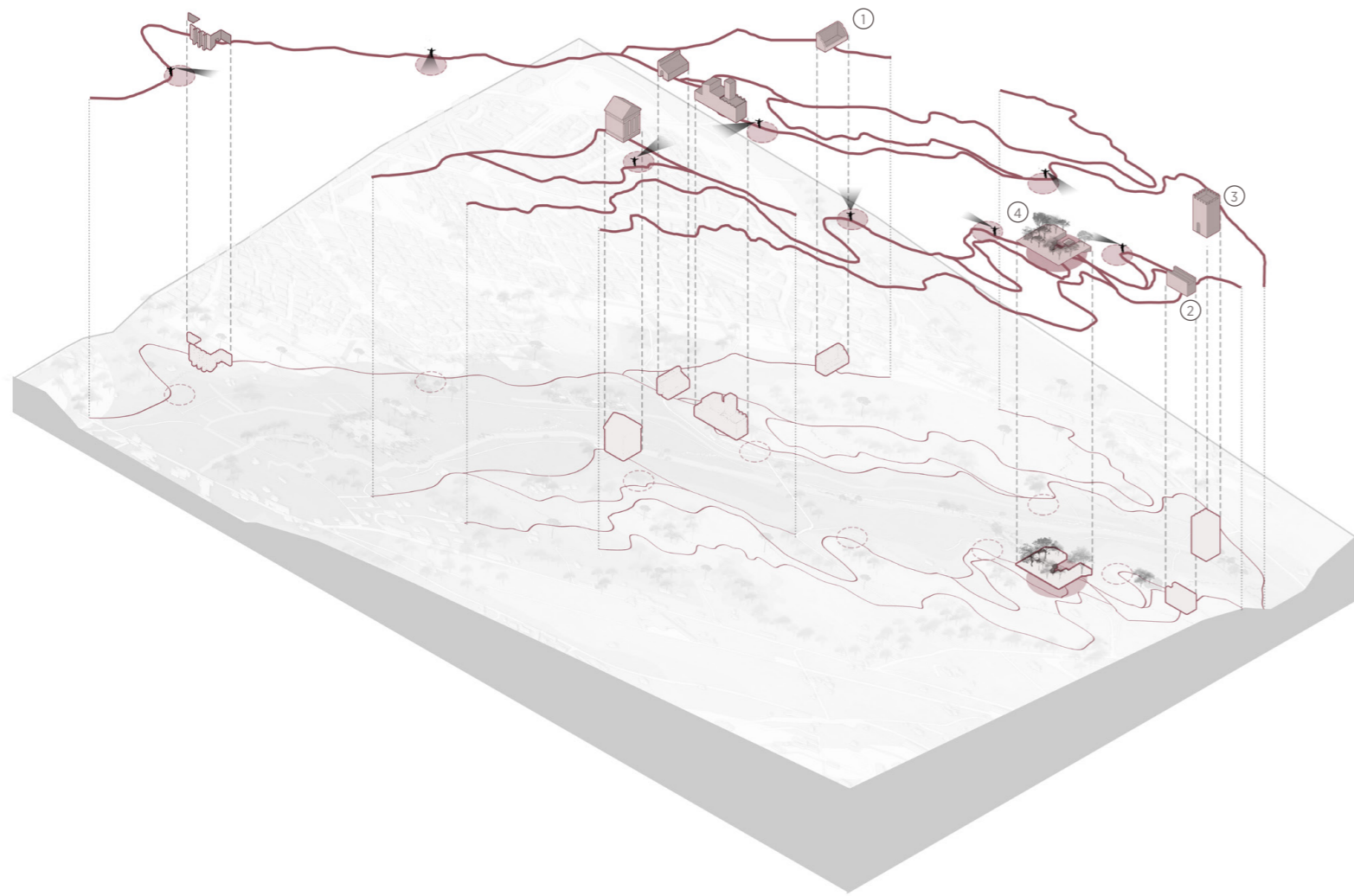
Section C

left FIG. 4.64  
Axonometry of site 2

right FIG. 4.65  
Sections of the site. They show the  
differences of height of the site  
(Author, 2020)







1. Roman water tank



2. Roman water tank



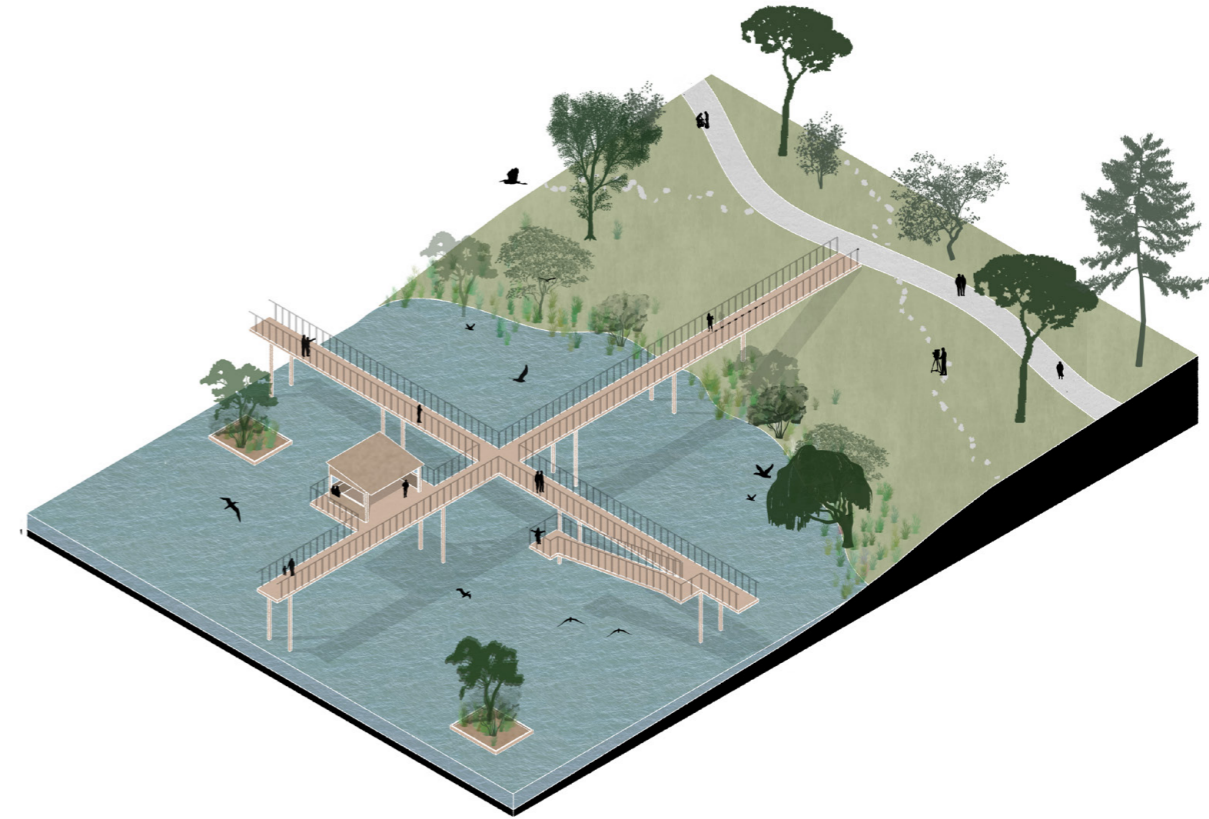
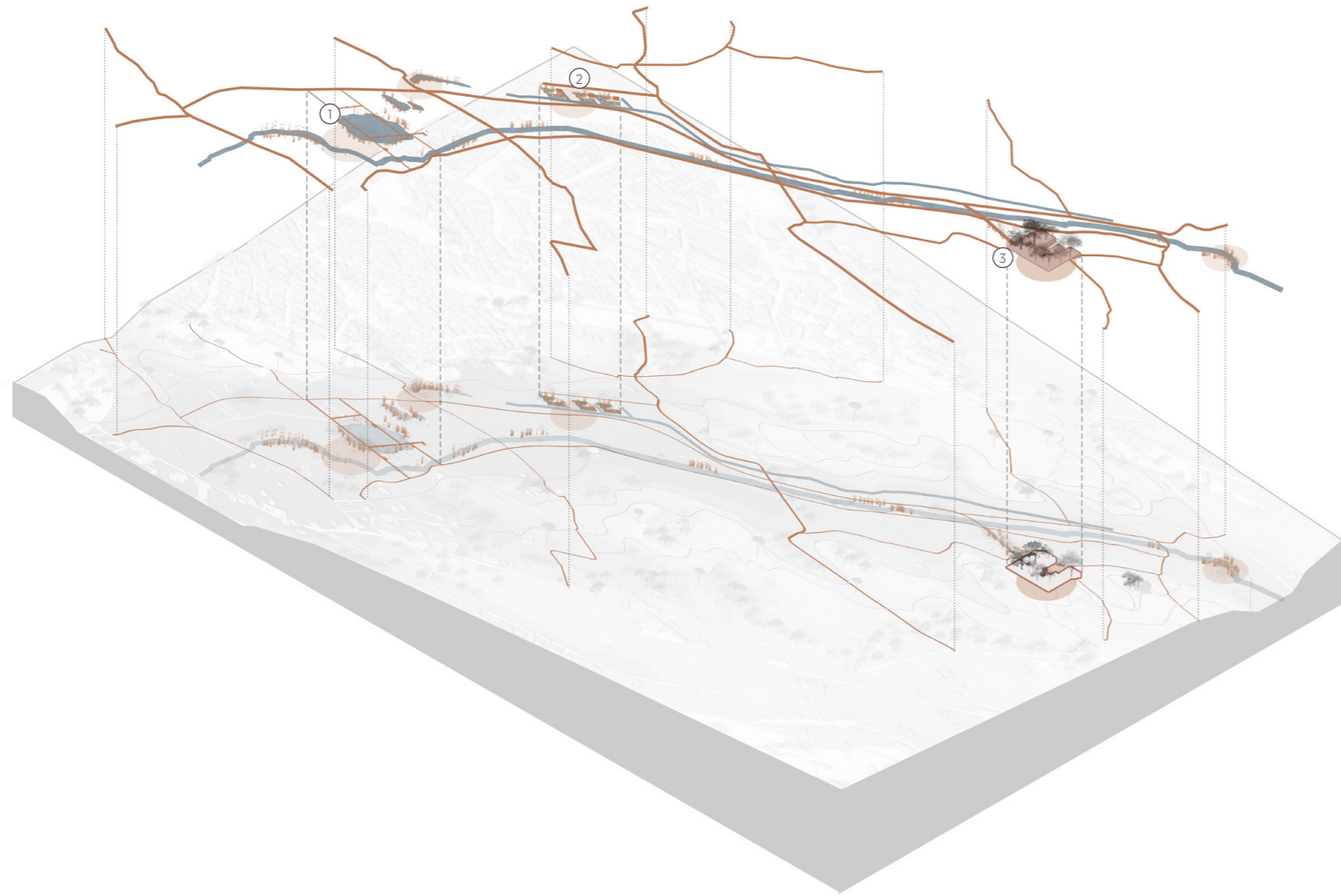
3. Torre Valca



4. Egeria Nymphaeum

left FIG. 4.66  
Axonometry of Route A. Highlight the architectural water elements and the panoramic points (Author, 2020)

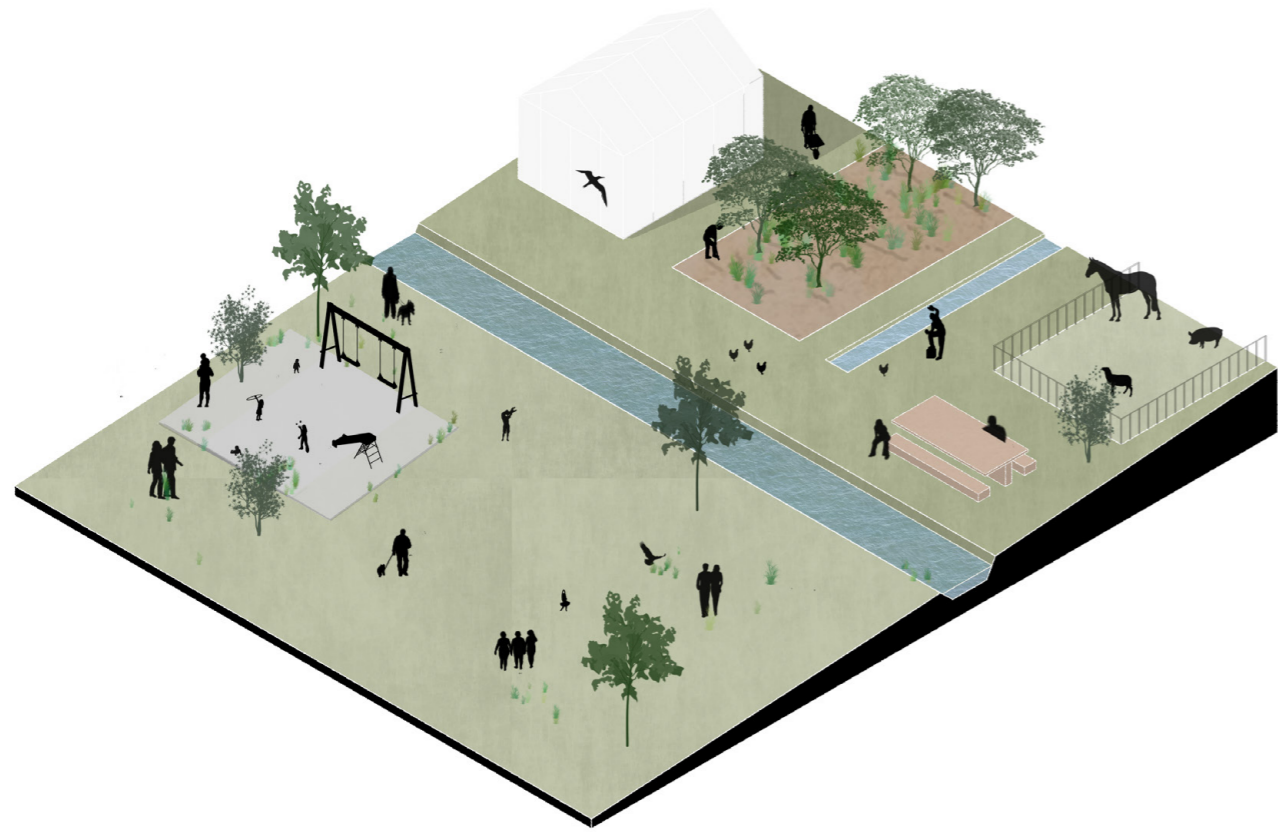
right FIG. 4.67  
Pictures of some ruins that the visitor can find along the route (F. Viviani, 2020)



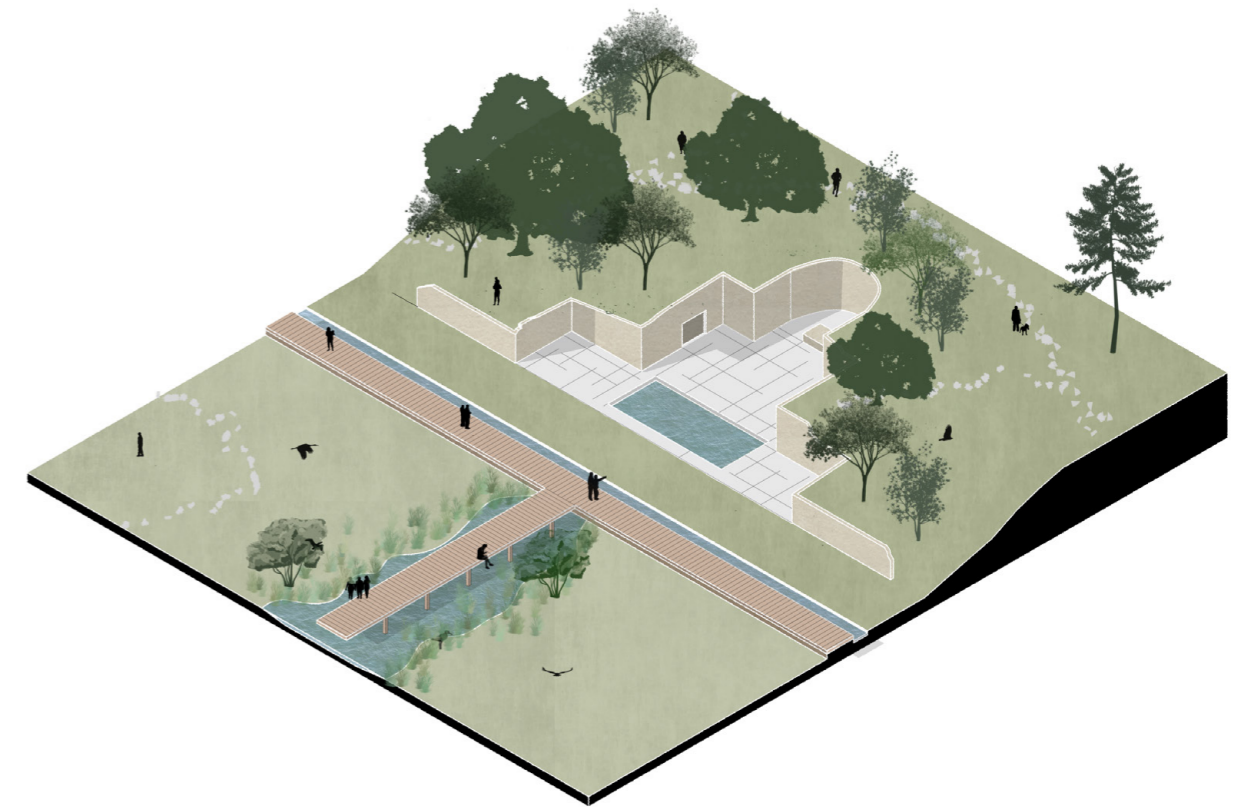
1. Wetland and the elevated path

left FIG. 4.68  
 Axonometry of Route A. Highlight the architectural water elements and the panoramic points (Author, 2020)

right FIG. 4.69  
 Pictures of some ruins that the visitor can find along the route (F. Viviani, 2020)



2. Community Gardens



3. Nymphaeum Egeria

left FIG. 4.70  
Axonometry of community gardens  
(Author, 2020)

right FIG. 4.71  
Axonometry Egeria Nymphaeum  
(Author, 2020)

1. Wetland and the elevated path



An important intervention has been carried out in the northern area of the Park. This area, one of the deepest in the park, has been exploited to create a wide wetland: it is an area dedicated to the nature and biodiversity of the park. The wetlands are not accessible to visitors who can enjoy the show through an elevated path. From here they can see different varieties of birds and amphibians, not to mention a variety of plants. Along the route there will be birdwatching areas or installations to explain the surrounding nature.

FIG. 4.72  
Section and plan of the natural wetland with the elevated path (Author, 2020)

top right FIG. 4.73  
In red is highlighted the location of the section and plan (Author, 2020)

2. Community Gardens



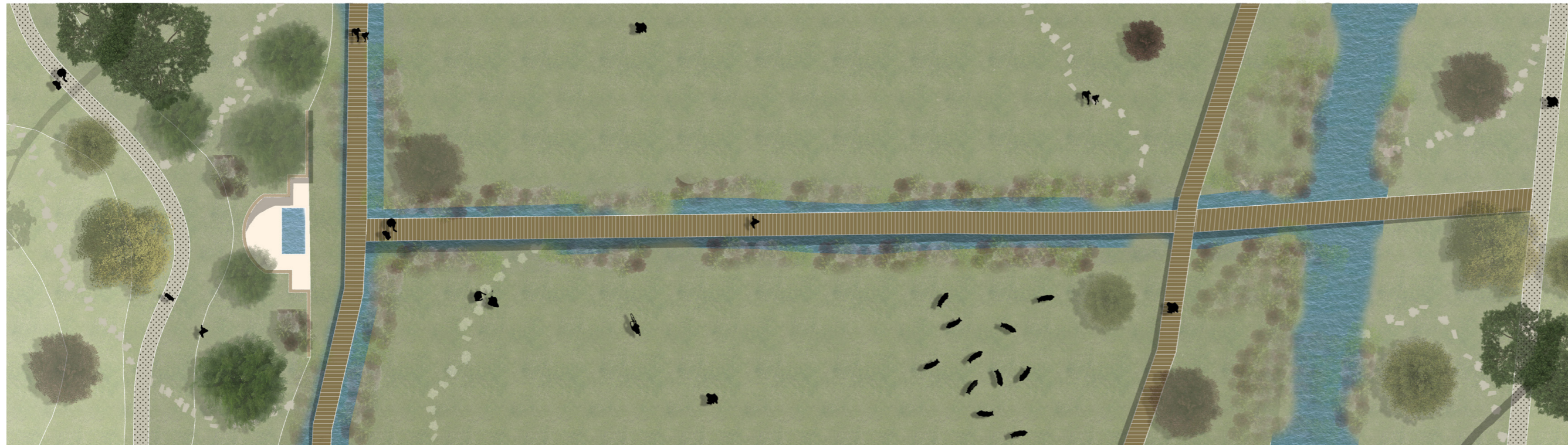
The second intervention area is more antropocized. The large lawn, whose primary purposes are recreational uses and provide extra surface for draining., is equipped with playgrounds, barbecues and picnic area. It is a place in which nature, as water, flower, sheep, and man combined together respectfully.

At the same time, community gardens will be installed in the western part of the area for the neighbourhoods. Here the citizens will be able to grow seasonal fruits and vegetables involving people of all age groups.

FIG. 4.74  
Section and plan of the lawn and the community garden (Author, 2020)

top right FIG. 4.75  
In red is highlighted the location of the section and plan (Author, 2020)

### 3. Egeria Nymphaeum



Finally, the area where the nymphaeum of Egeria resides is completely restored. The nymphaeum can be reached either via route A, i.e. walking from above in the forest the visitoris then at the highest point of the nymphaeum; otherwise he can reach it through route B. This path is raised so that it can be used at any time of the year. The ancient waterway that once connected the Almona to the nymphaeum is recovered and the path is drawn above it: the visitor will feel gradually immersed more and more in nature and ancient history, in a fusion between myth and naturalness, experiencing a cathartic and unique adventure.

FIG. 4.76  
Section and plan of the Egeria  
Nymphaeum area, the final destination  
(Author, 2020)  
top right FIG. 4.77

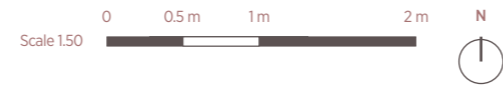
In red is highlighted the location of the  
section and plan (Author, 2020)

Materialization - Route A - Tuff platform



Roman Tuff

left FIG. 4.78  
Detail section and plan in scale 1:50 of route A in site 2.  
This route is characterized by its position, always placed in the high slopes of the valley, giving the opportunity to enjoy excellent views. For this reason, along route A you can find platforms that serve as panoramic terraces, equipped with seating. The main material of the paving is tuff, a stone widely used for constructions in ancient Rome, because of its physical characteristics of resistance and for its diffusion in the Roman territory, which therefore recalls the colours of the valley and the city. (Author, 2020)



Materialization - Route B - Wooden Path



*Acorus calamus*



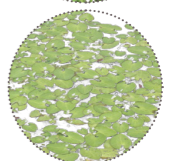
*Sagittaria latifolia*



*Lythrum salicaria*



*Iris versicolor*



*Nymphaeaceae aquatica*

left FIG. 4.79  
Detail section and plan in scale 1:50 of route B.  
In detail, there is a raised wooden path that can be found at the bottom of the valley, so that the path is accessible even when the river floods. The surrounding vegetation is typical of wetlands and their characteristics and properties are explained along the routes by means of special educational signs. (Author, 2020)



FIG. 4.76.1



FIG. 4.76.2



FIG. 4.76.3

FIG. 4.80  
 1. Walking along the route in the valley of Caffarella Park  
 2. Elevated path on the wetland area  
 3. Panoramic terraces „made of tuff stones, on the valley (Author, 2020)



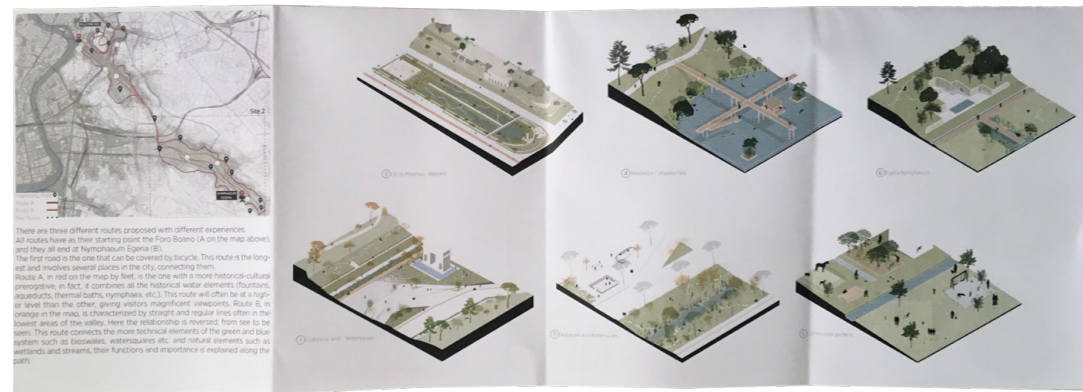
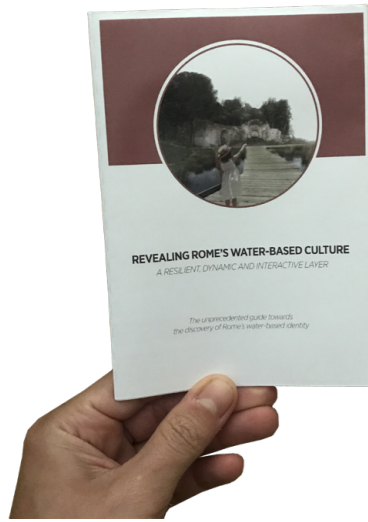


FIG. 4.771



FIG. 4.772

FIG. 4.81  
 1. Walking along the route in the valley, on the right the community garden and on the left the fishing pond  
 2. The final destination: Egeria Nymphaeum, reachable by the wooden path (Author, 2020)

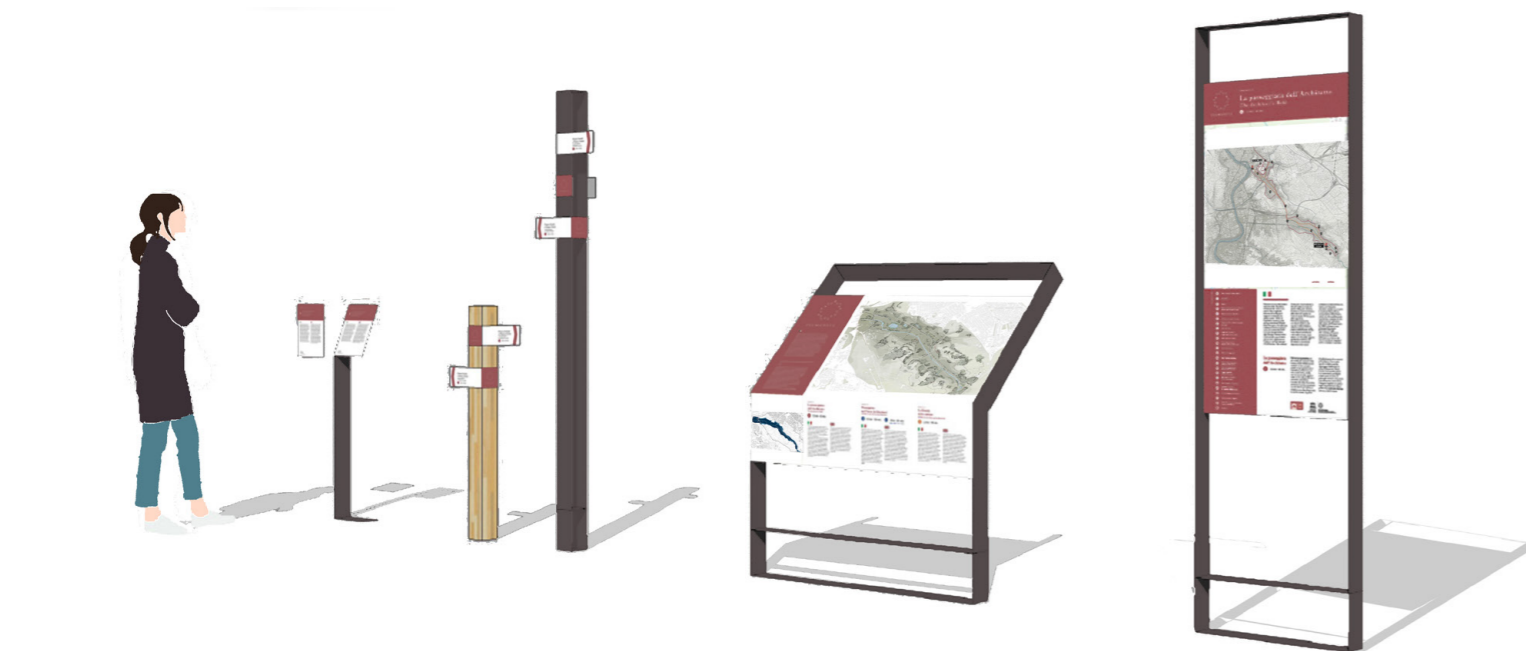


## AWARENESS

The education aspect, the conscience and the involvement of tourists and non tourists alike, is fundamental to the success of the project.

The path of knowledge is structured both through the visibility of tangible examples, such as for example watersquares or wetlands -whose visual and physical impact within the city is certainly important- will make reflect on different nature-based strategies, which can be used within an urban centre. A further point is also the practical involvement of the inhabitants: courses or workshops can be organised to educate citizens about the importance of certain elements, as well as courses in beekeeping, herbalism etc. that can involve people of all age groups.

Locals can also be involved in the maintenance of the park or other areas: this will benefit the locals, but also tourists, who want to devote their time to the contact with nature, restoring an important area -such as the historic city of Rome- and at the same time educating themselves on the different types of principles used in the project.



In order to make visitors more aware, several signs of different sizes will be installed along the whole route, with explanations about the area involved and the built project (FIG 4.82).

Moreover, an exciting and unusual guidebook will show the city of Rome like you've never seen before: a completely atypical guide that will be distributed to visitors, so that they can be followed along the route and be properly informed about the project (ANNEX A).

FIG. 4.82  
The different tourist signals, that could be found along the route (Author, 2020)



Revealing Rome's water-based culture

## CONCLUSION

The project works mainly with the importance of the water as an original, authentic feature of the city of Rome, in search of its role in the new modern society.

The historical, cultural, social and technological relationship between water and the city and its citizens, have been widely studied and developed in order to understand it and exploit its potentials.

The research explores this ancient bond between water and the city of Rome, a link that begins with its foundation and that manifests itself over the centuries with incredible fountains, baths and aqueducts; the thesis then dwells on the more recent aspects and the problems that the city is experiencing today: due to a strong urbanization and social change the millennial relationship is now almost forgotten by the citizens themselves, and indeed now water is seen as a threat that destabilizes the city with strong storms, flooding it, or otherwise with dry and hot summer times.

Therefore, it is necessary to re-establish the role of water in modern society and rediscover the water-based culture of the city.

Focusing on the importance of wetlands, rivers, water bodies in combination with the characteristic of the site such as hills, valleys, parks and local vegetation, the research project develops a green and blue infrastructure that connect different scales, developing a resilient and dynamic system and meaningful design for the city, rethinking the functions and land uses of the territory.

Not only then the proposed green and blue network provides space for nature within the city, enhancing biodiversity, creating leisure and recreational spaces but at the

same time, it will demonstrate a new way of conceiving the city and its spaces, in which water is no longer seen as a threat but rather as a benefit, in which green, bioswales, porous pavements, wetlands, rivers will become protagonists of a homogeneous mechanism between the city, nature and people. Tourists and citizens will be involved in this process, thanks to brochures, signs, with which they will be guided along the route and areas dedicated to community gardens and greenhouses will create active participation of the neighbourhood

The final object is then to mostrare, reveal, the water elements that characterize the city of Rome: the city is discovered from an ecologist and historical point of view, emphasizing its genius loci, encouraging the city's water identity both for promoting the value of historical testimonies related to its use -well visible within the city but little recognized for their value- and for making people aware of the great versatility and different functions that this resource could have, learning to respect it.

Within this project, water, in fact, assumes not only a fundamental historical-archaeological-cultural role within the identity of the city but also a necessary and vital role in future years for the resilient growth of Rome.

FIG. 63  
View of the Colosseum  
(Afp Agence France Presse, 2020)



Revealing Rome's water-based culture

## REFLECTIONS

### Environmental relevance

Contrary to what it may seem, Rome is a city that has a high number of parks and green areas. Unfortunately, the growth of the city has incorporated these green areas into its urban fabric, disconnecting them from each other and giving a general impression of a grey city. The “Parco Archeologico del Colosseo” and “Parco della Caffarella” have already an high level of biodiversity present, unusual for an urban area, that must be protected and enhanced. In this thesis project, therefore, this percentage of greenery is developed thanks to the green and blue principles, that generates a resilient and adaptive layer of the city, providing a safer and healthier structure for the metropolitan framework;

### Process of Data Collection

Unlike many of my colleagues who had difficulty in finding information on their site, in my case I had the opposite problem. About the city of Rome, one of the oldest cities in the world, a lot has been written, and when I started my research I had access to many sources and information from every point of view, initially finding many difficulties in understanding which one to choose. It was, therefore, very important the sorting process, going to thin out the aspects and topics that I was less interested in to deepen others.

### Research Results

In order to bring people closer to the water-based identity of the city, the project aims

to create two main routes that both lead visitors to the discovery of ancient ruins, such as aqueducts and baths, and also make them discover the modern layer of the green and blue system, that at the same time helps the city to become more resilient and cope with environmental changes.

Site 1 of the historical centre is presented in the project as a system detached from its surroundings; this choice was made because the site is a pilot project within the city. This area in fact has excellent characteristics to carry out this research, it is in fact in an area - as we have seen - that suffers from frequent floods and above all it is very central and famous where thousands of people come to visit it every day and therefore, at an economic level, it is easier to think of an investment.

These design strategies may also affect other areas of Rome, as we have seen in fact, the city of Rome was built on its own hydrographic grid and many modern districts today are located above ancient rivers that have been buried, resulting in serious flooding problems. Moreover, it is not only the historical centre where ancient Roman remains can be found, but both the countryside and the outlying areas are still full of ancient evidence of different historical periods to be discovered. Therefore, the principles of this project are certainly applicable to the whole city of Rome, indeed this would be desirable: creating routes around all the city would facilitate the movement of tourists to lesser-known but equally fascinating places, going to ease the tension in the historic centre. The city would then enjoy a larger and more efficient water management network, covering many places in Rome that suffer from flooding and

FIG. 71  
Pantheon completely empty due to the lockdown of March 2020  
(Afp Agence France Presse, 2020)

drought and at the same time giving green areas creating moments of sociality for the neighbourhoods.

#### Ethical, social issues and dilemmas

One of the main dilemmas I had to face was the **historicity** of the city.

The first step was to understand the role of history within the city of Rome, the relationship between the modern and the new: is it really so fundamental to know the ancient to implement the new? There is no city in the world so permeated with history as Rome, whose foundation dates back more than 2000 years and its evolution has changed the history of the world from a technological, artistic and cultural point of view. Its water-based culture is fundamental to understand the identity of ancient Rome and especially the modern one, the effective Roman technological solutions, their adaptation, their resilience must be remembered, studied and translated into modern time, in an era - the one in which we live in- that requires a strong change and respect towards the planet. Obviously, ancient technologies are no longer usable in modern times - although this is not entirely true, given that two aqueducts of the ancient Romans are still used today to bring drinking water to the city - but the study of history has above all a great cultural value: it teaches us the origins of societies and cultures, brings us to know our roots, brings us closer to a distant but somehow familiar world with which we share our heritage.

During the course of studying this thesis project, I was incredibly amazed by this hidden identity of Rome, where I was born

and grew up, discovering it I felt I understood and knew my city and my culture more deeply. Studying the fundamental relationship not only between the city and the water, but also the orography of the ground and even the subsoil, it seemed to me to discover a city that I had never really known before: this is therefore the ultimate goal of this project, to guide the visitor - citizen and tourist - within a path not only physical but also cultural, aimed at rediscovering the most authentic genius loci of Rome in this new and unusual reading of the city. By knowing our roots and the identity of a place we can learn to build a better future.

Another fundamental discourse when talking about historicity is one that includes the *delicacy* of a place full of such ancient and historically precious elements.

The historic centre of Rome is, in fact, one of the most famous places in the world, almost everyone knows the Colosseum and the Palatine area, so how to intervene in a decisive but equally delicate way in an area already full of its specificity? It was fundamental to understand its essence and try to define a project that somehow did not upset the pre-existing structures but still works on the needs that the city required. Some areas of the historic centre, once important places of culture or sociality, are now simple places of contemplation whose original function has been nullified over the centuries. One example is the Circus Maximus, next to the Palatine hill, once a chariot-racing stadium and mass entertainment venue, today is a place devoid of any function. Therefore in the thesis project, it has become a large urban wetland, so not only to retain the excess rainwater but at the same time to create a

place alive and characteristic again, where the water became the new protagonist and can be admired along the designed path. This type of intervention, however, must be accompanied by an awareness on the part of citizens and tourists. People must have a clear understanding of what they have experienced and why, only then they will be able to understand the project as an integral part of a whole system.

#### Corona Crisis

The advent of the covid-19 pandemic at the beginning of March 2020 was an event that had a significant impact on my thesis project. In addition to personal involvement, Italy was one of the countries most affected by the pandemic and this caused me distractions and some delays in completing my work, from a practical point of view several and unexpected problems came up: my site visit was, in fact, delayed, and with it the interviews I had planned and the visit to the library of the University of Rome were canceled as well. I lacked the necessary photographic material and, above all, the direct experience of those places, in order to better understand their nature and atmospheres.

I had to adapt to the new situation and with it also my project. Thanks to social media, I found new sources for the photographic material and wrote to many local people, in order to have a general impression of the chosen site. Many of the people I contacted were incredibly helpful, giving me their impressions, photographic material and opinions on my thesis work. Despite the unpleasant situation, the pandemic gave

me the opportunity to know the site in an indirect way, through the eyes of others: in fact through the words and photos of other people, tourists but especially locals, the project took shape, created by the union of different people's perceptions.

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Spanish steps in Rome during lockdown  
in March 2020  
(Afp Agence France Presse, 2020)

