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# the Hard and the Soft.

*How does the interdependency of water infrastructure and public space affect Madrid's relationship with water?*

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*Abstract.*

This research explores the paradoxical relationship between the city of Madrid and its river, the Manzanares, through the lens of water infrastructure and public space. From its etymological roots in the Moorish word Maŷrit—"waterways"—to the symbolic and infrastructural transformations over centuries, Madrid's urban morphology has been closely linked to water, yet the Manzanares remains absent from public imagination and civic life. A historical retrospective shows the complicated relationship the city has had with its river, highlighting moments when the river played both a functional and social role. Today, recent interventions, such as the M-30 ring road and the Madrid Río park, have often either hidden or over-designed the river promenade, contributing to a social detachment from its presence.Through cataloguing and analyzing water infrastructure, five key sites across Madrid are evaluated based on accessibility, water interaction, and integration of public activity. By analyzing urban models of other European cities like Zurich and Copenhagen—where civic life and infrastructure successfully intersect—the research argues for hybrid urban spaces.

The study critiques the Nature vs. Culture dichotomy in modernist urban planning, advocating instead for layered, multifunctional design informed by both technical systems and human experience. Ultimately, the paper entertains the idea of water infrastructure not as an invisible utility, but as a civic and spatial urban asset. Madrid holds the spatial and cultural potential to reintegrate water into its urban life, but doing so requires a shift in design thinking—one that treats water not just as a backdrop or problem, but as an active, fun and driving force in the city's future.

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Figure 1. Urban Context of Madrid

# 1. Introduction

A city's morphology and hence the way it is occupied has always been affected by the relationship with its water bodies. The flow of water has been used for the **flow of energy, goods and people** since the first cities in human history. Rivers and seas strengthened settlements as they brought in wealth and resources which highlighted the reliance between water and power. After all, water holds political and societal power as it is essential for growth and survival. Cities' identities have been formed around their connection to water and so is the case for the city of Madrid. The city is built between two rivers, the Manzanares which goes through the city and the Lozoya river. Furthermore, historians speculate that the name 'Madrid' is derived from the Moorish word 'Maŷrit', translating to 'waterways' (Stewart, 2015) since water is also present underground in various aquifers on which the city stands. Interestingly, Madrid's river is mostly absent from the general knowledge domain of most people. For Madrileños it is even a laughing matter or one of denial (Rivas, 2016). Meanwhile water and river **infrastructure** take a great amount of **space** in the city and influences its built environment and growth significantly.

Figure 2. The Manzanares

Figure 3. Water Cycle Collage

# *2. Methodology*

This **paradoxical** condition is the nucleus of this research. Firstly, the retrospective of the cultural significance of the Manzanares river, helps to break down the **complicated relationship** Madrid has with its water. The breakdown of the different eras substantiates the current condition of the river and the city's morphology. Then, the theoretical framework is established around i**nfrastructure and public space**, and the negotiating nature between big public works, nature and society. This framework informs the research on ideological stances and helps with forming a design position about the often-presented **Nature vs Culture** dilemma in architecture. The case study of Zurich in Switzerland is used as a successful example of infrastructure and public space integration around water, shaped by the design principles in Swim City by Ruby and Shinohara (2019).

By using a matrix as a method of cataloguing and digital drawing, an analysis is conducted on the existing public works, infrastructure and architecture of water management in Madrid. From the matrix, five spaces are selected, drawn and analysed through a set or parameters to be compared and evaluated about their spatial contribution to public space and public life. The tools help the reader understand the qualities of the spaces created within this paradoxical condition. The spatial qualities identified can then enhance our design toolbox and deepen our position towards these conditions.
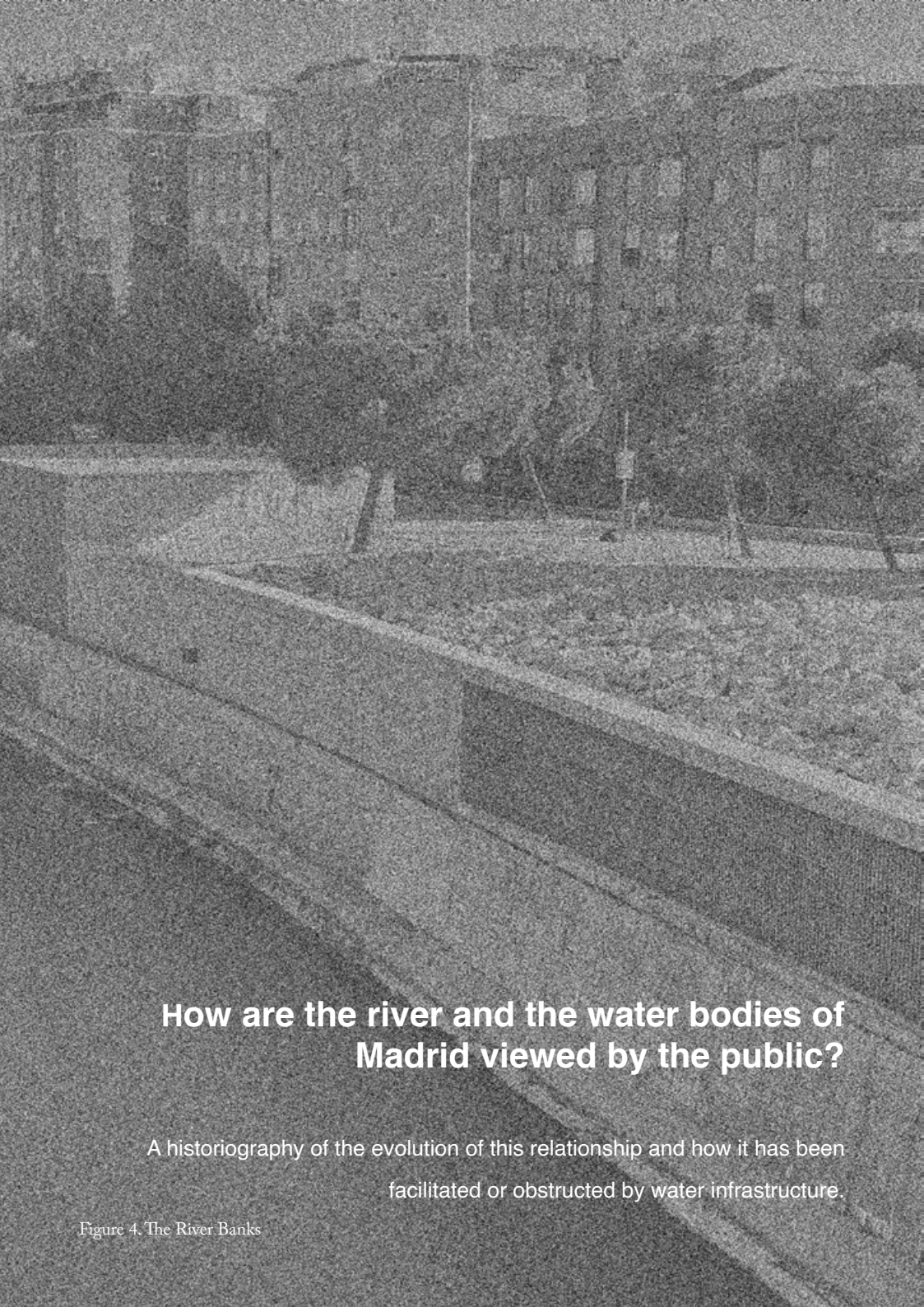
# How are the river and the water bodies of Madrid viewed by the public?

A historiography of the evolution of this relationship and how it has been facilitated or obstructed by water infrastructure.

Figure 4. The River Banks

## 3. El Apprendiz de Rio.

Based on philosophy of perception, which is the way we perceive and acquire knowledge about our world (Maund, 2003), it becomes clear that Madrileños do not have a strong bond with their river because of the Manzanares' low water level. This assumption is confirmed by conversations with locals and university professionals I had when I visited Madrid in November 2024 for field research. To further investigate this public view, public discourse like articles on the TV station TeleMadrid, newspapers and blogs are studied. Texts showcase this often-dismissive attitude towards the river, with a hint of nostalgia for its past. Spanish nobleman Francisco de Quevedo called it **'el aprendiz de río'** - an apprentice of a river in his poem 'Manzanares, Manzanares'. Famous writers like Rafael Alberti, Lope de Vega, Tirso de Molina and many more have mocked the Manzanares as the most navigable river in Europe due to its weak stream (Rivas, 2016).

In the 16th century, Philip II envisioned connecting Madrid to Lisbon through the Tagus River, granting the city access to the ocean and amplifying its **political power through waterways**. This ambition took form with the construction of the Royal Canal of the Manzanares, initiated under Charles III (Constanza Vacas, 2025). While 22 kilometers were completed, the project was abandoned in 1851 due to the rise of the use of the railway and Spain's loss of colonial territories. Yet for a brief time, the vision of a navigable Manzanares came alive—small boats transported goods and people, and gardens appeared on the the banks near the Toledo bridge (Morin et al., 2015).

This image marks one of the first moments in this research when infrastructure and recreation coexisted in the urban fabric of Madrid.

In the 20th century, the river was reshaped to manage flooding, accommodate the city's expansion, and integrate with the sewage system. While its urban design was drafted in 1909, its completion occurred between 1945 and 1962 (Rivera Lario, 2023). During this period, the Manzanares became a sea of white sheets, also known as the **Lavanderas**. The Lavanderas were women who washed clothes along the river banks and hung them to dry. Their presence challenged gender norms, since women's role on the society didnt allow them to work. Public modesty concerns pushed their activity into Laundry Houses, structures designed to shield them from the public eye (MiTEco). The river became a semi-public space: **part transportation route, part scenic element, and part workplace.**

This balance was broken in 1970 with the construction of the M-30, Madrid's first ring road, which enclosed the river, turning it into a forgotten, **inaccessible space.**

In the 21st century, the Madrid Río project buried the M-30 underground and created a 10-kilometer park that reintroduced the city to the river. This re -introduction, destroyed the biodiversity of the Manzanares so in 2016 the re-naturalization plan opened the dams, restoring the river's natural flow.

Today, the river is moving undisturbed, flourishing, **away from the city's gaze or reach.** It has disappeared from Madrid's horizon and from Madrileños' lives. What is left is the urban park, the abandoned water infrastructure and the tall concrete riverbank walls, exposed for the city to see. This architectural condition or the lack of - could be one of the most significant reasons why the Madrileños' relationship with the river is so distant, confirming the title of 'el apprendiz de rio'- meaning an apprentice of a river, someone learning how to be something they are not yet. The notion of false show is not merely generated by the physical characteristics of the river but also by its absent role from the city's life as a liquid public space.

*So where is the water use visible and where is it hidden?*

# 4. *Hard.*

## 4.1 Water Infrastructure and the Production of Space.

The history in the previous chapter showcased that the urban history of the Manzanares, has been a **constant negotiation between technology, nature, and society** as described in Matthew Gandy's 'Rethinking urban metabolism: water, space and the modern city' (Gandy, 2004). The city's water needs keep rising which pushes for more water infrastructure. Universally recognised water infrastructure, like dams and water towers are getting abandoned, due to technological progress of their systems. Traditional water management mechanisms and entire systems can become redundant in a few years. Water towers and cisterns were once symbols of technology and engineering. Today, they are giving way to water treatment plants outside of the city. They are left standing, taking up space, relics of the city's history. The mechanisms of these systems, whether still operating or not, have left a big mark on Madrid's configuration. Those so called **water territories** are still evident in the city, where the south downstream part is dictated by water regeneration and sanitation along with other industrial operations.

## 4.2 Culture vs Nature.

Maybe the Culture vs Nature dilemma is nothing but a misconception. Maybe possible integrations could be the way we design (with) nature, informed by Maria Kaika's critique on urban planning specifically following modernism's separation of city and nature. Kaika references the Greek Promethean myth, of Prometheus stealing from the gods in an attempt to tame nature and liberate humans from the natural restrictions so they can create self-sustained cities (Kaika, 2005, pp. 11–13). In modernist terms the engineer would be the modern-day Prometheus. However, modernism's attempt to separate nature from society for scientific study and control has created a harmful **dualism**. This dualism sets the city as a distinct space and superior to nature, while ignoring the i**nterconnectedness of the urban and the natural**. The city is not an autonomous entity but a hybrid, a product of both human and natural processes (Kaika, 2005, pp. 21–25).

The Manzanares is a tangible example of this dualism, where the city is always faced with the same dilemma, 'The People vs the River'.

The continuous and growing commodification of natural resources like water expands beyond the city's boundaries which affects outer city ecosystems. In the case of Madrid, this can be applied in the water territorialization of the city into **upstream and downstream territories**. Nonetheless, as mentioned previously, water infrastructure becomes more invisible and non-disruptive in our everyday lives. Sewage systems transport and metabolize nature, obscuring the city's dependence on natural processes (Kaika, 2005, pp. 51–76). This concealment of mechanisms enhances our society's perception of autonomy in relation to nature.

While visiting Madrid I talked with locals about two things: their view of their river and the water scarcity awareness in the city. The responses were always surprising. 'We don't have a river' and 'Madrid has great water and no problems with it'. It is true that the potable water quality in Madrid is high and compared to southern Spain the annual reservoir levels are higher. Still, the whole of Spain faces water scarcity and the desertification phenomenon (Cyrielle Cabot, 2023). Additionally, not one, but two colossal infrastructural projects have been constructed in the heart of the city for the non-existing river, the canalization of the Manzanares and the Madrid Rio Park. It can be argued that the complete detachment from the essential systems that provide our cities with basic goods, creates a false perception of reality when it comes to our natural resources.

Furthermore, in 'City of flows: modernity, nature and the city' (Kaika, 2005, pp. 27–50) modernism is criticised due to its contradicting nature. The author argues that the modernist city removed nature's 'messiness' by channelling underground rivers to create space for middle class housing and commercial avenues. In the case of Madrid, the same happened to streams along the city like Paseo de la Castellana and the Canalillo in the beginning of 19th century. At the same time artificial and designed nature and water bodies make their appearance in the case of 'Central Park in New York and the Royal Garden in Athens' (Kaika, 2005, pp. 3–10), works which heavily rely on the abundance of natural resources in the city. Hence, it can be concluded that the space envelopes of modernism which seeks to exclude the individual from its natural surroundings is very much dependent on their existence, as described in the litearture. The only difference is that now nature is no longer feared but harvested.

# *5. and Soft.*

## 5.1 Water Infrastructure and Civic Life.

My interest lies in the **impact of water infrastructure on people's lives**, the landscape, and the **spatial opportunities** it presents within its urban context. Madrid's urban evolution has prioritized Culture over Nature and vice versa. This oscillation raises the question of whether the merger of the two could lead to a harmonized infrastructure, architecture and landscape proposition. Or whether this merger is even the correct design path for our cities. Nevertheless, such approaches could bridge the **dichotomy** between the **hard, utilitarian** aspects of **infrastructure** and the **softer**, **social dimensions of public space**, fostering a new hybrid urban condition. The study of water management could reveal metaphorical and literal areas where architecture could harness **technicity**, creating a dialogue between water as nature, as a resource and as an element of **civic life**.

But where is this civic life?

Where would it take place?

Is it already happening?

Figure 5. The Soft

In Swim City (Ruby & Shinohara, 2019) civic life is described as urban swimming. As industrial activities have moved away from the city centres in Europe, the image of rivers and lakes has also started to shift. After being polluted and contaminated for decades, now cities in Switzerland, Denmark and Germany are cleaning their water bodies, introducing swimming as an everyday urban activity. These water bodies are essentially, **liquid and free public spaces.** Copenhagen offers a distinct example of this shift. The previously industrial port has slowly been turned into a recreational urban area. The newly introduced architecture varies from adaptive reuse of the industrial buildings like the old silo into housing and dining spaces with exceptional water views. A portable dipping zone which checks the water quality for swimming, public baths, saunas and water sports facilities are also spatial elements contributing to the area's redevelopment. These permanent or temporary architectural interventions become the bridge between the industrial infrastructure of the past and the new human and nature centric present.

Figure 6. Unterer Letten

## 5.2 Unterer Letten- The condenser.

Nonetheless, the distinction does not need to be this strict. Another European city which merges infrastructure and social vibrancy with water as the main actor is Zurich. In Switzerland the development of concrete in the 1930s played a vital role in the bathing and hygienic infrastructure of cities. An interesting observation is that modernistic language, being the architectural movement of the time, comes through the simple and functional architecture of the now mixed public baths. The modernistic separation of nature however, as analysed in the previous chapter was questioned from the left-wing governance of the city of Zurich in 1928 (Ruby & Shinohara, 2019). During this time, large infrastructural projects were used to **bridge the gap between people and nature and lack of open public spaces**, with the creation of parks and rest areas next to promenades, decks and public pools or ponds.

Specifically, the Unterer Letten Badi area is an example of **infrastructure and public life condenser**. The beginning of this complex can be marked with the Letten Hydroelectric Power Plant, placed on the river Limmat. The plant began as a component of the water supply system of the city in the 19th century and was later used for the power supply of the city's industrial factories. Due to hygienic needs and the societal shift towards public bathing, two public swimming pools were constructed in the late 19th and early 20th century in close proximity to the plant (Scharrer, 2023). Behind the powerplant, the Letten Train station connected the south of the city with the centre but is now redundant. Today, the listed building hosts the Transhelvetica editor offices. Railway tracks cross the site and the river on multiple locations, create an entanglement of pedestrians, swimmers and trains, over the water flow. At the edge of the Letten, stands the 118-meter Swissmill Tower, the tallest grain silo in the world. The tower is a prototype for the largest solar panel facade in Europe and a symbol of industry for Zurich. Still operational today, trains load and unload grain four times a day with a large viaduct bridge as a backdrop. Below it, people of all ages are swimming, jumping off bridges, enjoying a walk or a cycle, having a drink with friends, or watching a movie at the open-air cinema of the Unterer Letten Badi.

Figure 7. Unterer Letten
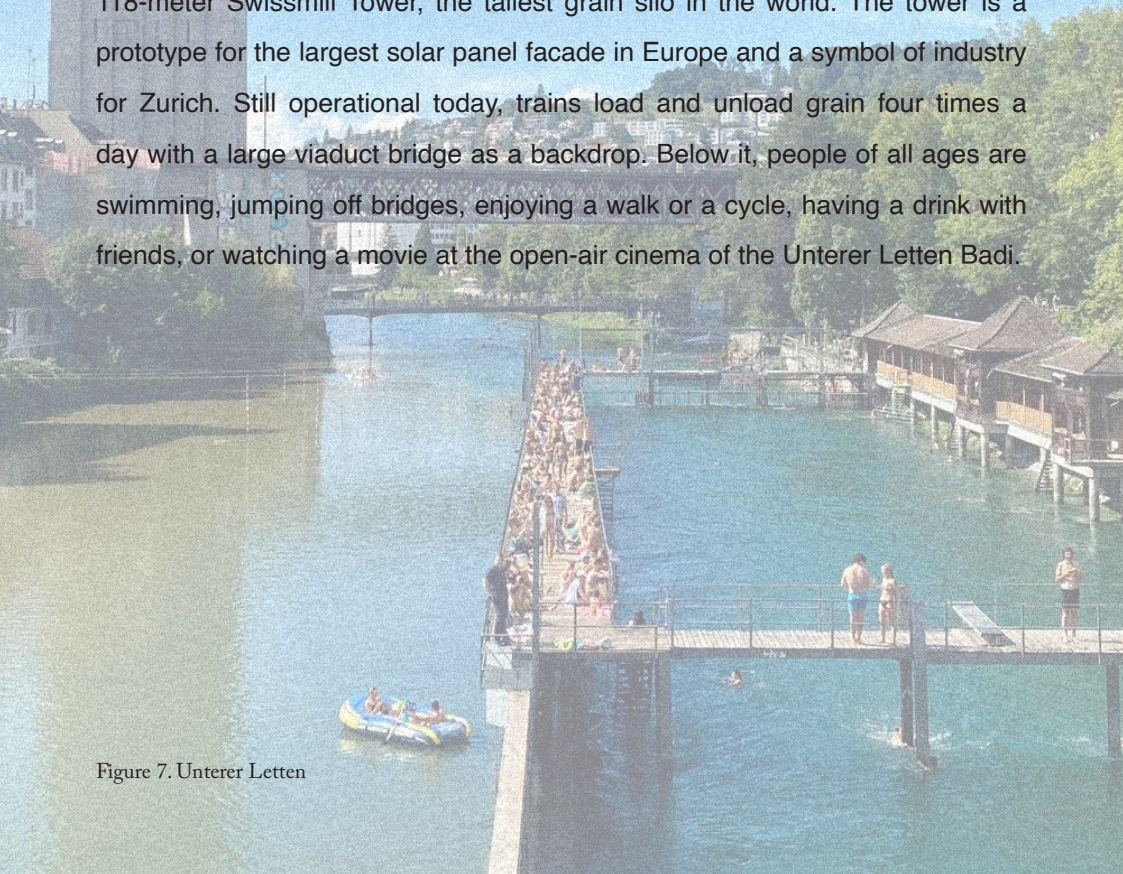
This is a case of a vibrant public magnet, an area surrounded and built for infrastructure and **essential operations** in the city, which has successfully integrated civic life. The valuable space in the city center of Zurich is not eaten away by operations but rather **coexists and enhanced with the combination of functional and recreational architecture.** Some key design lessons which can be learnt from this complex would be the proximity to the center of the city where most life happens at various times of the day. This includes accessibility to the site, by public transport, on foot or by bike and architectural programs which meet people's needs. Leisure, recreation, gastronomy, culture and wellness are weaved into industrial functions, like energy production and industrial agriculture. The presence of water binds them all together and offers an additional form of public space. This example of urban planning could set an

# 6. The Matrix.

In order to answer this question, the method of cataloguing the **water cycle and water management system** of the metropolitan area of Madrid is used. This large and complex system can be categorized by using specific parameters.

The parameters fall into three subject matters:

1. Infrastructure/ Public Works/ Architecture.
2. Outside/ Inside the city.
3. Visible/ Hidden.

The cataloguing is informed by the plan of Canal de Isabel II and is illustrated in a matrix form, following the canal's water cycle **from collection to regeneration.** It has also been completed with photographs from our studio visit, of places where I could have not found online. A first conclusion which can be drawn is that largest infrastructural works are found on the city's outskirts, whereas the newest ones within it and with the largest part found along the river.

*Visible*

outside of the city        inside the city
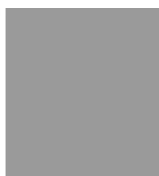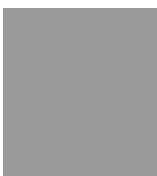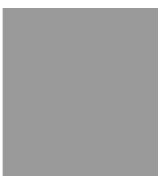
I1

I2

PW

PW/ A

A

**I1**

**I2**
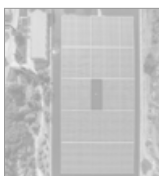
**PW**

**PW/ A**

**A**

To deepen the understanding of the system, the matrix is further dissected into narrowed down categories of structures which are still in use and ones which are redundant. Infrastructure elements in the city centre like water towers and viaducts are not used anymore, along with the first water tank of the Canal de Isabel II, which has been turned into a cultural space. Other unused structures include water towers on reservoirs and intricate long viaducts in the city's outskirts which have been replaced by long, efficient round water pipes. These objects stand as ornamental architectural symbols of a time where infrastructure and architecture were more tightly interconnected. In the city, plenty of masterplan buildings and pieces of the Madrio Rio park, are also made obsolete. The Madrio Rio Rowing Association's building is such an example. A stone clad pavilion looking building on the edge of the promenade, completely shut off and uninviting. A contradicting image next to an inviting ramp, leading to a generous deck area where one can access the water. Rowing cannot occur with the low water level of the river anymore, so the building and its infrastructure seem alien to their context today. Nevertheless, the design offers some spatial qualities, which are hard to find in the rest of the masterplan. Qualities that allow or even invite for human interaction and activity, near the water. Regardless of whether the water is prominent or not.
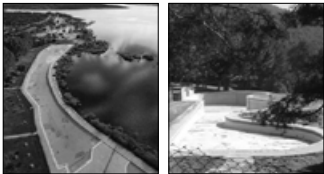
**I1**



**I2**



**PW**



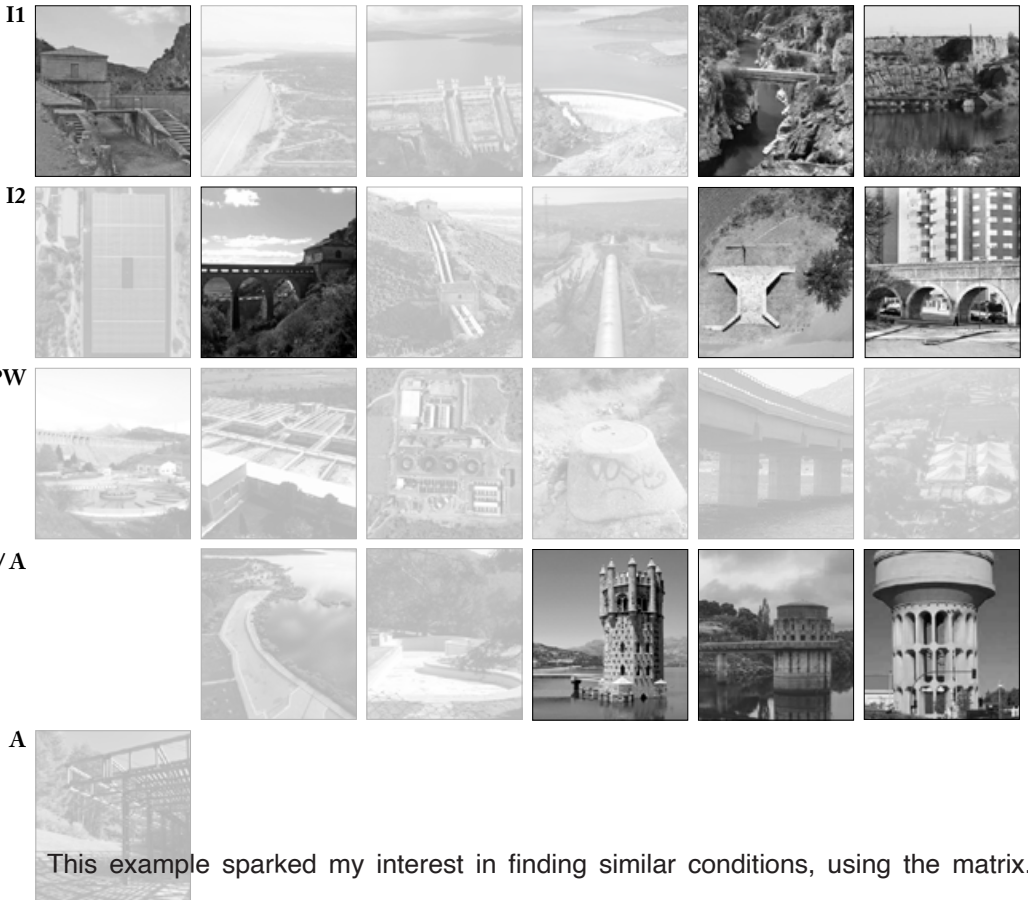**PW/ A**



**A**

**I1**



**I2**



**PW**



**PW/ A**



**A**



This example sparked my interest in finding similar conditions, using the matrix. These conditions can be evaluated by a set of parameters, that combine water infrastructure and public space or public presence. Taking the case study of Unterer Letten in Zurich, the parameters are set as the **accessibility of the site**, i.e. how close it is to the city centre. Secondly, the **water proximity** and/or interaction. This is understood as to the extend which water presence influences the activity of the site. Lastly the existence or the **potential** of the combination of infrastructure and public activities. This parameter is harder to grasp and it is simultaneously what this analysis is aiming to uncover.

# 6. The Intersection.

After studying the matrix, five sites are selected and ranked in accordance to whether they fit the parameters mentioned previously. The first two are Puente de Segovia and Riosequillo Recreation Area. These two areas rank the highest since they both include the presence of water to a significant amount, and are designed for mainly recreational or leisure purposes in harmony with infrastructural elements.

1



2
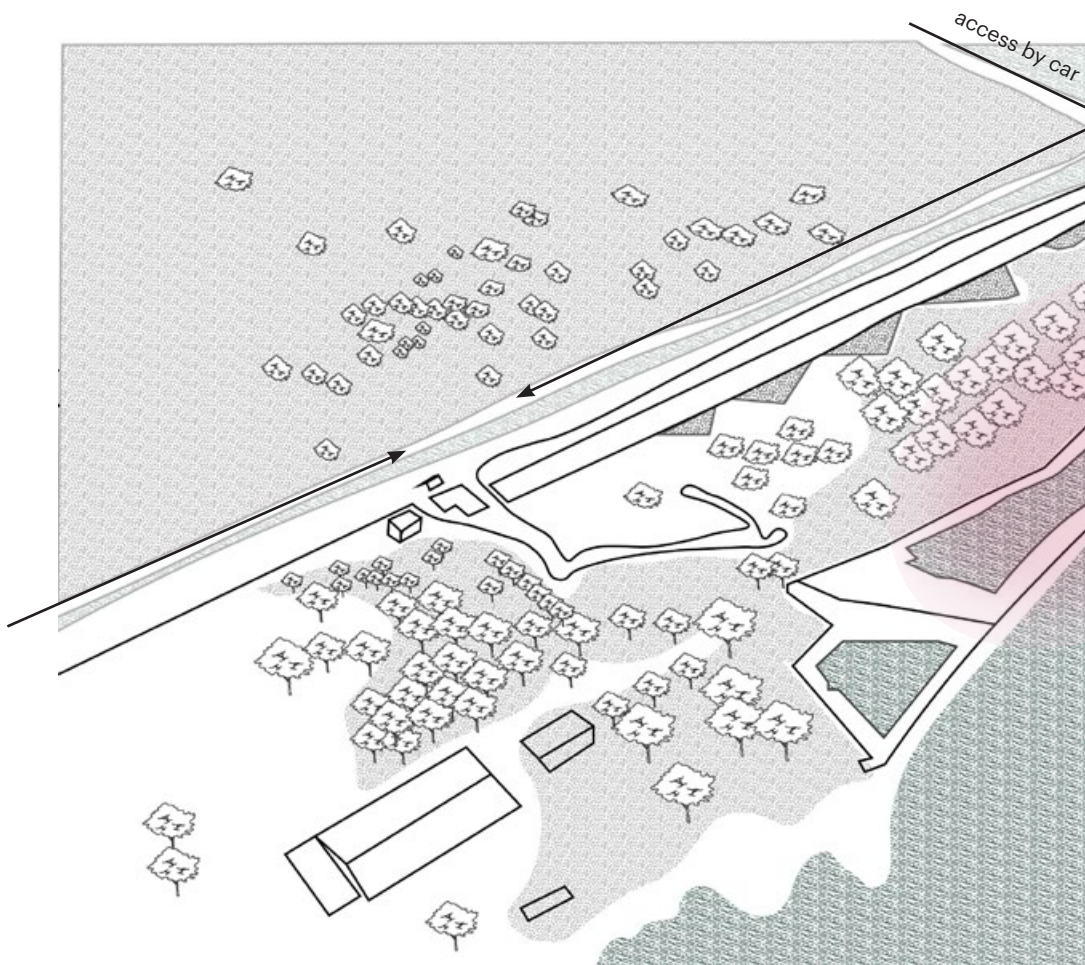


3



4



5

access by car

Figure 8. Riosequillo Recreation Area.

Riosequillo is a pool outside of Madrid, adjacent to the Riosequillo Reservoir, which offers a unique experience to the visitor, seen in the analytical drawing. One of the largest pools in the metropolitan area of Madrid, it brings Madrileños closer to the invisible mechanisms of the infrastructure that sustains their city.



activities area

the pool

the reservoir
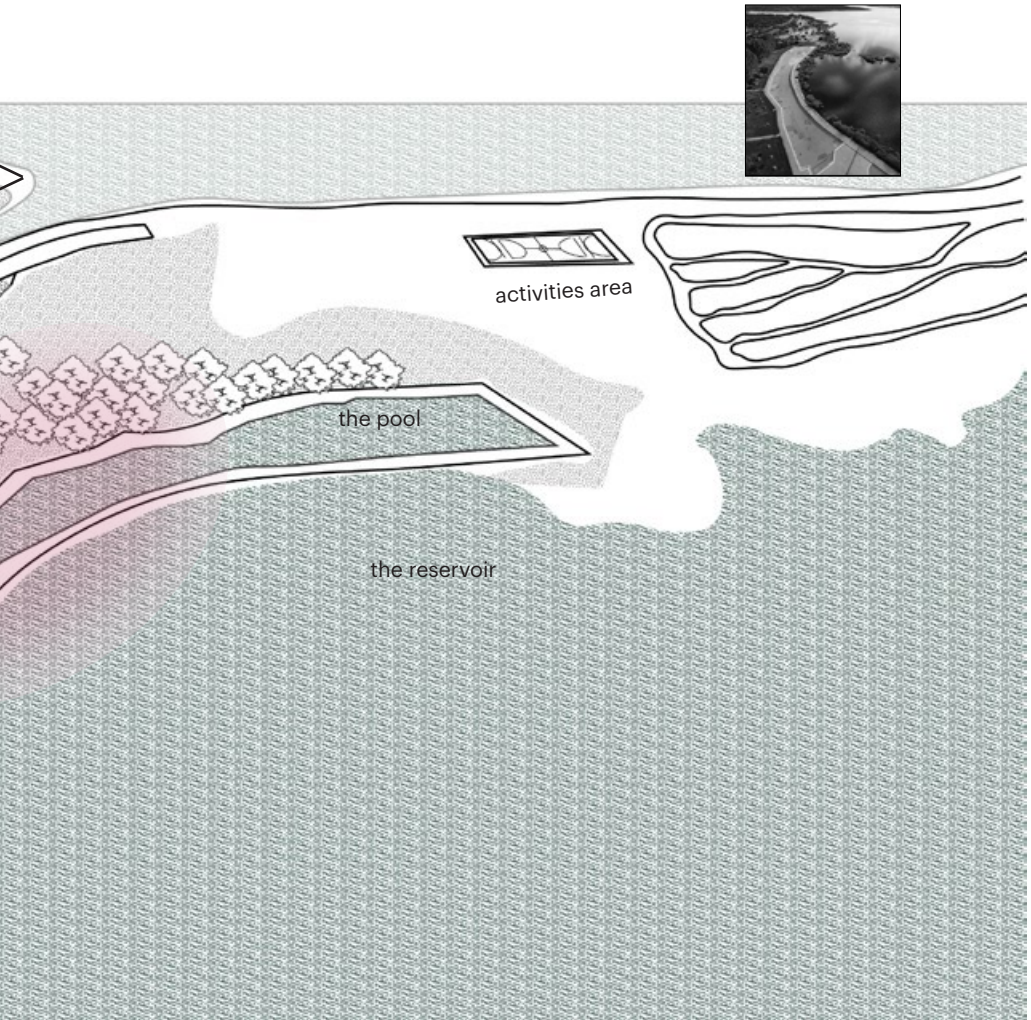
Naturally, the location is not accessible to everyone, which is why Puente de Segovia is also analysed.

The Segovia Bridge dates back to 1584. It used to be the main entry and exit point for commerce in the city. It has been destroyed and rebuilt several times, but it remains an important junction of the city. Today, it is not just an entrance and prologue to the royal palace. It connects the city to the park from the south to the north, it facilitates workers on their daily commute, and it hosts the research centre of hydraulic works of Spain. It invites passers by to stop and look at the
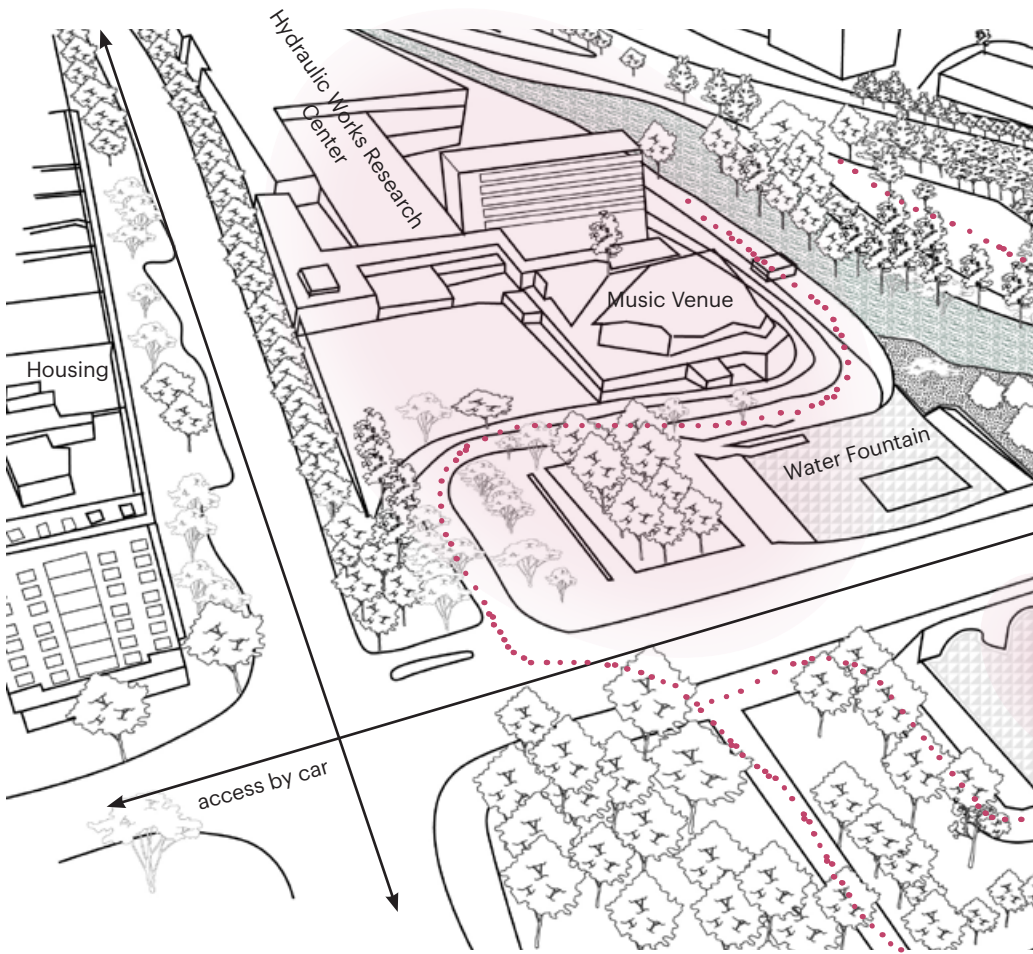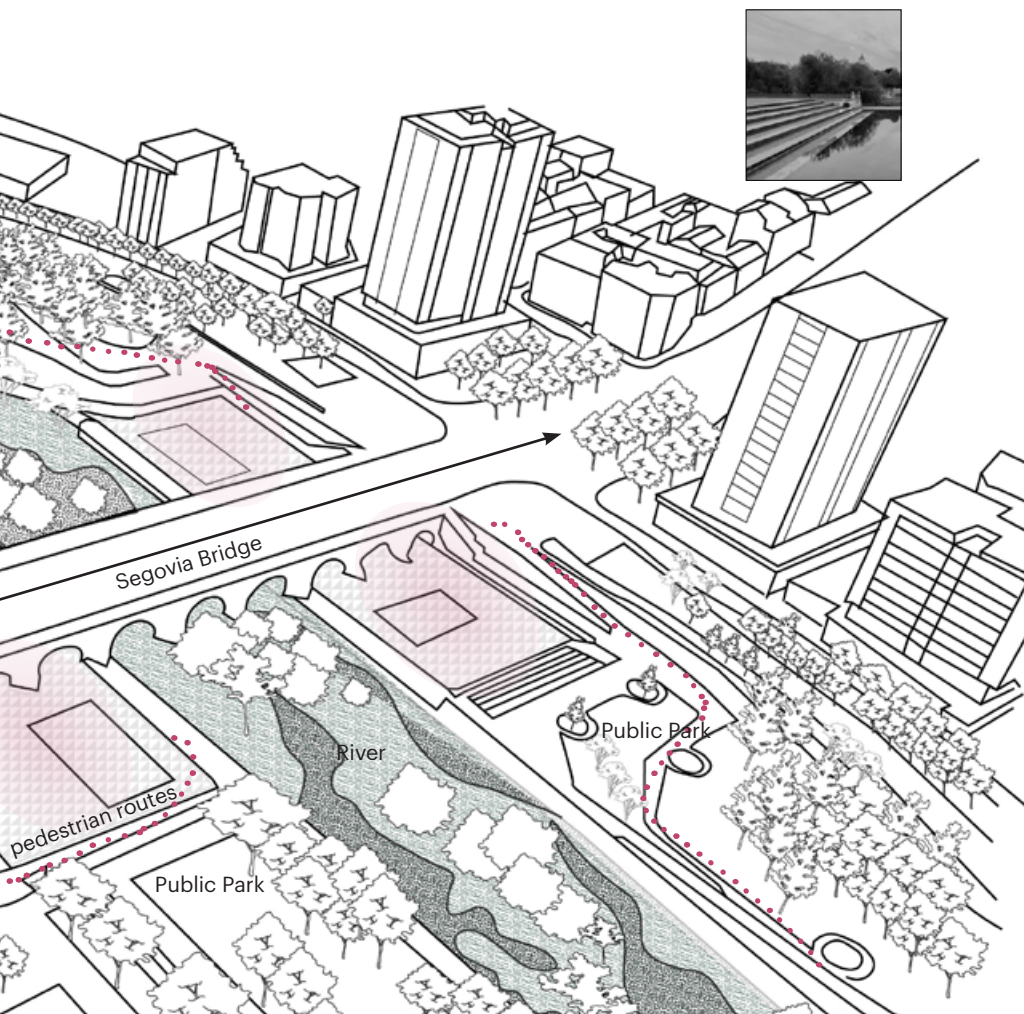


Figure 9. Puente de Segovia

water, both artificial in the fountains around the bridge but also the stream of the Manzanares. The site creates a pause within the Madrid Rio masterplan and brings the river to the people. There, harmonically different types of people, nature and infrastructure coexist.



Segovia Bridge

Public Park

River

pedestrian routes

Public Park

residential area

access by car

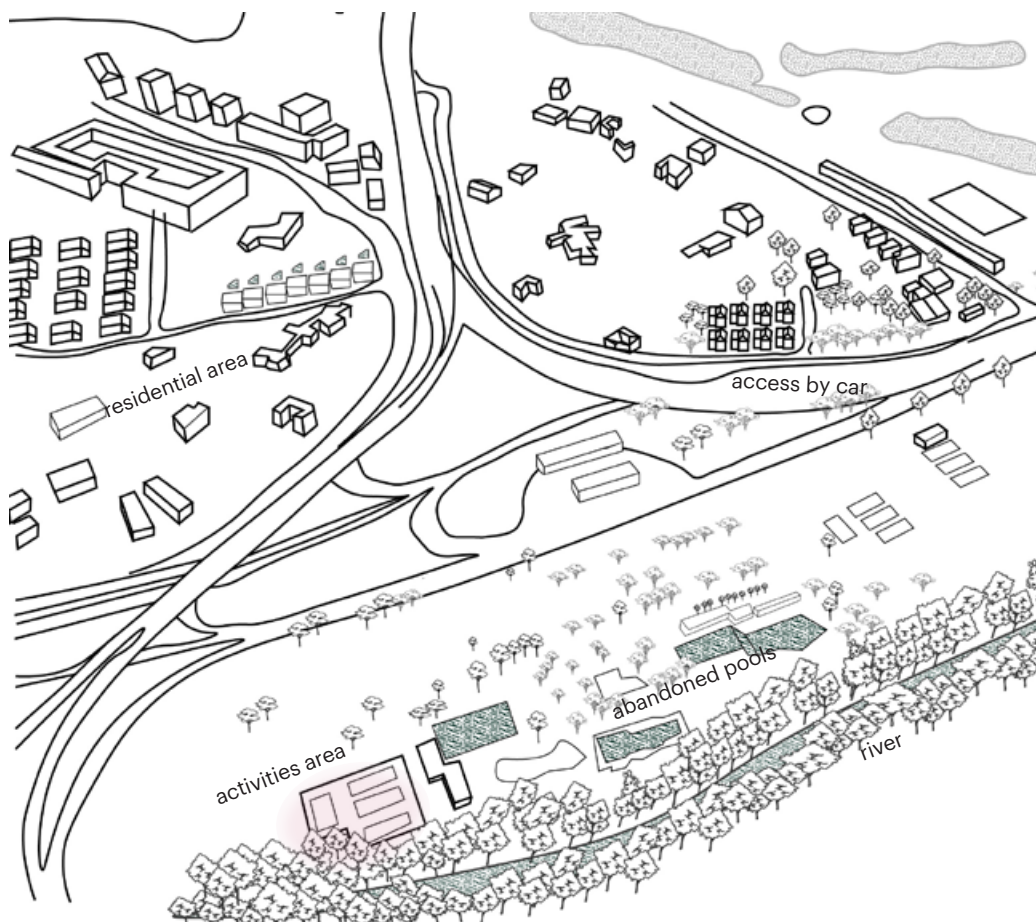activities area

abandoned pools

river

Figure 10. La Playa de Madrid

The other three sites rank lower for the following reasons. The abandoned playa de Madrid is shielded off from the community since the M30 follows the direction of the river, creating an access boundary to the site. La Playa used to be one of Madrid's most attractive social summer spots as the first public beach in the city. Water supply from the manzanares included the design of a water dam which redirected water to the beach. This location used to combine all the qualities



access by car

activities area
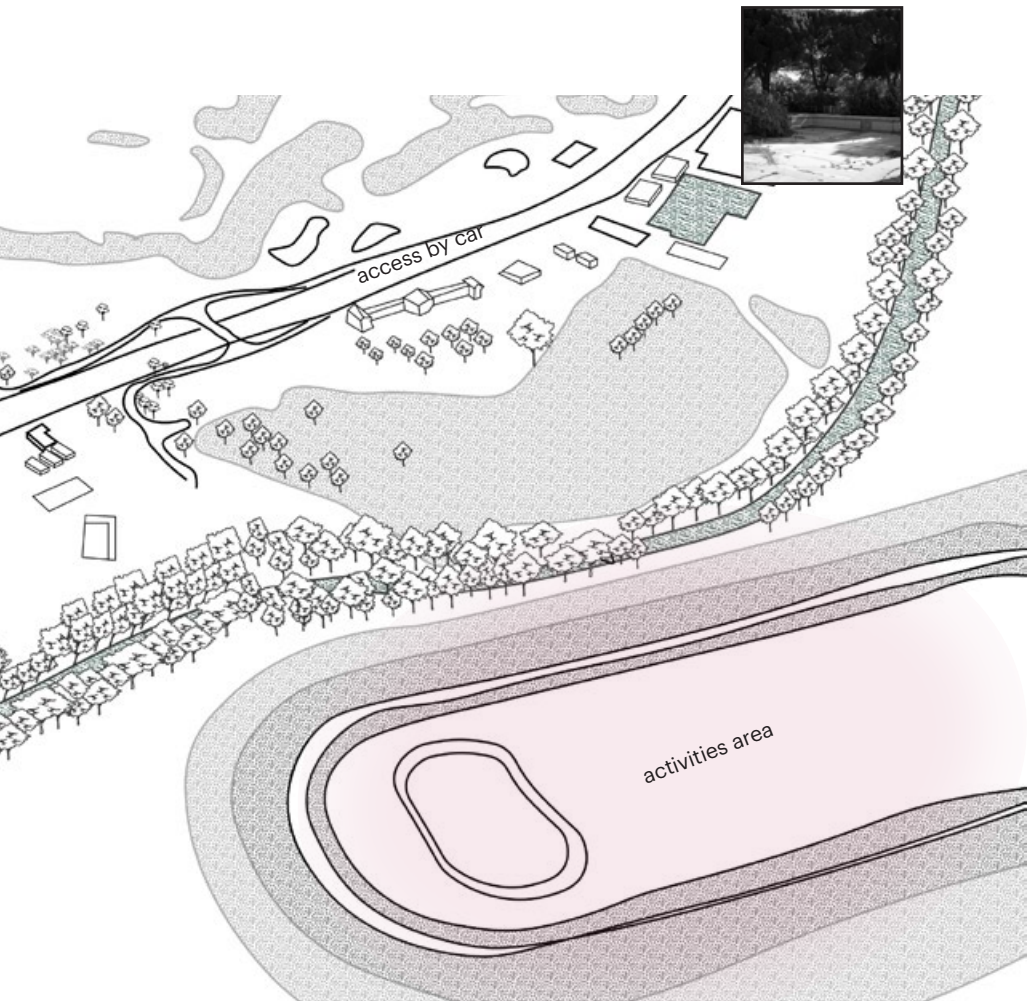
this research is aiming to unveil and could be a precedent for future water experience integration in the city. Today the area is abandoned and surrounded by the M30, which makes its restoration a big accessibility challenge.

The Canal Park carries the history of water management and engineering pride of the city. The area exists thanks to water infrastructure since it was one of the first places of water distribution in and to the city. Two of Madrid's most important storm tanks can be found under the generous public parks, which Canal de Isabell has offered to the public. The company has also designed a public pool for the community and has turned its obsolete water towers into educational public spaces. Paradoxically the only visible water element is the public pool. This location is a confirmational example of the detachment
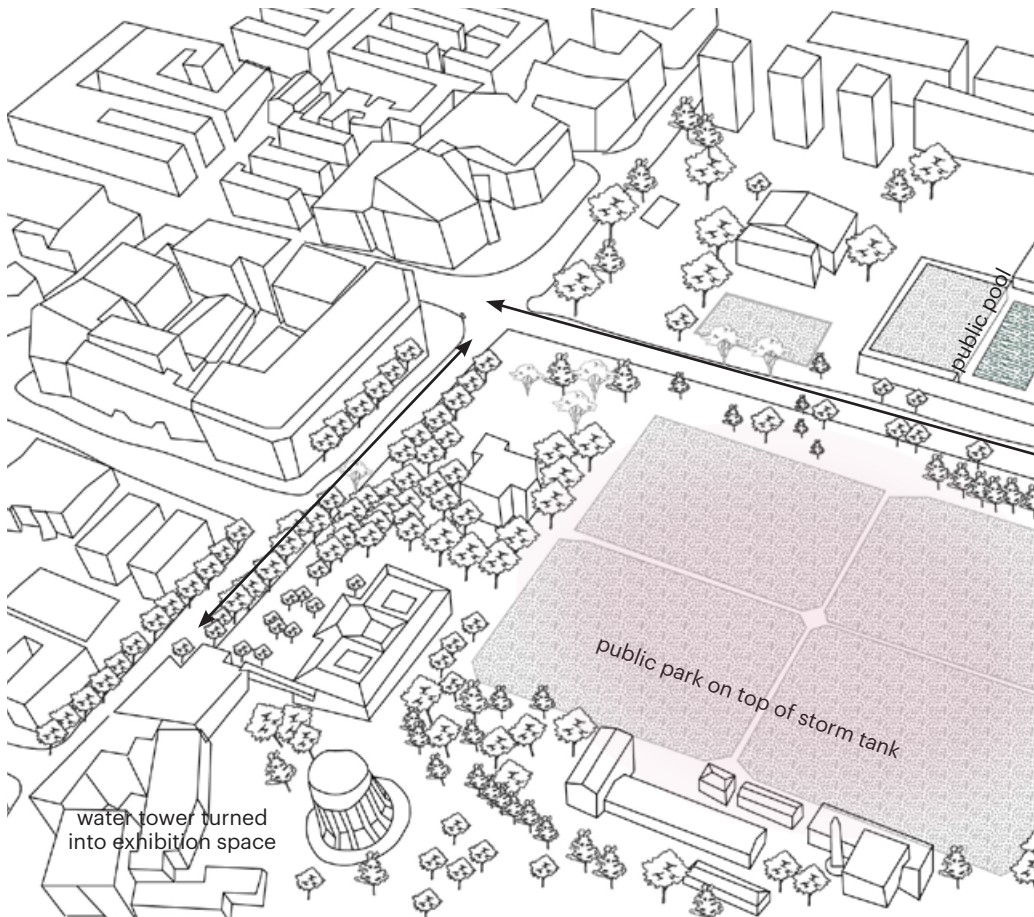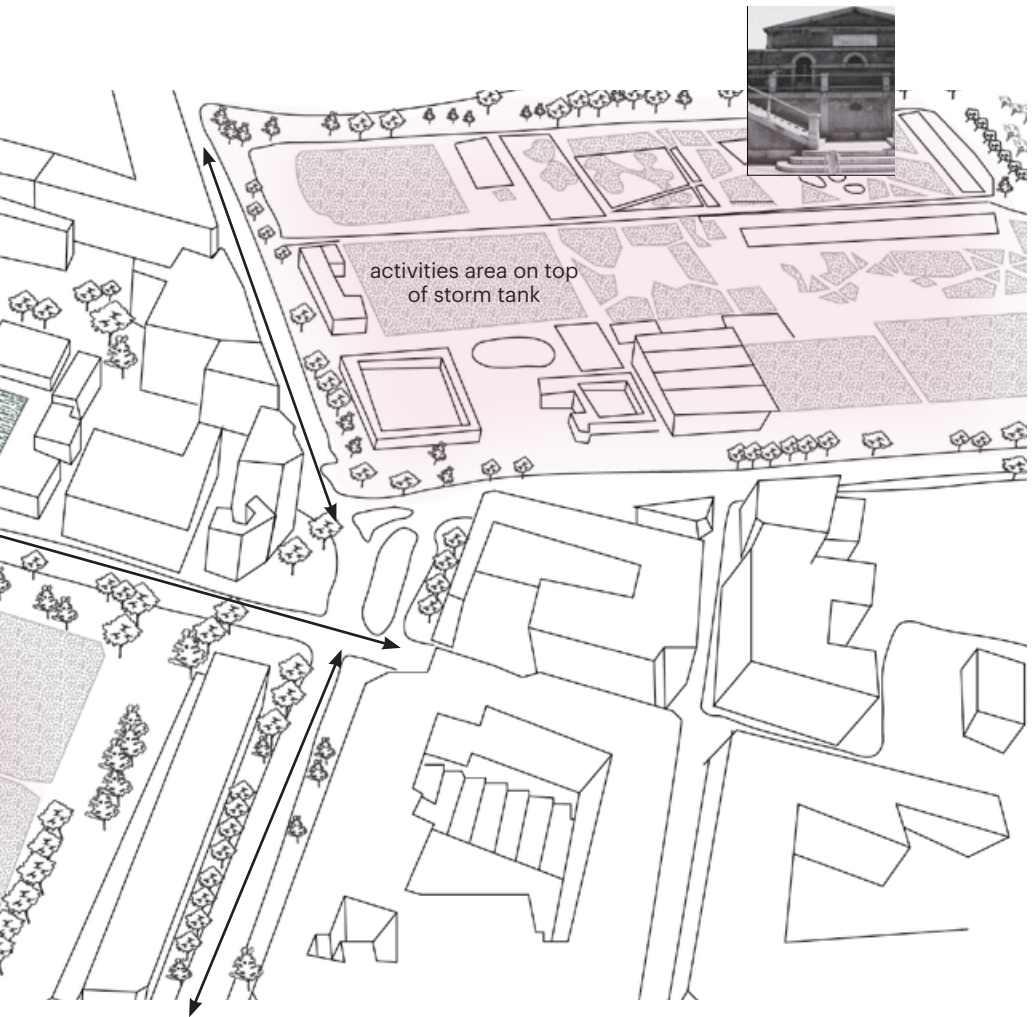


public pool

public park on top of storm tank

water tower turned
into exhibition space

Figure 11. The Canal Park.

activities area on top
of storm tank

our society has nowadays with the essential mechanisms for its survival, as
discussed previously in the literature.

Lastly the Madrid Rio Beach embodies accurately the complex history of Madrid's relationship with the Manzanares. It consists of large open, public areas, where water used to spray upward, offering heat relief for the old and fun for the young. The lush public park's vegetation secludes the site from the noise pollution of the busy street and offered an oasis for all next to the river, where people could rent jetties to navigate on the river.
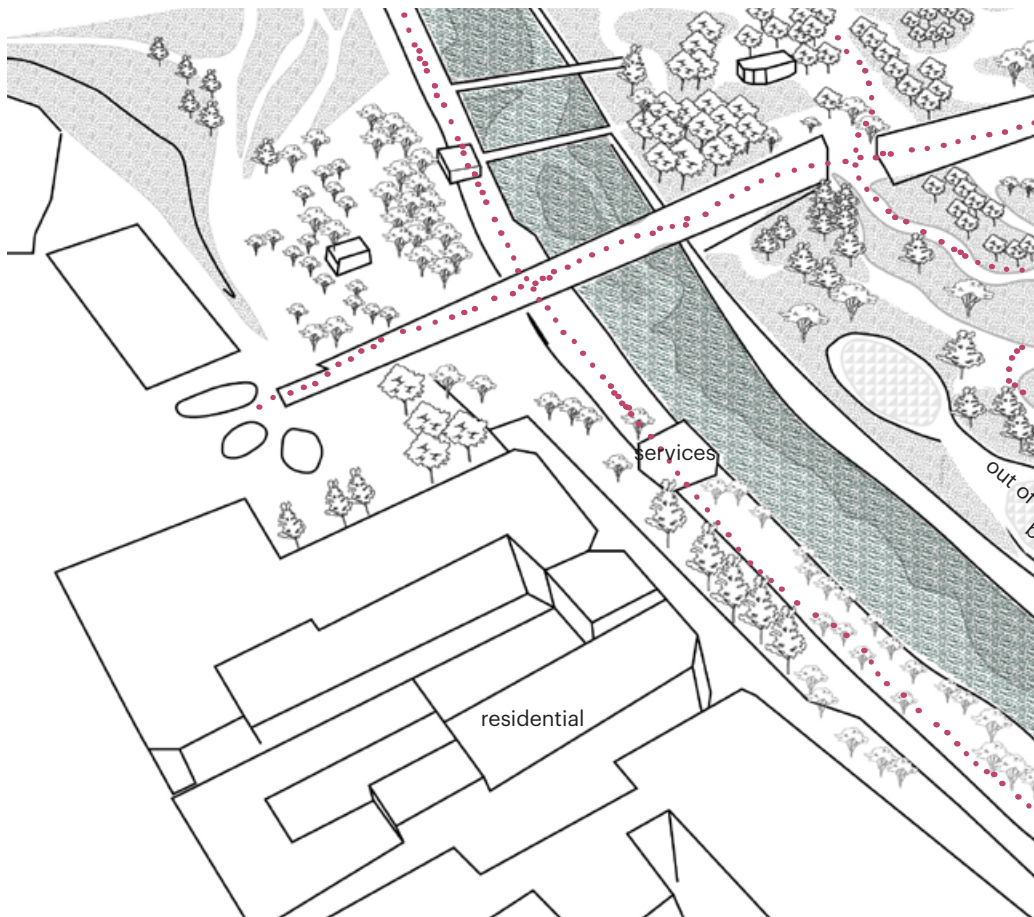


services

out of

residential

Figure 12. The Madrid Rio Beach.

Today, the beach is temporarily closed and fenced off. The jetty stations covered and the river flowing 10 meters below it. This space is a reminder of what Madrid could be or what the Manzanares could mean for the city. However, its demise could be an indication of a false approach.



public park

out of service public beach

out of service public beach

river
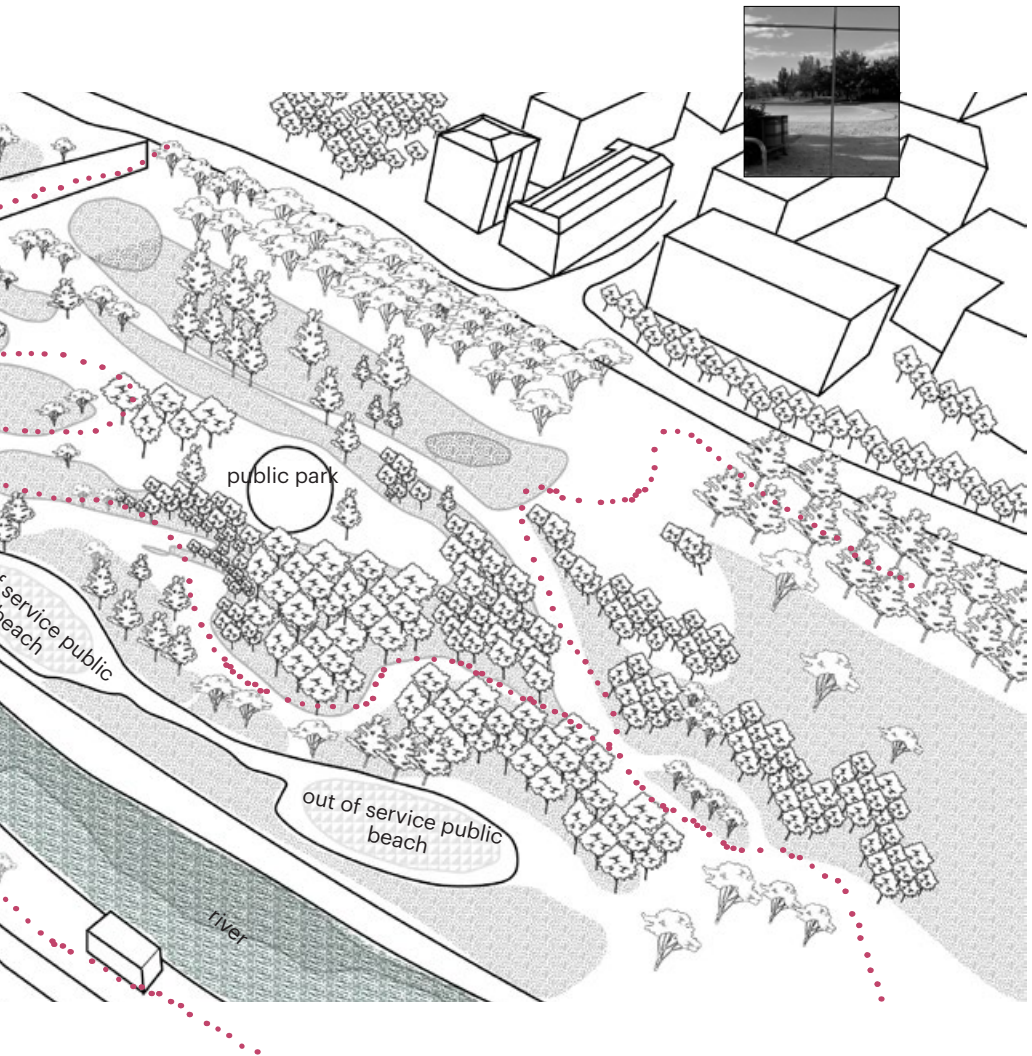
The comparative analysis of the five selected sites reveals both the potential and the pitfalls of water-focused urban design in Madrid. Sites like Puente de Segovia and the Riosequillo Recreation Area are the most successful examples of integration, of the five. Key elements are the visible and accessible relationship with water, reinforced by historical context and contemporary use. On the contrary, the last three sites reveal the vulnerabilities of less effective approaches. Their shortcomings are not due to lack of design intention, but rather a misalignment between infrastructure, accessibility, and pulic engagement.

These case studies suggest that successful integration requires proximity, visibility, and programmatic synergy between water infrastructure and public space. Water should be treated as an interactive, civic element, not only as a backdrop. Madrid has the spatial capacity, climate, and culture to support this move. Several abandoned spaces are waiting to be renovated and utilised which can be found in the matrix in this paper. The city has supported it before so it can do it again. But doing so requires courage: the courage to let infrastructure be visible, to let spaces be multifunctional, to let nature and culture coexist. I**t requires thinking in systems**, and to design with the water as an active actor in mind.

Accessibility plays a key role in this vision. For Madrid, this means **rethinking the dualism** that often defines urban planning: Nature vs Culture, Leisure vs Function, People vs River. Instead, there must be a move toward layered spaces—urban environments that accept and even embrace contradiction. Through transparency of design and integration of public elements, the systems that support urban life can become part of the city's story, not something hidden behind fences or buried underground.

# 7. Conclusion.

The relationship of Madrid and its river is not only one of proximity or absence, but of **identity**, visibility, and potential. Historically treated more as a boundary than a central element of civic life, the Manzanares River has mostly been absent from the city's **urban and cultural imagination**. Recent planning efforts have sought to change this, but the question remains whether these interventions are actually reshaping the relationship between people, water, and the city.

Architecture and water infrastructure, as main components of this relationship, play a crucial role. In addition to their inherited technical and aesthetical functions, they acquire the responsibility of the mediator between systems and citizens.

In many cities, rivers are both infrastructural backbones and public spaces. They carry the functional weight of water management, energy, and ecology, while also acting as social, cultural and liquid public spaces. However, when these roles are separated—when infrastructure is buried, and public space is over-designed, the result is often a **fractured urban experience**, like in the case of the Madrid Rio park. Madrid's ongoing transformation of its riverfront reflects this tension: the need to reclaim the river for public use, while also struggling to reconcile its **functional realities with its civic potential.** The hiding, combined with the river's infamous low flow, renders almost useless to the eyes of the people.

The challenge is not simply to make the river visible again, but to make it **meaningful**. The opportunity lies in designing environments where these elements coexist—where leisure and utility, nature and technology, people and systems are **not opposites, but companions.**

In this sense, the architecture of water becomes critical. Not just in the form of pavilions, promenades, or pools, but in the systems themselves—the treatment plants, reservoirs, storm tanks, and water pipes that silently sustain the city. These are not an opponent to public life; rather, when carefully integrated, they can become platforms for education, interaction, and leisure, as demonstrated in cities like Zurich and Copenhagen.

Likewise, the relationship with water cannot be superficial anymore. It cannot afford to be reduced to viewing platforms or ornamental fountains. Madrid, a city with long summers and a vibrant street culture, could benefit immensely from the creation of hybrid water spaces that offer heat relief, gathering, and even productivity. These spaces can shift in use with the seasons, respond to different demographics, and evolve over time. This requires complex designs which embrace and invite dualism as a design technique.

In the end, the goal is not to beautify the river, nor to monumentalize infrastructure. The goal is to design a city where people are aware, appreciate, experience and live with the water.  Madrid can become a city which combines and embraces the **intersection of the Hard and the Soft.**

Figure 13. Puente de Segovia

# 8. Bibliography

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# *9. List of Figures*