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LANDSCAPE LABORATORY HURLINGHAM-MORÓN

EXPERIMENTAL LANDSCAPE DESIGN FOR A POLLUTED WATERCOURSE IN THE METROPOLITAN AREA OF BUENOS AIRES

Dag Lindbom & Nelly Theander

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ABSTRACT

The subject of this master thesis is Arroyo Morón, a watercourse situated in the metropolitan area of Buenos Aires, Argentina, where the limited site for this project is located in the municipalities of Hurlingham and Morón. Present at the site today is the intertwined challenges of flood, pollution and social vulnerability but also the threat of further fragmentation of existing socio-ecological systems.

The aim has been to put forward a landscape design able to mitigate climate change related events as well as pollution, but also increase social and recreational values on site. The concept of Landscape Laboratories as test fields for future urban elements such as water and woods, lays as the foundation for the proposed design.

Methods used for building knowledge and develop approaches has been literature studies, course collaboration and on-site field studies. The investigation of three concepts has helped us to put the project into a wider context: Site Theory, Environmental Justice and Nature-based Solutions. The study is complemented by three reference projects acting as inspiration and examples of open-ended, transdisciplinary design processes, with assessable outcomes.

To secure open urban green spaces in an era of growing urbanities and climate change effects is crucial to the adaptation and resilience of today's cities. The evolutionary structure of a Landscape Laboratory enables mitigation measures to be initiated and studied over time. Social and recreational qualities are enhanced in this arena by its explorative character. A possibility of recreation in people's everyday life is achieved by pedestrian accessibility along with the creation of 'places' and 'non-places' based on emerging values.

We want to thank all of those who have supported us throughout our work, Lisa, Jesús, Johanna, Jorge and our families and loved ones!

PROLOGUE

This master thesis project is a collaboration between the University of Buenos Aires (UBA), the Faculty of Architecture, Design and Urbanism (FADU) and the Swedish University of Agricultural Sciences (SLU).

As part of the project and research course PUPA_LCJ_NEO_PERIFERIA held at UBA, FADU, the presented work engages in urban landscapes and waterscapes within a critical urban context where societal, economic and environmental issues correlate.

It is the Linnaeus Palme Grant, that have funded this exchange and made it possible, of which we are grateful. The aim of the grant is to share and gain knowledge on global issues in between nations and cultures.

Fig. 1. *Ongoing colloboration in the course PUPA_LCJ_NEO_PERIFERIA at FADU.*

CONTENT

INTRODUCTION

PART 1 - WATER LANDSCAPES OF BUENOS AIRES

PART 3 - LANDSCAPE LABORATORY HURLINGHAM–MORÓN


12 000 km
16 h
34.6037° S,
58.3816° W
BUENOS AIRES

Fig. 2. *Travelling to a destination unknown*

LET US
INTRODUCE

ARROYO MORÓN

The figure represents Arroyo Morón.

The stream is the antagonist of an urban area and ecosystem as well as the neglected border between three municipalities - yet, the protagonist in this thesis' proposal.

Arroyo Morón stretches about 16 km but is part of a system more than 40 km long, emptying into the Paraná Delta which drains an area bigger than Greenland.

Fig. 3.

Fig. 4-8. The Morón stream.
Source top til bottom: ElCiudadano.Gba, J. Huarté, LaPolíticaOnline, J. Huarté, Norte en línea

BACKGROUND

The effects of climate change are manifested all over the world bringing a wide range of consequences; social, environmental and economical. The global heating can cause drought and lack of water in some places, as well as flooding in other places. The watershed of Arroyo Morón, situated in the east of the Great city of Buenos Aires, will likely face a situation with increased water flows augmenting the risk of flooding in the area.

You find the Morón stream outside the Autonomous City of Buenos Aires where human influence is evident. The stream runs through a semi-urbanized territory with a mixture of industry and residential areas. Villas, informal settlements, are also found in close relation with the stream as well as existing and further planned infrastructure like railroads, roads and a military airport.

The historical implementations of infrastructure in the area along with the planned constructions benefit the communications within the metropolitan area and especially the connectivity with the Autonomous City of Buenos Aires. However, these large structures cause processes of fragmentation on a smaller scale. The Morón stream is poorly integrated into its urban surroundings and lacks a visual connection. The natural functions of the ecosystem are being compromised along with a range of amenity values and potentials.

The Morón stream is today a polluted ecosystem, from garbage to industrial waste and threatened with increased flooding risks, so we ask ourselves how to not further kill this watercourse?

Born in the south of Sweden within the University of Agricultural Sciences, SLU, is the concept of the Landscape Laboratory, and the potential framing of our site's problems.

In contrast to the features of a normal science lab: sterile, white facilities, workbenches, research equipment and four wall that confines the limit of the workspace, the Landscape Laboratory stands for something totally different.

The related concepts of research in Real-world labs and Living labs is emerging as a new type of transformative research that is carried out in and with society (Schneidewind, 2014), where real-life context is the arena of studying open innovation (García Robles, Hirvikoski, Schuurman, Stokes, 2015).

The idea of the Landscape lab confronts the static and finished design and instead focuses on the dynamics of the evolving landscape, guided by design and management interventions.

AIM

In this thesis we aim to conduct a site-specific design proposal able to tackle the challenges of an urban area defined by a polluted ecosystem and vulnerable urban living conditions.

The proposed design brings forward a new approach to the existing water landscape of Hurlingham and Morón by implementing the ideas of the Landscape Laboratory capable of activating and re-adapt the conditions of the urban area and the stream.

Considering the challenges and potentials of the complex site, it is a suitable place for an experimental test field to play out and develop mitigation methods and landscape elements - hopefully as a place for people's everyday life.

RESEARCH QUESTION

How can a Landscape Laboratory test out mitigation measures for flood and pollution in the area of Hurlingham–Morón, as well as providing social and recreational qualities for people's everyday life?

METHODS

This thesis is divided into three major parts. Part 1 will take you through the concerned sites. Part 2 looks into concept, theories and reference projects needed to bring forward a formulation of strategy. Part 3 is where the design proposal will be showcased.

A literature study has primarily been made to obtain knowledge of the area of Buenos Aires: its history, geographical situation and hydrological context. Our participation in the Urban Project course PUPA_LCJ_NEO_PERIFERIA held at UBA, FADU, have further provided us with valuable knowledge from field trips, lectures, literature, organizational documents and cartographical material. This has been crucial for the understanding of the site's context, ambitions and limitations as well as its changing narratives.

The field trip was arranged as part of attending the Project Course made able to us by the Linnaeus Palme Grant. On site, the local police escorted us through unsafe areas, in order to gain access and view of the critical areas, much needed to further get to know the site.

In order to build knowledge and formulate a framing of solutions to the challenges of the site, we have investigated theories of three key-concepts. Site theory, Environmental Justice and Nature-based Solutions. As a guideline and inspiration, we have also studied three reference projects, through which we trace these concepts in order to develop strategies and elements for the design proposal.

In complement to literature studies, field trips etc. we perform a case study in the form of a design proposal for the Landscape laboratory in Hurlingham - Morón.

DELIMITATIONS

Writing this thesis as the last part of the Landscape Architecture program, with several years of design-background, our main focus stays on configurations of the physical site's spatial and experienced qualities. The limits of this work preclude an action plan of possibly involved actors, governmental planning policies and larger structural planning within the affected municipalities as well as financing.

Limitations in scale of the design project has originally followed that of the project and research course held at FADU, and later been made to encompass what we thought to be the most interesting area of our site visit; the larger part of Arroyo Morón and its borders in the municipalities of Hurlingham and Morón.

The conducted design proposal is produced and aimed only for this particular site, and shouldn't be taken as a model applicable to similar cases.

Due to the short extent of time spent in Buenos Aires and the risks connected to the site, only one field study was carried out.

The reference cases in this thesis will mainly serve as inspirational content, guiding us through the process of adopting our own take to strategies and components of the design. An in-depth study of them will not be done.

PART 1: WATER LANDSCAPES OF BUENOS AIRES

METROPOLITAN AREA
BUENOS AIRES

The urban periphery makes the border between the dense urban core and the rural settings surrounding it. It could be regarded as a gradient, a zone of transition between these two situations, containing a wide range of functions (from dwellings and social needs for recreation to industry and agricultural areas).

The water in the context of the urban periphery is vital to sustainable and livable cities (Rozzoli, 2016). These natural resources are essential for the provision of water for domestic use, commerce, industry and environmental purposes (Rozzoli, 2016). Therefore, the use and management of these water systems is of great importance; however they are often compromised by increasing urbanization (Rozzoli, 2016).

The growth and urbanization of marginal urban areas is one of the most noticeable planning and design challenges of the 21st century (Thorn, et al., 2015). These sites are also where the most extreme cases of environmental stressors and climate change related risks are manifested due to socio-economic vulnerable populations dwelling in informal settlements on the city margin (Thorn, et al., 2015). To conclude, these sites are sometimes where socio-environmental inequalities are the most evident.

Fig. 9

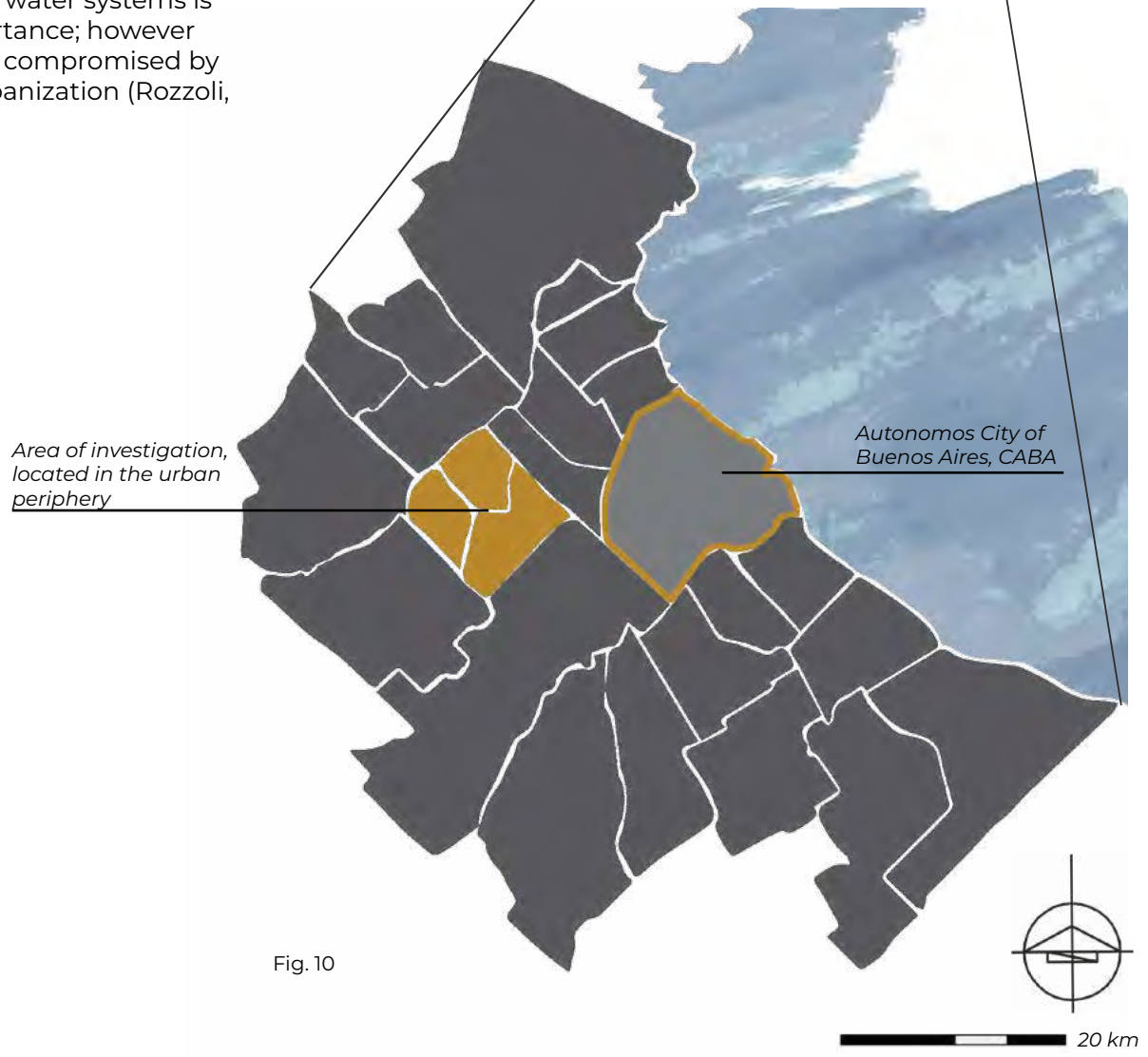


Fig. 10

CITY CENTER
BUENOS AIRES

The autonomous city of Buenos Aires is often described as a very European city though situated in South America, Argentina.

One explanation for the European influence on Argentina and the city of Buenos Aires is the early Spanish colonization of the region during the 16th century. The former native population within the area was pushed aside and was to be concluded into two Spanish Viceroyalties, Peru and Rio de la Plata. The latter declared its independence in 1816 but it took nearly a half century longer before the Republic of Argentina was founded. (Landguiden, 2019).

The city of Buenos Aires was established two times, first in 1532 and then again in 1580, this time following the Laws of the Indies; a set of planning guidelines for colonial cities under the Spanish Crown.

grid system, usually consisting of square or rectangular blocks with sides measuring about 100 meters. Each block is usually divided into four lots for dwellings, so that each house faces two streets. (Vigliocco, 2008)

The construction of a city, according to the laws, begins with the centre plaza, followed by straight roads and blocks, created with wind and sun conditions in mind. The construction mode allows the city to grow in the same manner if the population increases. The main square is rectangular (often one and a half times the width) and placed near the waterfront with a connection to the harbour. Four main roads are linked to the square, one on each side and two roads linked to its corners. The corners of the square are oriented towards the main winds which will protect the main roads from inconvenient, heavy winds. The width of the street is based on its location; hotter spots have more narrow streets and in colder areas the streets are wider. (Vigliocco, 2008)

Fig. 11: City plan of San Juan de la Frontera in Argentina. An example of the grid system for establishing cities in South America. Source: Mexconnect

LAWS OF THE INDIES - CITY GRID

The planning guidelines presented in the “Laws of the Indies” describe how regions and places are chosen for the establishment of a new population, land distribution and village formations. These documents are regarded as some of the most important historical documents of urban development in the world. The set of laws explain in detail how and where churches are constructed, how and where hospitals should be implemented and most evidently the basis for the urban construction: the grid system.

The proposed city of the indies constitutes of primarily two zones. The civic centre, consisting of a main square surrounded by public buildings of the political and spiritual authorities. The urban area is divided into a

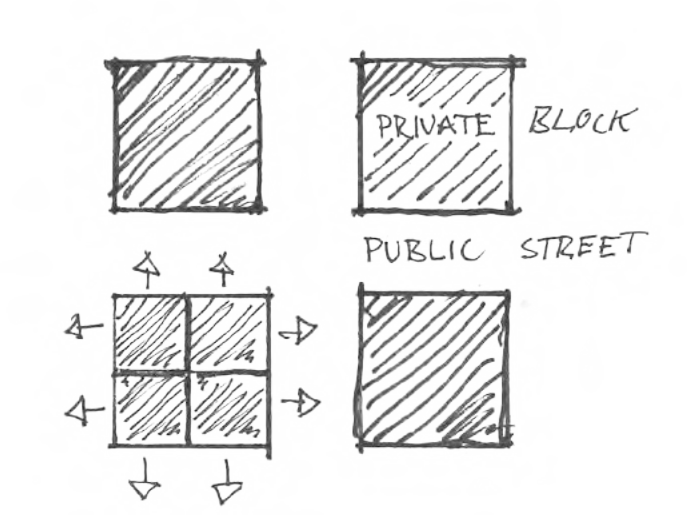


Fig. 12: The basic elements of the grid system: the private square block with four dwellings and the public street.

The structure of the grid system which Buenos Aires is built upon could be criticized for its homogeneity and thereby the anonymity which it imposes on the urban landscape; halting the emergence of uniqueness connected to its various places.

In the same sense, the uniformity of the grid system provides certain values. We could be talking about a democratic basis or fairness in the sense that every lot is given equal conditions. The idea of the street as a public space could also be connected to the grid system. The lots similar relation to surrounding streets can be giving birth to a truly authentic space for everybody. (Janches, 2013)

"The site and position of the towns should be selected in places where water is nearby and where it could be deviated to better service the town (...)"

(Lejeune, 2003, s. 19)

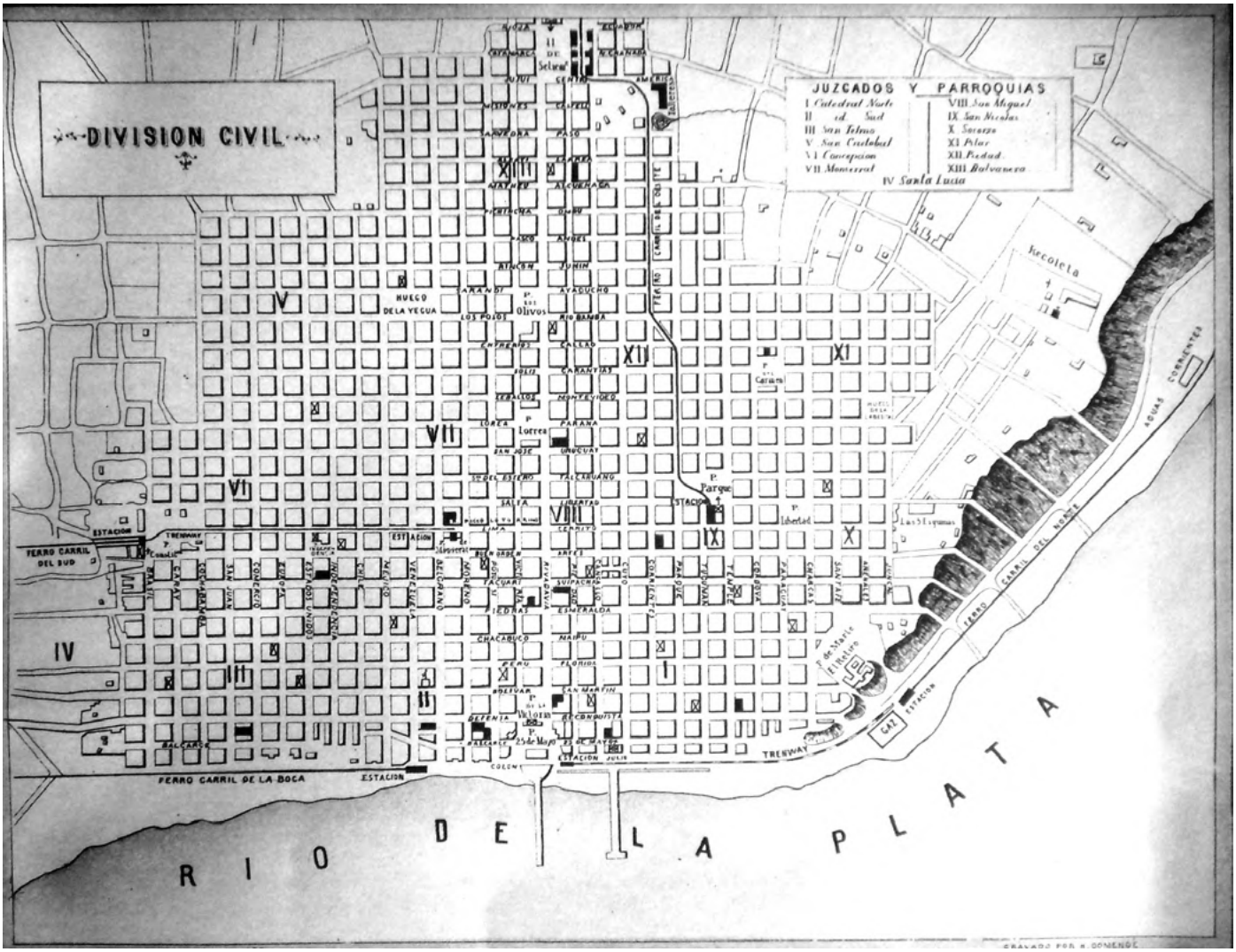


Fig. 13: Buenos Aires city plan of 1870.
Source: Wikimedia Commons

HISTORICAL BACKGROUND

The following section describes the urban birth and growth of Buenos Aires based on statistics and a publication provided from the Gobierno de Buenos Aires (La Ciudad Producida). The summary is completed with extensive references where additional facts are of interest and importance for this project.

FIRST URBAN STRUCTURE

The Spanish interests of the region were mainly enabling navigation of the rivers reaching deeper into the territory (from the coast line), as well as keeping control in the area and establishing trade. Trade and commerce was during this time the first traits to signify the city of Buenos Aires, but it is not yet an important political centre. When the city is appointed capital of the viceroyalty Rio de la Plata in 1776 it is facing a considerable development. In 1778 el Censo de Vértiz has counted a population of 24.205 inhabitants. In 1816 Buenos Aires becomes the capital of Argentina that is now an independent state. The colonial patrimony is evident in the cityscape, hence the initiative from Bernardino Rivadavia, Argentina's first president, where he in 1826 aims to broaden a number of avenues within the city to break up the colonial grid.

AUTONOMOUS CITY & URBAN GROWTH

The city of Buenos Aires becomes a Ciudad Autónoma in 1853. Two years later, the district of Belgrano (located to the north) is incorporated within the urban context and the population reaches 93 000 inhabitants. Smaller cities develop in the periphery of Buenos Aires due to infrastructure, industry and rural interests. The oldest are Morón and Moreno. That the autonomous city of Buenos Aires is economically strong due to harbour activities and industry is mostly manifested in its population growth.

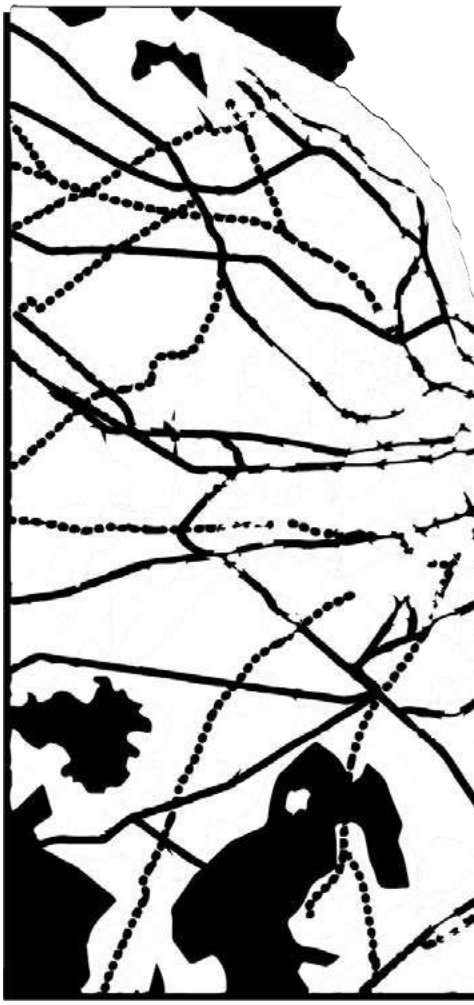
New immigration laws in 1876 heavily increases the European immigration to Buenos Aires. The industry flourishes by the end of the 19th century and is regarded as a key element to the state economy. In 1880 it is decided that Buenos Aires now is the federal capital which awakes conflicts with the province (the Province of Buenos Aires) who does not want to lose the economic and political territory of the city. However, the port, police and justice are still national interests. La Plata becomes the seat for provincial powers.

Wealthy inhabitants leave the southern parts of the city and the harbour area and move towards the north and the districts of Retiro, Recoleta and Palermo. Due to immigration the population is about 664 000 in 1895. This following period brings an enormous augmentation of the population which have permanent effects on city borders and the spatial conditions of Buenos Aires. New schools, new roads, new hospitals and tramways are being constructed and the northern axe through the city is being favoured with better communications due to its concentration of richer areas.

In 1913 is the subway of Buenos Aires introduced as the first one in South America and the population reaches 1.5 million in 1914.

1856

1936

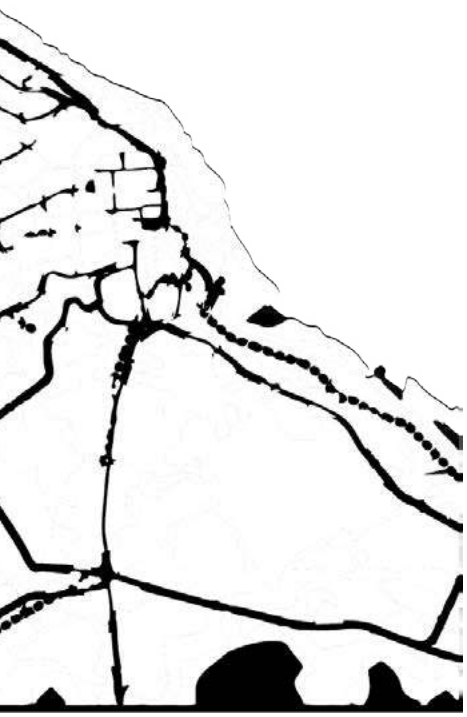


1943

1964

Fig. 14-18. *Illustrations showing the historical urban expansion of Buenos Aires.*
White color is depicting the urban grid.

2000



BUENOS AIRES AND THE WATERFRONT

In the late 19th century the waterfront development in Buenos Aires played a significant role in the modernization of the urban structure. Since the 1870's, public spaces and leisure areas like beaches, parks, promenades and avenues started to appear in urban planning projects due to issues of hygiene, urbanism and landscape became important. The traditional grid system was not enough to tackle the urban growth on its own. However, the first half of the 19th century was strongly influenced by harbour development and infrastructure projects like tramways and a new train station, creating a boundary between the city and the riverfront. (Martire, 2012)

Jorgensen states in her article A city is still a landscape, 2018, that Buenos Aires, though its location (on the edge of Rio de la Plata) and original raison d'être (a harbour city born from shipping and commerce), has lost its connection and relationship with the river Río de la Plata. The city grid of Buenos Aires was originally laid out right angled to the river in order to create sightlines and a connection between the urban fabric and the waterfront.

From old photographs of the historical and cartographical centre - Plaza de Mayo - a strong connection between the coast and the place where the presidential palace will be situated can also be identified. This contact is however broken by 1900 when four big harbour basins of the new district Puerto Madero with warehouses and infrastructure is being developed. (Jorgensen, 2018)

Le Corbusier identifies this shift in direction for the development of Buenos Aires in 1929 (Gorelik, 2003). His idea Cité des Affaires, was a platform of skyscrapers in the middle of the Rio de la Plata. This strong reorganization of city growth towards the river, instead of towards the periphery was an attempt to restore the historical centrality of Buenos Aires (Gorelik, 2003). The project was never executed but inspired perhaps some failed exploitation projects outside Puerto Madero, today being classified as a nature reserve.

EXPANDING URBAN FABRIC

The new spatial diffusion of the city is explained with the statistics from 1904 where 26% of the population lived more than 5 kilometers from Plaza de Mayo compared to the numbers from 1914 (ten years later) when 46% lived more than 5 kilometers from this central point.

This leads to the growth of the metropolitan area. The textile industry, chemical and mechanical industry is well connected with railways and other infrastructure which attracts immigration from within the country, in contrast to the previous European immigration flows. The city stays at three million inhabitants in 1947 but during the 50's heavy industry is favoured, and the metropolitan area continues to grow. In 1970 about a third of the population in the metropolitan area (Great Buenos Aires) lives in the city.

INFORMAL SETTLEMENTS

The industrial and infrastructural situation had new effects on the territorial reconfiguration of the metropolitan area. A limited state regulation led to a land division where lands of poor environmental quality became dominated by self-construction. This led to the creation of alternative settlements where the inhabitants who could not afford to pay rent in the city were able to live close to work in the periphery. The socio-economic level decreased starting from the centre towards the periphery.

The alternative settlements, known as villas, were of poor living conditions, often without plumbing and water, overcrowded with hygienic risks. Between the years 1962 and 1976 the population of the villas grew from 42.000 to 224.000 inhabitants. Shortly after, in the year 1979, the population of the villas is once again about 50 000 inhabitants. This is due to an eradication policy initiated by the new military

Fig. 19-20 *Above: the villa 1-11-14 in 2008.*
Below: the same villa in 1989 after the military eradication.
Source: Gobierno de Buenos Aires (La Ciudad Producida)

Fig. 21-22. *Villa 31, one of Buenos Aires most recoqnised informal settlement, located next to the city's main transfer center and wealthiest neighbourhood.*
Source: Vía Buenos Aires, Reddit.

regime.
Between 1980 and 2010 the population of the villas has once again augmented with more than 300%. This is reflected in societal events like the economic decline in 1980, the de-industrialization during the 90's and an unstable labour market. These factors came to increase a social polarization, poverty and social exclusion.

RÍO DE LA PLATA
HYDROLOGICAL CONTEXT

The metropolitan region of Buenos Aires is located on a territory which is strongly influenced by its relationship with Río de la Plata, the estuary of the Parana and Uruguay rivers, the second largest river system of South America (Britannica, 2014).

The connected hydrographic basins west of the coast drains most of the region thus creating a system of rivers and streams that is a part of Cuenca de la Plata.
In the province of Buenos Aires there are four water basins from north to south: the basin of the Luján river, Reconquista river, Matanza-Riachuelo river and the one belonging to the streams of the south zone. (Tauber, Martino, Sánchez, Maria & Resa 2011)

Since Buenos Aires is situated on a delta, the vast savannah of the Pampas, a large part of the region is located between 2.8 and 5 meters above sea level. These parts are prone to be frequently flooded caused by the weather phenomena sudestada. The sudestadas occur because of the geographical position of the river (Río de la Plata), flowing northwest to southeast. Strong winds and precipitation coming from the southeast (mostly during July - October) therefore causes large water masses to flood low-lying areas. (Merlinsky, 2016)

ESSENTIAL YET NEGLECTED

Despite that the water basins historically always have played an essential role for the settlements, the communication network and further urban expansion in the region, the very protection of them has been ignored. (Tauber et al. 2011)

In the upper basin, conflicts are minor between human activities and natural resources because the land uses are still predominantly rural. However, in the middle and lower sections of the basins that are the most urbanized; residential, commercial and industrial uses are causing a more problematic environmental situation. (Tauber et al. 2011)

The growth of Buenos Aires has followed two dynamics, one organized, market-based oriented toward upper and upper-middle classes, and the other one, being outside the market, where poor people acquire land lacking in economic value. (Cravino, del Rio & Duarte, 2008).

Informal settlements and neighbourhoods in the metropolitan area are more than often located in floodplains with conditions of various soil contamination and open trash dumps. The most impacted areas are the lower basins of the Reconquista and the Matanza-Riachuelo rivers (Merlinsky, 2016).

Today it can be said that most rivers found in the area are highly complex systems, modified by anthropogenic activities which bring together some of the most critical socio-environmental problems of the region. This is especially true in the city of Buenos Aires, where the natural drainage system composed of crossing streams has been completely replaced by conduits and tubes, buried and covered. (Tauber et al., 2011)
Agricultural land and wetlands have in high degree turned into urbanized hardscapes, altering the natural drainage system of

surrounding areas and which also has put an impact on people living outside the new urban grid (Daniele et al., 2006). Recent developments of expressways and gated communities have continued to ignore water conservation practices (COMIREC, 2017).

It must be understood that infrastructure and other large constructions in the watershed and in close relation with the watercourses have significant effects on the flow dynamics, as water velocity and sedimentation transport. These interventions have a large influence area since they affect and alter the stream in a longitudinal scale.

Fig. 23: *Satellite image of Río de la Plata.* Source: NASA, 2017

WATERBASINS IN THE REGION Fig. 24

RÍO RECONQUISTA
AFFLUENT TO RÍO DE LA PLATA

The watershed of the Reconquista river is 175 000 hectares and covers 18 municipalities within the metropolitan area of Buenos Aires (consisting of a total 24 municipalities).

The watershed is divided into three basins; the upper basin, the middle basin and the lower basin. The river basin consists of 134 water courses giving the length of 606 km.

The hydromorphology of the Reconquista river follows the characteristics of a general plain course and its flow is affected by rainfall, the tides of Rio de la Plata, the fluctuations of Río Paraná as well as the weather phenomena sudestadas. (COMIREC, 2017)

Reconquista Basin is located in the Pampas region. Its hydromorphology is characterized by a wavy type of meander; the first stage of the formation of meanders which has minor bends in the longitudinal course and presents a floodplain with a gentle slope towards Rio de la Plata. (Bharatdwaj, 2006; COMIREC, 2017). The basin is a relief, formed by the erosion of the pampean soil which have been carved by local streams that descends towards Río de la Plata or its main tributaries. Within the Metropolitan Region of Buenos Aires, these are the Reconquista and Matanza-Riachuelo rivers.

The source of Río Reconquista is in a constructed dam, Dique Roggero, and it debouches in Río Luján. The dam was created in the late 1990s as a flood mitigation measure along with rectifications of the course and relocations of multiple tributaries. Major parts of the Reconquista basin have been subject to large-scale interventions of these kinds, where the problem of floods have been addressed but rendered the sanitary and urban-environmental problems worse.

Modification of the territory's morphology and vegetal cover have for example altered the surface runoff and advanced the contamination of soil and water, that has triggered a cumulative process of urban-environmental degradation. The watershed of Reconquista river has like many others, crossed by urbanized areas, been left to become a degraded riparian jurisdiction. (Tauber et al., 2011)

RECONQUISTA RIVER BASIN

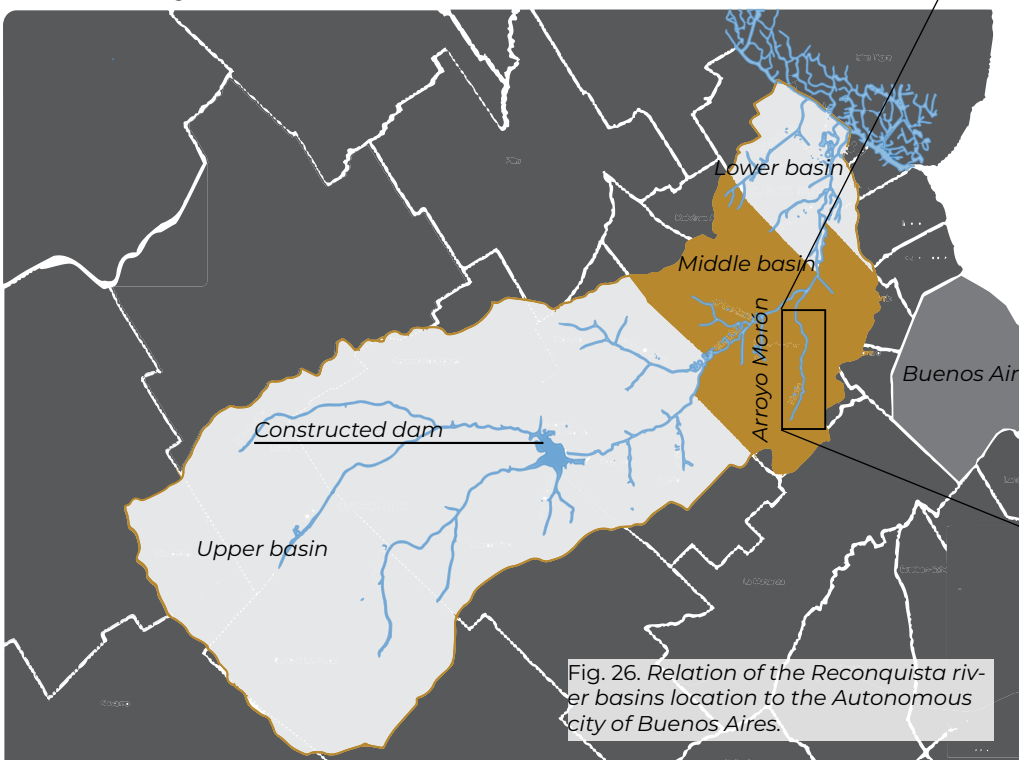
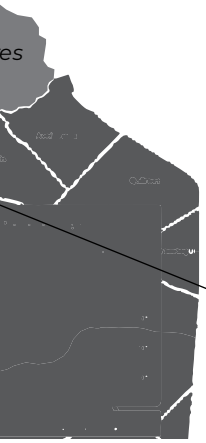


Fig. 26. *Relation of the Reconquista river basins location to the Autonomous city of Buenos Aires.*

Fig. 25. *Reconquista river as a dumb site.* Photo: Reddit



THE MORÓN STREAM

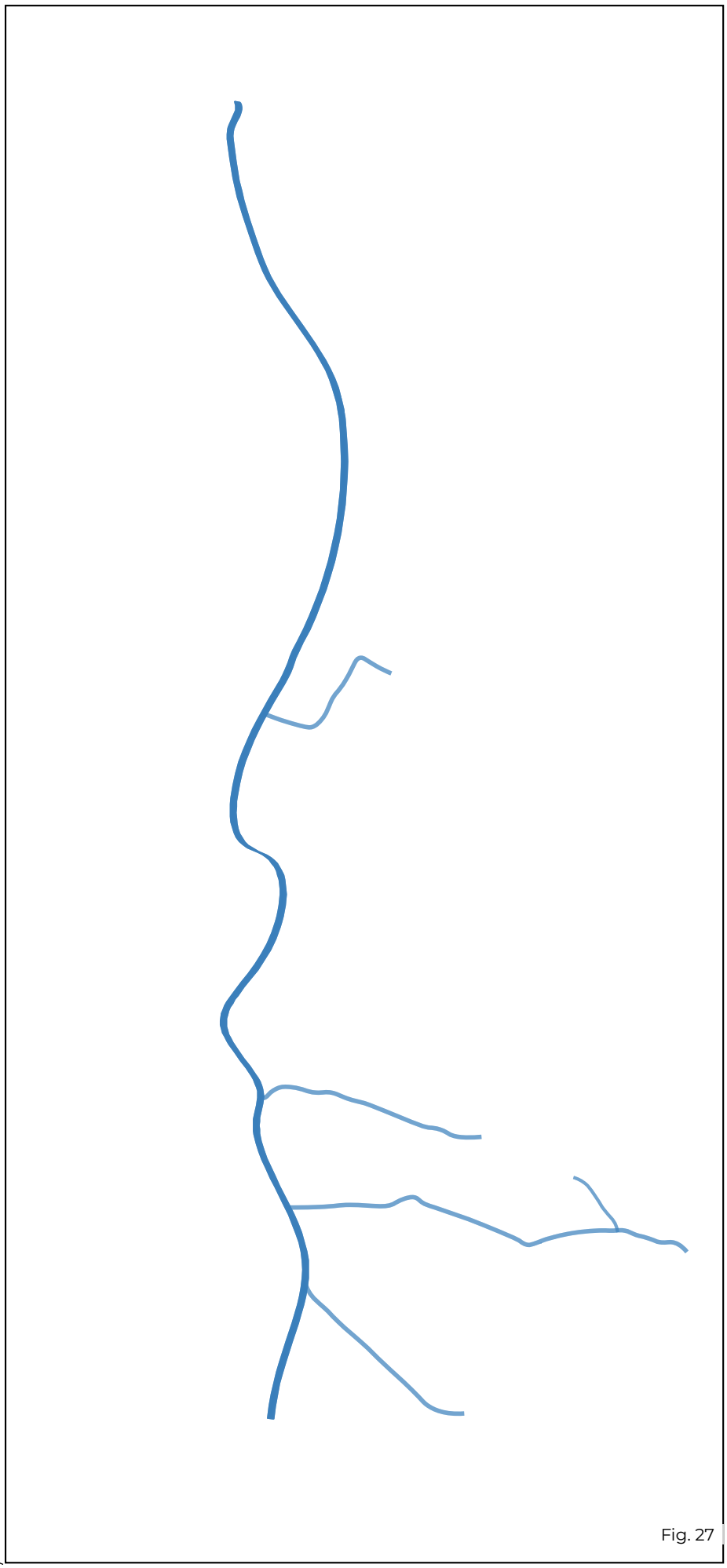


Fig. 27

ARROYO MORÓN
TRIBUTARY TO RECONQUISTA

The basin of the Morón stream is 88 square kilometers and makes out 5% of the total Reconquista watershed. In this area lives more than 650 000 people. It is one of the main tributaries of Reconquista, as well as one of the most degraded. It runs through three municipalities, Hurlingham, Morón and Tres de Febrero. In the area that we study and have visited, the Morón Stream makes out the border between Hurlingham and Morón. Both municipalities face challenges of socio-environmental character due to poor water management. The area is highly urbanized with a high density of industrial sites, polluting Reconquista river that indirectly contaminates Rio de la Plata. (COMIREC, 2017)

Fig. 28. *One of many existing traffic routes crossing over the Morón stream.*

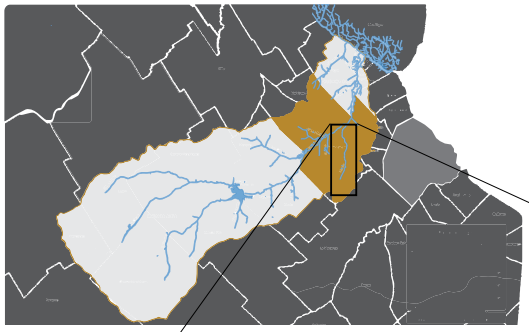
The Morón stream is located in the middle basin of the Reconquista watershed. In the middle basin we find the municipalities Malvinas Argentinas, San Miguel, General San Martín, Tres de Febrero, Morón, Ituzaingó, José C. Paz and Hurlingham.
Like the Reconquista River, the Morón stream has the characteristics of a plain course with low slopes on either sides that affect the frequency of flooding of surrounding lands. Although its small size, it is of great importance, not only because it drains an area of high urban and industrial concentration, but also because it is responsible for the biggest share of the Reconquista river pollution in which it flows into, and indirect, Río de la Plata.

The Morón stream is 16 km long and has its start in the vicinity of the southern Airport of Morón where it invisibly runs 4.5 km through the Municipalities of Castelar and Morón. It can first be seen from the junction with the Acceso Oeste highway, where it continues as an open-air canal, presenting a border between the municipalities of Hurlingham and Morón.
On its way towards the Reconquista river, Arroyo morón receives three tributaries; one from the left bank and two from ditches on the right bank.

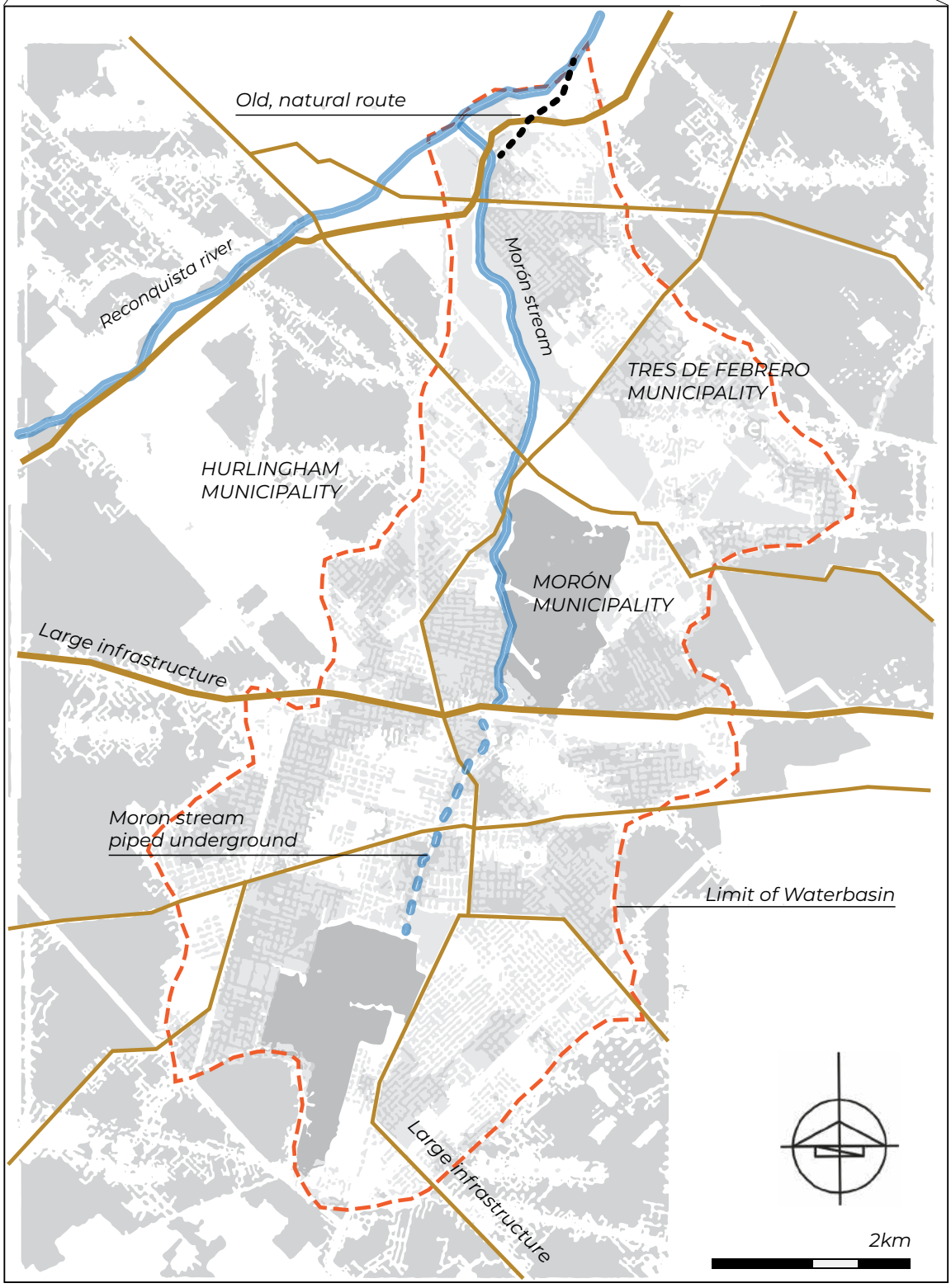
The watershed of Morón is to 80 % urbanized and the Morón stream is much influenced by the metropolitan area, mostly because of the infrastructure and transportation system that crosses the watershed in multiple horizontal axes. Most of the incisions changing the natural environment took place in the 20th century.

Large parts of the Arroyo Morón has levées on both sides of the mainstream. These are elevated areas, often covered in vegetation. The levées are created during inundations when the largest deposition of sediments happens directly beside the riverbed, mostly in straight sections and outer curves (where the flow velocity is higher). (Världsnaturfonden WWF, 2012). However, the course has been dredged and modified as actions to reduce flooding.
A general chapter of hydromorphology follows in the second part of the thesis.

Naturally, the Morón stream used to empty into the Reconquista river close to the Camino del Buen Ayre, but its course has been rectified to do so in the province of Churruca (see figure 29). (COMIREC, 2017)



MORÓN WATERBASIN Fig. 29



HISTORY OF MORÓN WATERSHED

RURAL PERIOD 1580-1850

During the 17th century a fort was established in what today is Morón city centre. Its main purpose was to protect the settlements from raids from the indigenous people (Malones). The grounds were mostly farming grounds for wheat and elevation of livestock.

The “Camino Real”, today route 7, connects the village of Morón with the city of Buenos Aires. Infrastructure, like bridges and village formations in the area took place in the second half of the 18th century. In the early 19th century, developments of summer houses and estates begin to complement the existing ranches of the area.

THE INTRODUCTION OF RAILWAYS 1850-1900

The railways were laid out, based on commercial interests. The aim was to link the production of the province to the port of the city, as well as to enable the distribution of imported goods. As the west axis was reinforced with the establishment of the railway to Morón in 1859, the multiple new stations increased urbanization of the area. Morón continues to be the western centre of the watershed.

SUBURBANIZATION IN 1900-1940 AND 1940-1970

Multiple reasons explain the suburbanization during these years. The European immigration is one large factor. Another one is the increased rents in the city combined with epidemics connected to sanitary problems. Landowners in the periphery start to sell off land disconnected from the urban infrastructure to real estate speculators. By this time the watershed is clearly confined in between the axes of expansion.

THE CREATION OF NEW CENTRALITIES 1970-2001

During this period the watershed of Morón is part of the development of creating a new metropolitan centrality. A range of new rapid routes are implemented as Panamericana, Acceso Oeste and the Buen Ayre. These structures increase the fragmentation of the territory and the use of private motor transport.

A STRAINED SYSTEM

ANTHROPIC EROSION

The type of soils that are present in the river basins are composed of a thick mantle of Quaternary sediments (the most recent geologic strata) whose main origin is wind and low fluvial processes.

The soils covering the area of the Reconquista Basin have traditionally been used for the keeping of livestock on natural or implanted pastures and for the use of selective crops. The characteristics of the historical, typical soils in this area can be related to various mitigating abilities such as the retaining of heavy metals and organochlorine pesticides and the degradation of hydrocarbons by biological activities. However, soils found in the Morón river basin today, are exposed to a high degree of anthropic erosion and correspond to urban soils. (COMIREC, 2017)

COMIREC notes that the Reconquista river and its flood valley has undergone a high degree of anthropization, particularly due to the works of canalization of the river and the construction of big roads (Camino del Buen Ayre) and in general by the filling of hardscapes of low-quality materials made by the population in the area. Further, the human actions have modified the natural physiography of the land to the worse by piping streams, constructing ditches, dredges and making rectifications. (COMIREC, 2017).

AN INSUFFICIENT FLORA

The natural landscape in the basins have for centuries been modified by the agro-livestock occupation and the progressive human expansion in the region. Due to a combination of these processes, resulting from human activity the loss and reduction of biological productivity have been severe. (COMIREC, 2017).

The vegetation belonging to Pampas is characterized by the lack of endemism (species being unique to a defined geographic location), although this does not exclude that native species could have migrated. (COMIREC, 2017).

Next follows a reference library of native and exotic flora belonging to the area of interest, divided into the categories of: Pasturelands, Edge vegetation, Multi-layered forests, Water forests and riverbanks.

EXISTING FLORA IN ARROYO MORÓN

Fig. 30-31. *Lush vegetation on the streambank of Morón, Manihot grahamii.*

PASTURELANDS

NATIVE SPECIES

CORTADERIA SELLONA:
Known as the Pampas weed.
2-3 m tall, decorative. Creates a tuft of green bended leaves.

STIPA HYALINA:
Species from the feathergrass family.
50-60 cm tall.

SCHIZACHYRIUM MACROSTACHYUM:
Lower grass creating tufts. Red tones.

OXYPETALUM SOLANOIDES:
Orchid-like flower.
30-50 cm tall with 2 cm flowers.

DIPSACUS FULLONUM:
Biennial plant. The flower is structural and has interest also during winter and autumn. 1-2,5 m tall.

EXOTIC SPECIES

ARUNDO DONAX:
A large grass, about 6 m tall. The flower is decorative 40-60 cm. Mediterranean.

ACER NEGUNDO:
25 m, large canopy and fast growing tree. North America.

LIGUSTRUM LUCIDUM:
Evergreen tree, very globe-like canopy, flowering. 10 m tall. China.

LIGUSTRUM SINENSE:
2-7 m. A very dense shrub. China.

EDGE VEGETATION

NATIVE SPECIES

ERYNGIUM SP.:
Perennial plant with interesting flowers, also when dried.
80 cm tall.

BACCHARIS TRIMERA:
Low growing shrub in the aster family.
40-50 cm tall.

ASCLEPIAS MELLODORA:
White flowering perennial plant in the oleander family.
30-60 cm tall.

OENOTHERA AFFINIS:
An annual yellow flowering plant.
40-150 cm tall.

LANTANA CAMARA:
Small perennial shrub with yellow-red flowers.
50 -150 cm tall.

WEDELIA GLAUCA:
Yellow flowering perennial.
30-80 cm tall.

SOLANUM GLAUCOPHYLLUM:
This is a perennial, purple flowering plant. Can handle very wet areas.
1-2 m tall.

SIDA RHOMBIFOLIA:
Perennial plant with adorable little malva-flowers.
50-120 cm tall.

AUSTROEUPATORIUM INULIFOLIUM:
White flowering shrub or perennial, can grow up to 2 m. A primary species.

VERBENA BONARIENSIS:
Herbaceous perennial plant with purple flowers and delicate stems.
180 cm tall.

MULTILAYERED FORESTS

NATIVE SPECIES

SENNA CORYMBOSA:
Small shrub with yellow flowers of about 1 m. Evergreen.

ACACIA CAVEN:
A small tree of 6 m. Thrives in dry areas and former flood zones. Have small yellow flowers and thornes.

PHYTOLACCA DIOICA:
A large evergreen tree with visible large roots. The canopy can reach 12-15 m of width and the height of the tree is between 12-18 m.

CELTIS EHRENBERGIANA:
Small tree with orange fruits and thorns. Like rather dry places.
4-7 m tall.

CESTRUM PARQUI:
A yellow flowering shrub of about 3 m height. Common in edge zones. All parts of the plant are toxic.

EXOTIC SPECIES

MORUS ALBA:
Mullberry tree, about 10-20 m tall with rather short lifespan.
China.

MELIA AZEDARACH:
Tree with pink flowers about 15 m tall.
China.

EUCALYPTUS CAMALDULENSIS:
Can reach 20 m height with loose bark and branches that often fall of. Pretty muc halways found along watercourses.
Australia.

WATER FORESTS AND RIVER BANKS

NATIVE TREES, SHRUBS AND VINES

ABUTILON GRANDIFOLIUM:
Rather large shrub of 2 m height and width, yellow malva flowers.

MANIHOT GRAHAMII:
Perennial shrub. Large spectacular leaves and the height is about 3-6 m.

SOLANUM GRANULOSO-LEPROSUM:
Tree between 6-12 m of height. Common in riparian areas with blue flowers.

BLEPHAROCALYX SALICIFOLIUS:
Tree related to thte eucalyptus, but of smaller size, between 3-6 m. Floweringen in white.

ARAUJIA SERICIFERA:
A vine with pinkish-white flowers and large fruits looking like cacao beans.

PASSIFLORA CAERULEA:
The blue passionfruit is a creeping plant and its flower is stunning.

CLEMATIS BONARIENSIS:
A vine with modest white flowers.

WATER FORESTS AND RIVER BANKS

NATIVE SPECIES IN FIELD LAYER

SALPICHROA ORIGNAIFOLIA:
White flowering herbaceous perennial, from the Solanum family. Have egg-like fruits.

CLORAEA MEMBRANACEA:
Orchid plant with white flowers.

HYDROCOTYLE BONARIENSIS:
Waxy, small, green leaves, great ground cover.

DICHONDRA REPENS:
Ground covering plant with small green leaves.

TRADESCANTIA FLUMINENSIS:
Great ground covering plant with lila and green leaves.

SALVIA GUARANITICA:
A large blue Salvia of 1.2-1.5 m height.

PAVONIA SEPIUM:
Perennial malva plant. Yellow flowers.

COMMELINA ERECTA:
Small herbaceous perennial plant with blue flowers. Seeds a lot.

TILLANDSIA AERANTHOS:
Grass-like plant, behaving like a parasite without being one. Grows wet on other plants, cliffs, rocks.

TILLANDSIA USNEOIDES:
Spanish moss, light colored, hanging from trees giving a mystical impression.

WETLANDS AND THE WATER'S EDGE

CANNA GLAUCA:
Wetland plant up to 1,5 m tall. Yellow flowering with blueish leaves.

TYPHA LATIFOLIA:
Tall growing (up to 3 m) waterplant with ornamental value. Common in ditches and wetlands.

CANNA INDICA:
Wetland plant producing clumps of stems. !,5 - 3 m tall with red flowers. Edible.

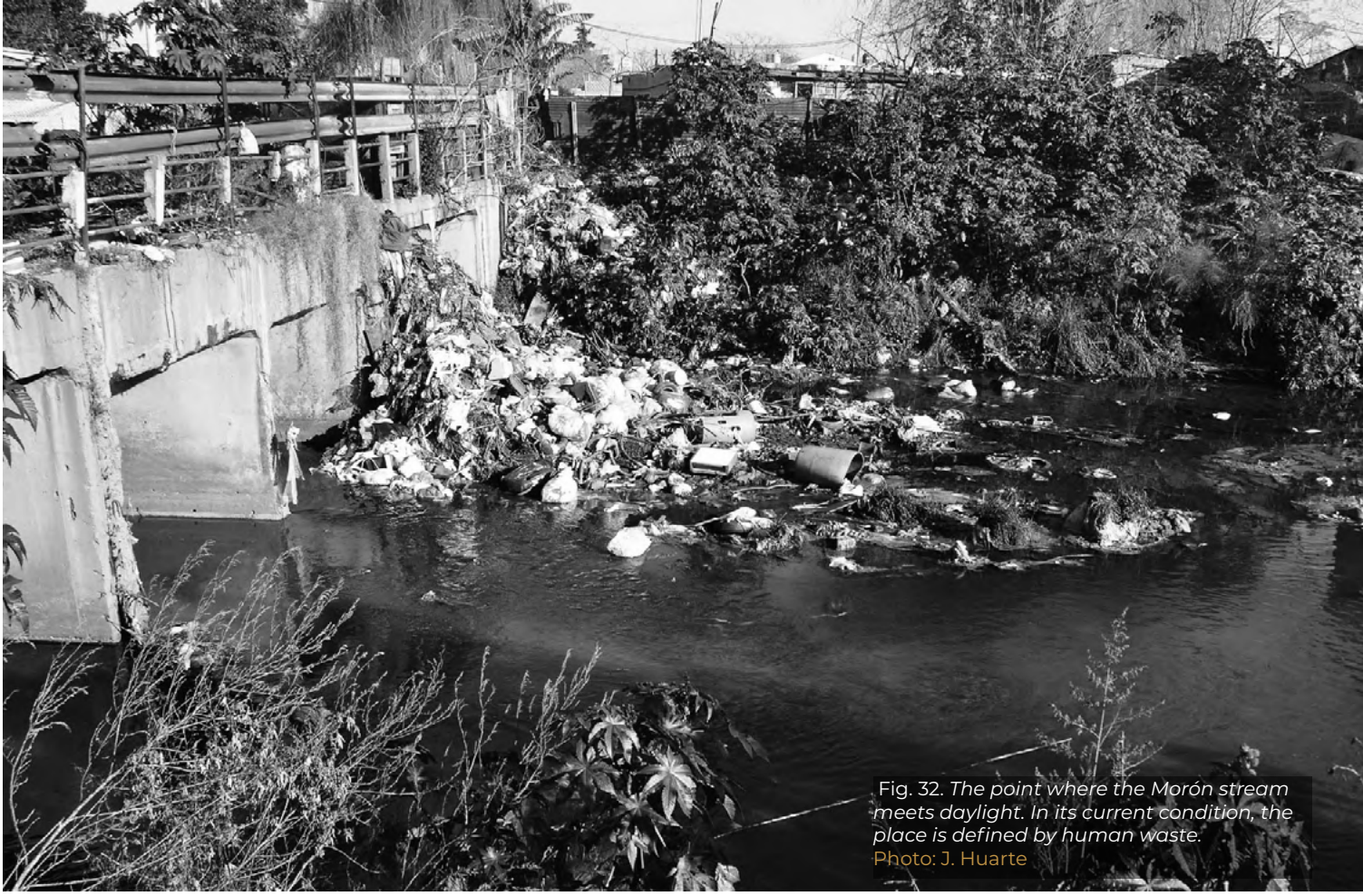


Fig. 32. *The point where the Morón stream meets daylight. In its current condition, the place is defined by human waste.*
Photo: J. Huarte

CHARACTERISTICS OF POLLUTION

There have been few studies carried out to determine the water quality of the Morón stream and its tributaries, though a series of interventions made in the 90s regarding the water quality of the Reconquista river appointed Morón river as the main source of degradation. (COMIREC, 2017).

Results made from samples determine that the deterioration of the aquatic environment in the Reconquista river was progressive downstream of Morón and that the tributary brought elevated amounts of organic matter and fecal pollution (Kuczynski, 1994; Martinez & Salibian, 1995). It was found that physicochemical values of the river were far from natural containing significantly higher values of heavy metals, ammonium, orthophosphate, chloride, phenols etc. than preceding sampling sites upstream (Topalián, Rovedatti, Castañé & Salibián, 1998).

Along its 16 km course the Morón river receives the discharges of diverse residential- and industrial zones with organic, inorganic and microbiological contaminating load (Kuczynski, 1994). Among some ditches and tributaries emptying into Arroyo morón the symptoms have been found rather evident, where the colour of the water has been observed as green-black/ violet with a strong, irritating smell.

The latest study made to evaluate the impacts of anthropic activity on the Morón stream was carried out 2017 by the Water Authority of the province of Buenos Aires (ADA), monitoring four points along the stream. It was found high concentrations of ammonium, high concentrations of heavy metals (Al, Cr, HG), high concentrations of coliforms fecal, high electrical conductivity, low dissolved oxygen concentrations along with other measured characteristics of heavy pollution by residential and industrial effluents. (COMIREC, 2017).
Sampling points downstream showed similar values to the ones further upstream, indicating a lack of self-purification capacity.

THE RISK OF FLOODING

The human influence is definitive and recent climate changes are causing widespread damage to human as well as natural systems. As anthropogenic emissions of CO2 and other green-house gases is peaking, changes in the climate system are observed: the temperature in the atmosphere and oceans has increased, the amount of ice and snow has decreased, and the sea level has risen. (Stocker et al., 2013).

Situated on a delta, the city of Buenos Aires already has an unfavourable outset regarding accelerated sea level rise and other effects on the environment caused by Global climate change. The weather phenomena sudestadas naturally occurring in Río de la Plata, which brings elevated amounts of rain and strong winds, further worsen this outlook (Merlinsky, 2016).

The effects of a changing climate is already noticeably in the watershed of Morón since the rain has become more intense. The continued urbanization in the area has also caused a increase in the peak flow of the floods. (COMIREC, 2017)

There is limited information about past floods in the Morón basin but as part of the Reconquista basin, the most important floods have been produced of the Reconquista rivers backwater. The worst floods in the basin occurred between the 50's and the 80's.

Since the flood of 1985, rectification works, embankments and pumping systems have been introduced to the middle section of the Reconquista river basin as an effort to reduce the risks of flood. (COMIREC, 2017)

Actions carried out in the Morón stream have been many and primarily focused on increasing the flow-runoff to avoid flooding.

Facing the threats of floods, COMIREC (2017), states that the Morón stream is in drastic need of further adaption.

Considering the damage done on this already heavy polluted watercourse and the lack of self-purification capacity, the subsequent question is how this adaption should be made. Following previous, static interventions or choosing a more dynamic, nature-inspired approach?

"Warming of the climate system is unequivocal"

(Stocker,Thomas et al., 2013, V.)

ARROYO MORÓN
ISSUES INTERTWINED

The huge distances of Buenos Aires quickly became apparent when we were to travel to the municipality of Morón, where the site of observation was located. Firstly, we arrived at the municipality office in Hurlingham where Luciano Haas, (Director General de Vivienda y Hábitat) with co-workers introduced us to the area: its historical background, the current situation and future planning outlooks.

Ongoing field work.

Fig. 33-34. *Fellow course participants carrying out an inventory of the streambank.*

Hurlingham used to be an extremely industrialized area, but during the 80's and 90's the industries started to move out and the municipality is today a mixture of residential areas and industries that foremost are placed along the Morón stream. We are informed that an old Argentinean law claims 60 meters of untouched ground on both sides of a stream, as a water runoff area. These standards are however, not met in Hurlingham where some industries and informal settlements (villas) seemingly are glued to the stream.

In some cases, it appears that the municipality must evacuate people due to poor housing and the recurrent flooding of the stream and in other cases there are informal types of dwellings that must be moved because they reside on areas of interest for development.

There is an interest from the residents to establish a recycling plant in the proximity of the stream. As they are gathering waste and cardboard from the river and its banks, they see this as an opportunity to obtain legal work with salary. Today, the industry ground is not as intensively used as in the past, which leads to some vacant lots creating a territorial asset. Perhaps these plans are possible?

The municipality informs us that there are current high amounts of traffic through the neighbourhoods and that they therefore want to build a route, especially for trucks, on the Morón-side of the stream.

QUICK STOPS

On our travel between and on site-visits, we are accompanied by the local police, Policia Ecologica for protection. Policia Ecologica, as the name implies, is tasked to address and control legislated environmental issues, i.e. dangerous substances, transport and storage. (La Nueva, 2005). Theoretically, with a quick look at the map, our roundtrip should not have taken that long. Though, traffic was hard and road conditions were poorly – patchy concrete, asphalt roads and uneven gravel. Each stop for site intervention was made quick and no longer than five minutes at each place.

Fig. 36. *Villa (Informal settlement) on top of the Morón stream*


Municipality
of Hurlingham
Municipality
of Ituazingó
Municipality
of Morón
Autonomos City of
Buenos Aires, CABA
20km

Fig. 35

LIMITED ACCESS

The inaccessibility of the Morón stream becomes quite evident during our field trip, the Pampas is a flat landscape not providing any sight lines, the banks are often elevated, and roads only connect to the river in a few places. We are not allowed to take any longer strolls along the river, but neither are any possibilities of such identified. The industries are making out a large barrier and the villas are to us also experienced as a restricted area with little or no passage possibilities. Our glimpses of the stream show us shallow, calm water with some small fish shoals, a variety of garbage and quite lush riverbanks on the opposite side. Some banks appear to be exposed to disturbance; either mechanical by human inference or by spontaneous deterioration. Some variation in vegetation is identified on the opposite bank where different types of grass reside.

The height of the banks is hard to measure, but appears to be around 3-4 meters, rather steep. From the junctions we have encountered, no sign of pedestrian crossings over the stream are noticed. It does not appear to exist.

We are making at least three stops in industrial areas. In some cases, the industries are located very close to the watercourse and have pipes directly out over the open stream. At other sites, where a cardboard factory and a Pampers factory are placed, there appears to be an open sewage system leading towards the stream. In this case we are however not able to come all the way down to the stream.

We are during our visit not able to walk on the Morón-side, which appears to be of more natural character. But at the end of the day we are shown to the place where the pipe opens to an open-air canal. The area above the pipe appears scattered and unpaved. We are not able to leave the car; therefore, it is impossible to see the actual water, but the barrier above the pipe-opening is visible behind a pile of human trash and wreckage.

We have time to make a visit to the municipal office of Partido de Morón as well, where we are shown the future city planning strategies for the municipality. The Partido de Morón is part of the Buenos Aires Metropolitan Area and is located west of the Autonomous City of Buenos Aires.

Fig. 37. *Policia de Ecologia.*

Fig. 38. *Pipe coming from the factory to the right, leading directly out over the stream.*

FROM SITE TO CONCEPT AND BACK AGAIN

Having read up upon the site on beforehand we thought of what we could expect of the field trip. We quickly understood though, to be there, to be bodily immersed at the site and experience it fully and not just through pictures and cartographic material, will always be important in design professions. As this is a real site that we propose to change and as intricate and complex as every other, further knowledge about site theory is needed.

The problems that the city planners and the inhabitants of Buenos Aires are facing are multiple and often intangible from one another. Societal problems and socio-economic status are intertwined with environmental conditions, rendering a situation of extreme complexity in every action trying to better it. Facing climate change and future, unexpected environmental occurrences, the hardships will most certainly be unequal. The concept of Environmental Justice will provide a deeper understanding of these issues in the next chapter.

Since our will is to change the situation of the site and we aim to propose a landscape design that is able to face its problems, we will look into the concept of Nature Based Solutions (NbS), a relatively new tool that can help us formulate sustainable approaches for our design.

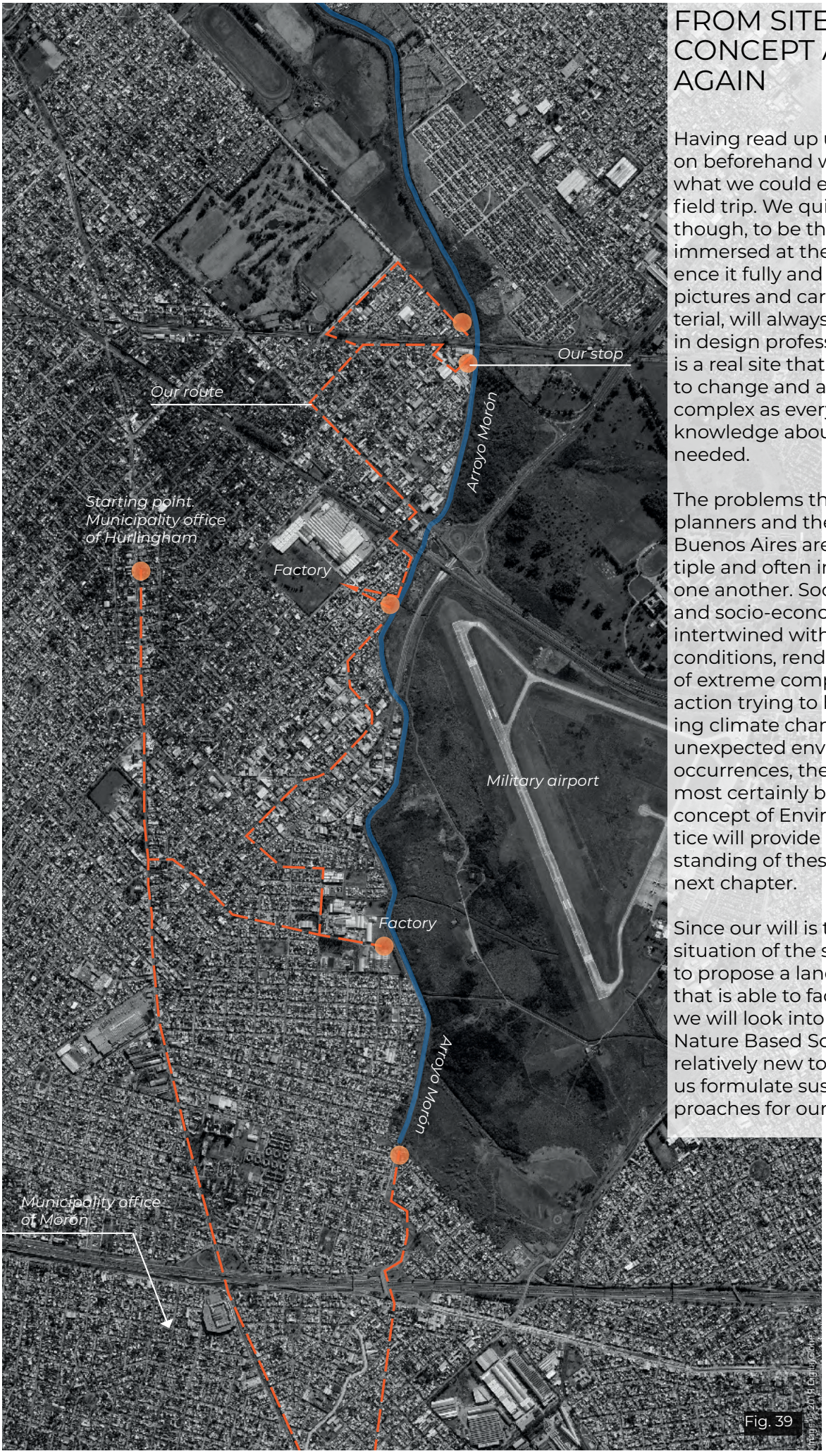


Fig. 39

PART 2: CONCEPTS & CASES

In the following part, we will investigate concepts, theory about water systems and investigate three reference projects in order to formulate strategies to adopt as basis for Part 3, the design proposal.

CONCEPTS

SITE

In the simplest meaning, the word site refers to the area chosen for a purpose or some event or practices (Burns & Kahn, 2005). Hiding behind this simple notion is the fact that each physical design discipline such as Landscape Architecture, Architecture and Urban design has its own agenda and mental image connected to it, which manifests in only parts of the possibilities and qualities of a site is being used (Diedriech, 2013).

Following the point of the researchers Burns and Kahn (2005), designers are changing the environment with both physical and conceptual means, so an understanding of both the physical and conceptual terms should be essential. In the book, *Site Matters*, the authors try to address the subject of site theory in an alternative way and stresses the importance of understanding the relationship between a project and a locale.

A COMPLEX CONCEPT

Commonly seen as something obvious and simple within the design discourse, a site is a given area limited to the surrounding by boundaries (Burns & Kahn, 2005). Perhaps suitable to achieve an intended goal, but in this static notion it fails to recognize appurtenant elements and products outside the set limits.

Within the Landscape Architecture discipline, the view of the concept site has lately begun to shift from being something static to something more fluid (Burns & Kahn, 2005).

Burns and Kahn (2005) explain that a locale never can nor should be experienced in isolation. Belonging to a site, there are three inseparable areas. The first one is the area of control which corresponds to the delimitation of the site. The second is the area of influence, covering forces and systems that influence the site without being limited to it. Lastly comes the area of effect, comprising of areas beyond the limits of the given site that are impacted by the design. (Burns & Kahn, 2005)

Considering the referral to the timeframes of past, present and future, three different physical areas and two opposing ideas of spatiality, the concept of site is highly complex, but by adopting this view of site, far more site-specific values can be understood. (Burns & Kahn, 2005)

When projecting Burns and Kahn's concept of site upon this thesis geographical area, our area of control is located on the border of Hurlingham and Morón municipalities, including a narrow stretch of land on both sides alongside the Morón stream (more about the site follows in Part 3).

When working with an area deeply rooted to the complexities of a water system, as in this case, a dive into the theory of hydrology is necessary to understand the area of influence and area of effect, which follows in the next chapter.

READING AND EDITING

When a designer takes on a site and starts to think, the mental process can be divided into two moves: the understanding of the site and the imagined transformation of it (Diedrich, 2013).

In the PhD thesis, T*ranslating Harbourscapes* (2013), the Landscape Architect, Lisa Diedrich, stresses the importance of a site as a dynamic relational construct. To follow this notion, the linguistic that is being used in design discourse also play an important role.

By naming the understanding of a site to *site reading* and the imagined transformation of a site to *site editing*, it becomes clear that sites feature existing qualities. This designation can further be used as a validation tool - if there is no connection between a designers' reading and editing, the finished design cannot be deemed site specific. (Diedrich, 2013).

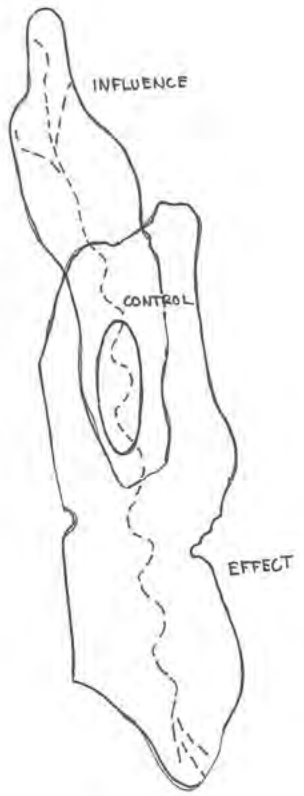


Fig. 42. *Areas of a site*

"Each built project creates new forces within its own area and also modifies and influences systems that both reach beyond the site and operate within it"

(Burns & Kahn, 2005, s. xii)

ENVIRONMENTAL JUSTICE

The movement of Environmental Justice (EJ) originates in the United States in the 1970s, when investigations of environmental pollution related to social distribution started to appear. In 1992, concerns over these matters led to the establishment of the United States Environmental Protection Agency (US EPA), which still is the lead authority on EJ matters in decision making and planning. (Mitchell, 2013)

"Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

(EPA, 2018)

INTERNATIONAL AGREEMENTS

More recently emerged is the International scope of the Environmental Justice policy where agreements between countries and governments on human rights, have increasingly been seen as a tool for achieving ecological sustainability. (Mitchell, 2013) Among the human rights agreement that was principally defined in the 1992 Rio Declaration, you can find the right to an environment that is clean and safe, the right to act in order to protect the environment and the right to take part in decisions concerning the environment. The implementation of these rights has since then been made through other international agreements like the Human Rights Act in 1998 and the Aarhus Convention on the Environment. (Mitchell, 2013)

EJ is today a standard theme in the paradigm of sustainable development where it connects objectives of social justice and environmental protection.

The Author, Mitchell (2013) gives a clear, international example of how EJ's concerns may look like on a global scale:

Low lying countries in the pacific stand before total disappearance, due to increasing seawater levels, caused of climate change. Others are threatened with coastal storms and groundwater contamination - left to be uninhabitable.
Considering these pacific states small contributions of CO^2 emissions compared to industrialized nations - their share of upcoming consequences of global climate change are highly disproportionate.

THE LATIN AMERICAN PERSPECTIVE

While EJ in the United States grew from inequities of industrial and hazardous siting, Environmentalism in Latin America generally holds a stronger social justice component derived from popular movements of activism (Carruthers, 2008).

In Latin American cities, clear correlations cannot be made between race or poverty and environment. Still, higher risks often face the poorest, most recent urban immigrants, this is largely due to growth patterns that produce inexpensive informal housing settlements near factories (Kopinak and Barajas, 2002). As previously described in the chapter Río de la Plata - Hydrological Context, this pattern is evident in Buenos Aires when studying the informal settlements within the city, which are often located in floodplains with vulnerable living conditions associated with soil contamination and open trash dumps.

Only since the late 1980s or the 1990s have the Latin American governments began to adopt environmental laws and institutions. And these have not functioned as well in practice as on paper as they were "imported" from Northern, industrialized

"In simple terms, environmental justice comes down to this: "(...)All people have a right to a clean environment, and all people have a right to accessible natural resources"

(EPA, 2018)

countries with a completely different context.

ENVIRONMENT & JUSTICE IN BUENOS AIRES

The city of Buenos Aires has a history of lacking water basin management, leading up to poor initiatives for tackling climate change. Historically, the rivers of Buenos Aires have been regarded as dumps for all kinds of waste, by citizens, industries, companies etc. The limited interventions from the state, combined with the high environmental impact from the inhabitants have led to natural systems not being able to regenerate themselves. (Merlinsky, 2016)

This causes environmental problems, often affecting different socio-economic groups unequal, as they are increasingly longer from the centre towards the periphery. The population residing in informal settlements has grown by 220 percent in Buenos Aires between 1981 and 2006, and a large part of these people live in the lower water basins where the levels of environmental contamination and risks of extreme floods are the highest. (Merlinsky, 2016)

In 2008 environmental laws were issued after the governments of the province, the nation and the autonomous city came together after a group of citizens sued companies for polluting the environment. The three fundamental actions that were taken was the conversion and control of polluting industry, expansion of the drinking water system and re-zoning and relocation of people living in areas of flood risks. (Merlinsky, 2016)

The result is three governmental organizations for water management, one for each basin in the metropolitan area: Rìo Luján - COMILÚ, Río Reconquista - COMIREC and Matanza-Riachuelo - ACUMAR.

This process also brought a higher status to environmental issues, now being regarded as a public concern where water is essential and should be protected from further contamination (Merlinsky, 2016).

Reports show that climate change will have a considerable effect on the Greater Buenos Aires, particularly due to increased precipitation. The risk of flooding will increase and unplanned urbanization, extensive impermeable surfaces and disappearing green spaces is adding to it. Even though, in coastal cities with great urban growth, measures mitigating flood, like permeable materials and well-developed drainage and sewage system, are proven to be most effective. (Merlinsky, 2016)

NATURE-BASED SOLUTIONS

Nature-based Solutions (NbS) are described as: interventions inspired by or based on nature with the capacity of dealing with global challenges of climate change and the restoration of natural or modified ecosystems, also providing social and economic benefits (IUCN, 2019). A definition describing inspiration, methodology and expected outcome, without describing anything concrete, Nature-based Solutions is currently a trusted and trending concept. However, NbS is neither implemented nor evaluated to a strong degree.

As previously stated, Nature-based Solutions can provide ecosystem services as well as health benefits leading to environmental justice within an urban context. NbS is also regarded as a valid tool in healthy urban planning acting to provide high-quality and safe urban natural space fit for recreation and play. (Annerstedt van den Bosch and Kabisch, 2017).

Types of green infrastructure or NbS, like bioswales, rain gardens and green roofs have shown to be efficient in mitigating local flood and economic loss at storm events with medium return rate. However, these small-scale interventions have less impact on river flooding, seaside flooding and catastrophic precipitation events. This summarizes the need for actions on multiple scales as well as planning with local conditions in mind. (Emilsson and Ode Sang, 2017)

SOLUTIONISM

Nature-based Solutions is an interesting concept that serves as an umbrella, bringing a range of ideas and strategies together under the same roof, providing validity. Though we acknowledge the values brought forward, the notion of *solutionism* should be viewed critically when referring to global, complex challenges of economic, environmental and social character.

To cite the Dutch Landscape Architect, Dirk Sijmons:
“We cannot solve all the world’s problems” (Diedrich, 2018 s. 164)

And doesn’t “solutions” lead to new problems anyways?

The EU financed, research innovation project, Joint Programming Initiative (JPI) Urban Europe, is in their formulation of *dilemmas*, more open for capable actions. They believe that building synergies between the plurality of goals, strategies and actions, is the best way forward. (JPI Urban Europe, 2019)

RIVER DYNAMICS

THE WATER ASPECT

Aquatic ecosystems in a natural state are highly influenced and controlled by geological, geomorphological and hydrological factors. Human interactions however, as urbanization, industrialization, population growth and extensive agricultural usage alter these natural processes increasing eutrophication, acidification and hydromorphological degradation. (Verdonschot, 2013). These facts might lead to the assumption that urbanized human territories and aquatic ecosystems are unable to coexist in a healthy relationship.

Nevertheless, the equation has to add up, since the human race and survival is dependent on freshwater resources. But is the cost the loss of aquatic habitats and species in a degraded ecosystem?

Changed land use affect the connectivity of a watercourse, the upstream-downstream relation and the stream-riparian zone connectivity (Verdonschot, 2013). The natural fluctuations of watercourses, meanders, floods and its lateral connectivity with riparian vegetation systems create habitats for a range of species as well as important sedimentation processes leading to purification of the water as well as flood retention (WWF, 2012). This dynamic should be kept also in an urbanized area as a valuable ecosystem service, providing a valuable resource of recreation and social values.

To frame and mitigate the alterations of aquatic ecosystems is complicated since it is ranging from regional to site spatial scales (Verdonschot, 2013). However it is within the understanding of how the scales interact the way to sound water management is found. (Verdonschot, 2013). This starts with regarding the dynamic of a watercourse as more than what meets the eye. The groundwater and the plains surrounding a watercourse are equal parts of the system. Exactly as Burns and Kahn implies that the conception of a site is experienced and intertwined on multiple scales with different areas of direct or indirect effect, the water's movement through the landscape behaves in the same way.

In this chapter we will study and investigate the hydromorphological process and later on one reference project of river restoration in order to find answers to how natural systems and urban systems can benefit from each other instead of acting counterproductive. Perhaps the answer will be a third form of territory, some kind of metamorphosis between the two polarities. Or we will find a logical way of implementing nature based measures that have the capacity of mitigating flood and pollution levels.

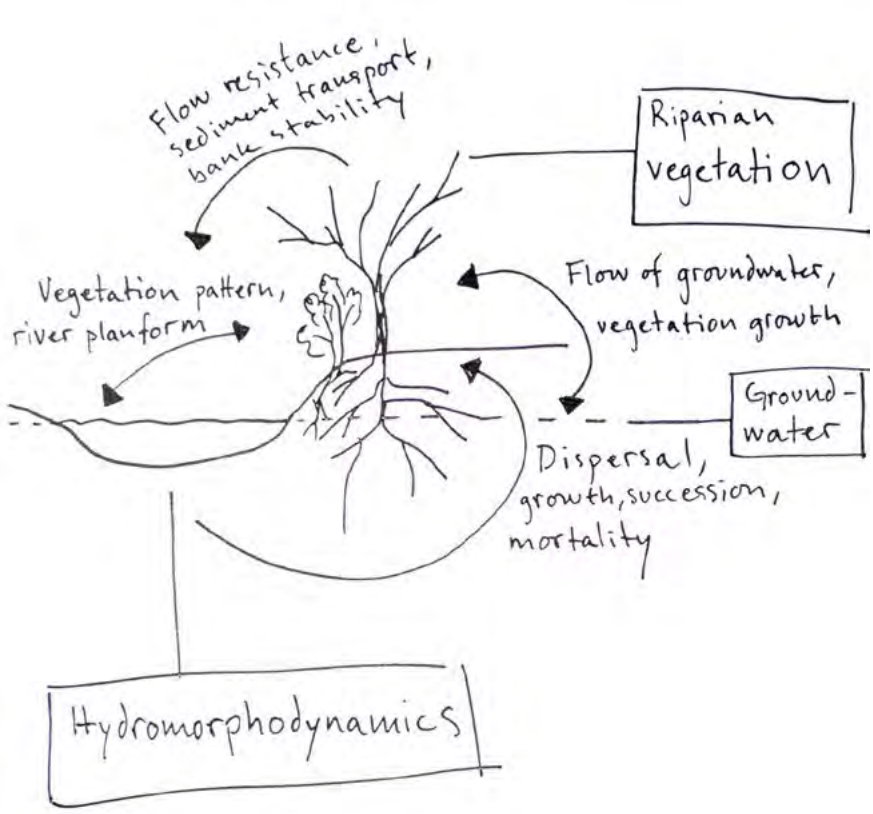


Fig. 43. *Scheme drawn up from Solari's explanation of connections. Further explained on next page.*

HYDRO-MORPHOLOGY

In order to think of good design methods and make relevant decisions in Arroyo Morón, a study of hydromorphology will provide some valuable comprehension about natural processes and systems. This knowledge hopefully transforms into inspiration and a base for design models in our creative process. The text is mainly based on "Eléments d'hydromorphologie fluviale" (2010) by Jean-René Malavoi and Jean-Paul Bravard and WWF's publication Vattendrag och svämplan - helhetssyn på hydromorfologi och biologi (2012). Extensive references are added when needed.

The discipline of hydromorphology studies the physical processes determining the functions of a watercourse, as well as the forms in which these processes result in, known as the morphology of the course. Indirectly or directly, these processes also

have an influence on the dynamic of the ecosystem in which the watercourses are placed. (Bravard, Malavoi, 2010)

A watercourse is part of a system of many dimensions. The first dimension is the longitudinal connectivity, meaning that changes and situations upstream will have an effect further downstream in the course. The second dimension is the contact between the watercourse and the groundwater, called the vertical connectivity. The third dimension is the lateral connectivity, the relation between the river and the surrounding land. (WWF, 2012) The lateral connectivity is probably the most important connectivity to take into account in the Morón stream. However, the project site must also be affected from a large piped stretch upstream altering the dynamics in the longitudinal connectivity.

Solari (et al.) stresses in the article Advances on Modeling Riparian Vegetation (2016) the importance of vegetation in the hydromorphological processes. Vegetation could be seen as a mediator between the three above mentioned connectivities. In short explained like this: the above-ground biomass of vegetation have effect on the flow velocity and sedimentation process affecting the hydromorphological evolution while the below-ground root system influences the substrate structure and the groundwater flow (Solari, et al., 2016). It is concluded that riparian vegetation has effect on the planimetric appearance of a watercourse, but that the interactions between vegetation and hydromorphology need to be modeled from interdisciplinary research, not yet conducted (Solari, et al., 2016). The aim of this chapter is not however to create a scientific model, but rather grasp the fundamental dynamics of hydromorphology and its connection to vegetation and from there withdraw the most important physical traits for restoration methods.
The riverbed can be divided into the “minor bed” which is the mainstream, basically always filled with water, from low water to normal flows. The “major bed” is the plains surrounding a watercourse consisting of fluvial sediments. This area is created by inundation and is still inundable during heavy flows. Constructions in the “major bed” have a great effect on the river’s hydrological function and behavior. (Bravard, Malavoi, 2010)

In natural stable condition rivers tend to create a dynamic combination from two types of variables. First comes the variables of control, they act on the scale of the river basin including the velocity of the water, the velocity of sediment transport and the soil structure. These factors are also under the influence of the vegetation cover and the climate which have effect on erosion and surface runoff (these conditions might vary depending on time and location in the catchment area). The variables of control are however always directly linked to the watercourse’ physical evolution.

Variables of response are found within the section of a watercourse. These variables are among others, the local slope, the meander and the width and depth of the course. If there are major changes of the variables of control, like climate change, durable changes of vegetation cover etc., the variables of response permits the watercourse to adapt itself to the changed conditions. For example it is observed that a watercourse with vegetation-covered banks, where the vegetation is subservient to the course, is deeper and more narrow than a course with no or little vegetation on its banks. (Bravard, Malavoi, 2010) This example shows the correlation between the variables of control and response.

Two variables of control with a large effect on the dynamic of the course are flow velocity and

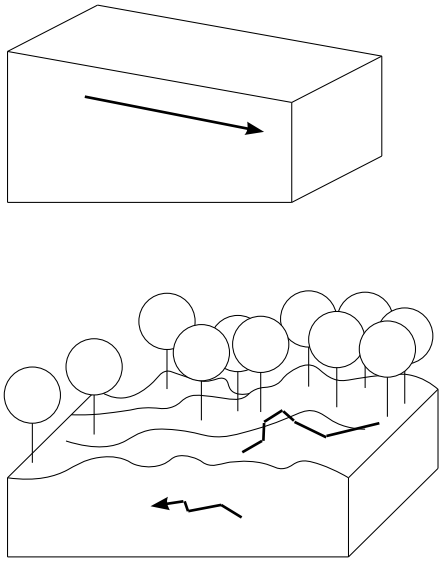


Fig. 44. *“Comparision of surface” Lack of vegetation vs. having vegetation Surface runoff water. How does it behave? How is it handled by the landscape? How can we control its speed etc?*

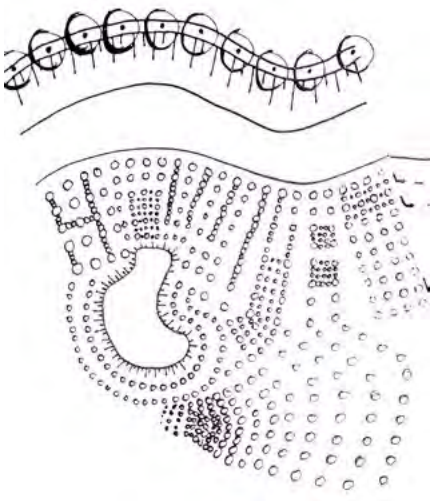


Fig. 45. *Investigating water-vegetation relationship with sketches.*

the velocity of the sediment transport. These variables determine the sedimentation and erosion processes in the watercourse. The Hjulström curve (see fig. 45) explains clearly how sediment size and flow velocity correlate in the phases of erosion, transportation and deposition of material. The transportation of sediments is called suspension when particles are moved freely in the water, saltation when larger fragments are bounced along the bottom of the course and finally traction when large rocks are transported by rolling on the bottom.
As described above, the variables of control are affected by the characteristics of the water basin. If the basin is highly urbanized and consist of impermeable materials (metamorphic rocks, clay, asphalt, etc) the flow velocity will increase. If the basin consists of permeable materials (calcareous soil, sandy soils, soils rich in organic matter, vegetation layers) the runoff water will infiltrate, hence the flow velocity will be less affected. (Bravard, Malavoi, 2010)

Perhaps the most interesting variable of response is how the course shapes its own channel pattern. A river is rarely running straight, so the two types of major channel patterns are meandering and braiding. (Bravard, Malavoi, 2010) The meandering shapes are a result from erosion and sedimentation in rather fine soils. Briefly it could be explained as the water velocity is higher in the outer curve which increases the erosion of this bank while the opposite process is happening in the inner curve. The inner curve becomes flatter as fine sediments are deposited here due to a lower flow velocity. (WWF, 2012) A braiding pattern is created in a non-cohesive substrate, with multiple migrating streams and sediment banks and islands in between. (Bravard, Malavoi, 2010)

However, rivers have historically been straightened and moved for various reasons. In agricultural contexts to drain territories, create larger fields and make

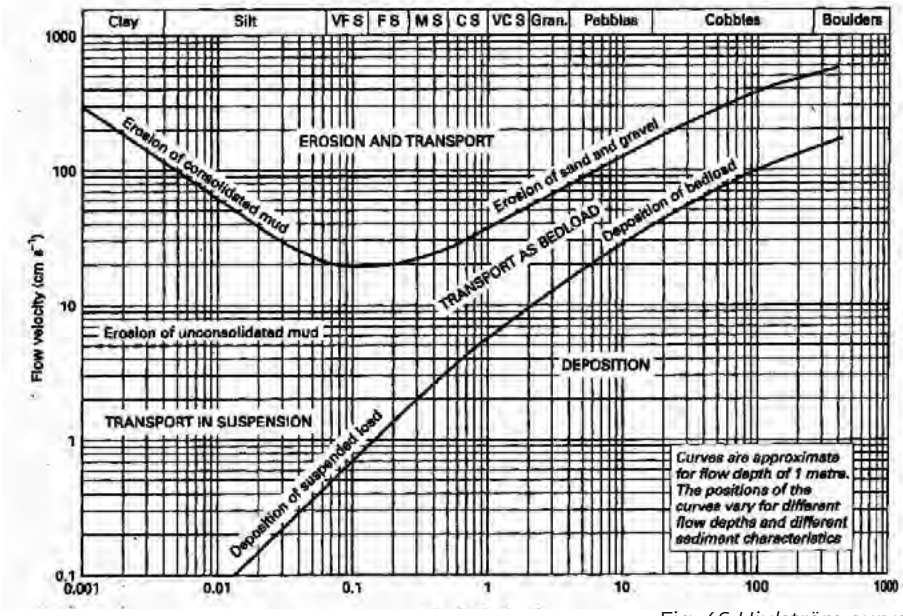


Fig. 46 *Hjulström curve.*
Source: Geocaching

the farming easier. (Eden River Trust, 2019) This alteration often shortens the course of the river since the natural bends are removed. A shorter course leads to increased water velocity and increased erosion of the minor bed. In the long run this has a great effect on biotopes and smaller habitats which threatens the biodiversity of the fluvial system.

In order to regenerate the stream and give sense to its borders and surrounding landscape, we have to start viewing the Arroyo Morón as a larger entity then just its watercourse. The plains, the vegetation, the material of the soil are all important components of the Arroyo Morón system, they all have to be taken into account when designing a new use and a new narrative.

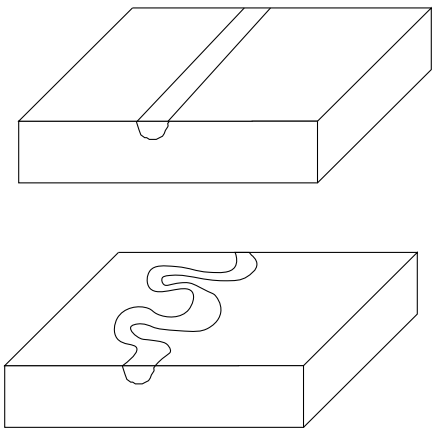


Fig. 47. *"Stream morphology"*
The straight course vs. the meandering channel pattern. Affecting the volume, capacity, velocity etc.

LANDSCAPE LABORATORIES

Fig. 48. *Location of Reference Projects*

Fig. 49-51.
Photo: Atelier Descombes & Rampini

Fig. 52. *Aerial photo of Alnarp, an island midst agricultural land and urban development.* Photo: M. Hedblom

A foundation for this design projects conceptual and physical structure is the concept of Landscape Laboratory and the belief that the landscape cannot be sheltered in a laboratory for study - instead the laboratory needs to be in the landscape.

A core idea of the Landscape Laboratories is to go against today's desire of having static, full-blown outdoor environments, but instead explore the dynamics of the changing landscape, with its appropriate stages and qualities. (Gustavsson, 2016)

The initiation of projects of this kind was made in the early 1980's with the Landscape Laboratory of Alnarp, located at the Swedish University of Agricultural Science's campus.

Today it consists of more than 40 hectares of test grounds where different species mixtures of woodlands and plantations are trialed, inspiring similar projects all around Europe. (Szanto & Diedrich, 2016)

Presented next is a quick walk-through of three projects that is permeated by the ideals of the Landscape Laboratory.

Looking at the reference cases through the lenses of the concepts *Site*, *EJ* and *NbS*, introduced earlier, we wish to gain further understanding of the design.

REVITALIZATION OF RIVER AIRE

Location: Geneva, Switzerland
Extent: 50 hectares
2002 -

The river Aire, Switzerland, is as much as Arroyo Morón - a watercourse in the urban periphery, altered by human modifications leading to a damaged ecosystem with recurring floods.

An initiative in 1997 to improve water management in Switzerland led to revised water laws in the Canton of Geneva. To enhance ecological values, water quality and the public access to the river Aire, a fund was established to support its revitalization.

MIXING CULTURE AND NATURE

The river Aire has a catchment area of 100 square kilometers and commences its course in the French glacial moraines north of the plains of Aire. After studies of landscape, hydrology, water management and ecology, a strategy for restoration was put forward by the interdisciplinary group, Superposition. The strategy was based on the recreation of the original flow pattern of the river, an increased capacity of flood retention and an increased public access. (Superpositions, 2014)

Historically, between the end of the 19th century and the mid-20th century, the course of the river has been changed and altered with concrete dikes, channelized parts and piped

Old route of the river turned into a recreative river garden

Fig. 53-55. *The waterlandscape of River Aire.*
Source: Atelier Descombes & Rampini

The old river route made into park

"Dans le projet, quand nous avons fait cette plaque de béton qui vient voler au-dessus de l'eau, nous voulions que les enfants soient invités à aller au plus près de la rivière. Pas pour donner une forme pittoresque à la rivière, mais pour que peut-être un enfant vienne là et sente l'eau, comme moi je l'avais sentie. C'est un peu comme ça que cela marche pour moi, le projet." - Georges Descombes (Architect of River Aire)

New, free course of the river

The new river route.

stretches in order to prevent flooding and turn marshlands into valuable farmland. However, the modified system lacked the capacity to tackle higher precipitation and flood peaks due to climate change of more recent days. In these events, the river was led to transport the 'problems' downstream where the water masses instead flooded the adjacent land in other areas. (Superpositions, 2014)

Thus, the revitalization project of three phases started out in 2002. Retention basins were created on the flood plain, re-meander and a freer course of the river was implemented along with the reconfiguration of the channelized stretch into a recreative river garden.

LESSONS LEARNT: CLOSE ENCOUNTERS

As this project suggests along with our study of hydromorphology, the river basin must be regarded as a complex system. Changes of the watercourse and its floodplains have effect on the water dynamics, and sometimes the effects occur further downstream (in the longitudinal connectivity).

As understood from the citation above the visual connection and the actual access to the watercourse is of great importance. Especially in the case where the narrative of the site has to be altered, as in the Morón stream.

By making it visible and accessible is one way of restoring power to the watercourse, to make it harder to ignore and neglect. It becomes a way of merging nature and culture.
One way of providing an access point in close relation with the water surface is to place it close to existing infrastructure. At these points the banks are already stabilized with concrete and no further stabilization of banks are necessary.

PARC AUX ANGELIQUES

Location: Bordeaux, France
Extent: 75 hectares
2010-

Commissioned to transform a former harbour- and industrial site along the riverside, Michel Desvigne and his team chose a rather unusual approach...

Situated on the river Garonne's right bank, a new green area have started to take shape - not in pace with the emergence of the city's urban fabric, but rather grown in consecutive steps, coordinated with the gradual withdrawal of the sites industrial uses. (Desvigne, 2016)

Fig. 56. *Bordeaux's emerging green infrastructure alongside the river Garonne.* Photo: Guillaume Leuregans

The central idea behind Parc aux Angeliques is not to design in a static, premature way and instead leave (time)room for the evolution of place and not "overplan". In accordance with this thought, newly purchased plots of land were immediately planted with trees by the city when the industries moved out. (Desvigne, 2016)

The urban woodlands being similarly created by this governing rule make up a inherit relationship to each other by means of age. By older acquired plots having more mature vegetation than newly ones - the trace of time is clearly visible.

GREEN BLOCKS

Parc aux Angeliques structure is formed by a woodland grid, where the trees makes the borders of an green urban square. The structure and orientation of the "green blocks" are derived of two key aspects: to preserve the legacy and orientation of the former industrial sites and to direct attention and movement towards the river. Since the trees always are planted perpendicular against the walkways and the river they serve as sightlines as well as contours of forests, which vary in expression in correlation with its planting structure and distances. (Desvigne, 2016)

Fig. 57. *New tree lines perpendicular to the walkways and the river.* Source: Desvigne

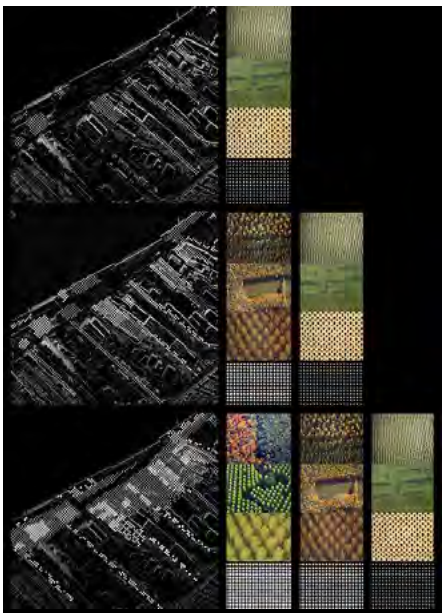


Fig. 58. The structure and typologies of Bordeauxs new landscape. Source: Desvigne

Fig. 59. Source: Desvigne

LESSONS LEARNT: *THE BIGGER PICTURE*

In the project of Parc Aux Angeliques, it becomes clear that the site is holding more than the area of control. Looking at the plans, the ambition here is large scale and aims to be a part of the regional green structure. As such, the area of influence is evidently a major part of the overarching site thinking which is a neccessity to obtain a full understanding of the site.

The main idea of the project is to transform these former industrial areas by starting out with a green net as a foundation to be able to fall back onto. The notion of structuring up the project grounds with vegetation clearly ties to NbS as a central part of the strategy providing certain benefits.

Providing a new riparian green zone to the Garonne river does not only give benefits to the ecosystem of a former sterile industrial area, it also provides important spaces for recreation and leisure activities for the city's inhabitants.

Environmental Justice is not commonly seen as a front figure of landscape projects, and so is also the case of Parc Aux Angeliques. Still, patterns involving EJ is in urban contexts often easy to distinguish if you know what to look for.

When Desvigne and his team changed the industries and factories for the development of park areas, they were moving out pollution and contamination in order to favor decontamination. As previously stated, groups belonging to lower socio-economic status tend to a higher extent live in industrial areas. For those living in the vicinity to the river Garonne's right bank, the environment will most likely change for the better.

ALNARP VÄSTERSKOG

Location: Alnarp, Sweden
Extent: 13 hectares
1994-

Established in 1994, Västerskog (western forest) is the largest test-area of the Landscape Laboratory in Alnarp (Diedrich & Szanto, 2016).

The concept of Alnarp, Västerskog is that new as well as old elements, species and management directives are evaluated over a long time, in an experimental arena having the size of a full-scale landscape. (Tyrväinen, Gustavsson, Konijnendijk & Ode, 2006). Thus, deriving knowledge about the dynamics of the future building blocks of urban landscapes and cities.

Aside of providing a cross-disciplinary testing ground for natural sciences and landscape architectural design approaches, it serves as a recreational space with unique experienced qualities for nearby inhabitants and visitors. (Diedrich & Szanto, 2016)

EXPERIMENTAL STRUCTURE

Making up a narrows strip of woodland, Alnarp, Västerskog covers about 13
hectares of land divided into 60 allotments of various planting experiments manifested in the elements of which the contemporary landscape is made out of: woodland interiors, woodland edges, shrubs, meadows, water bodies, streams and paths. (Die-

Fig. 60. *Path made out of material from the Landscape Laboratory itself.*

drich & Szanto, 2016)

Instead of having a comprehensive plan drawn up and implemented only to demand renewal years later, the process at the Landscape Laboratory was made to be reshapable from start, without having a finished initial design. In this sense the landscape can be adapted to further implementation and evolution as well as environmental unexpected occurrences. (Gustavsson, 2016)

Since the saplings were planted in a grid like structure the basis of Västerskog are the tree trunks which with different distances to each other creates spaces and woodlands of different density and expression (Gustavsson, 2016). Among the most important parts of the lab is the 32 stands of native trees and shrubs, exploring different interiors for reasons of user experience, biodiversity and productivity. These models are differentiated in vegetation structure according to three categories: monocultures, simple species mixtures of two to three and advanced species mixtures with up to 15. (Diedrich & Szanto, 2016)

Along with the variation in the woodland stands internal structure comes the management approaches and intensity which deliberately have been made different, from free-growing to extensive thinning and implantation of understory. (Diedrich & Szanto, 2016)

LESSONS LEARNT: OPEN FOR CHANGE

The understanding of site as Burns and Kahn see it, as a construct tied to different geographical and temporal frames, is more than evident in Alnarp, Västerskog.

The time aspect is the most noticeable since the very idea of Alnarp, Västerskog is to showcase and evaluate the different stages in an evolutionary process. This open-ended process is a key for how spatial design may keep track with, and actually be part of, the ongoing global transformation.

By doing research and following the landscape change on site, academic work is also introduced to variables and conditions that only are present out in the field.

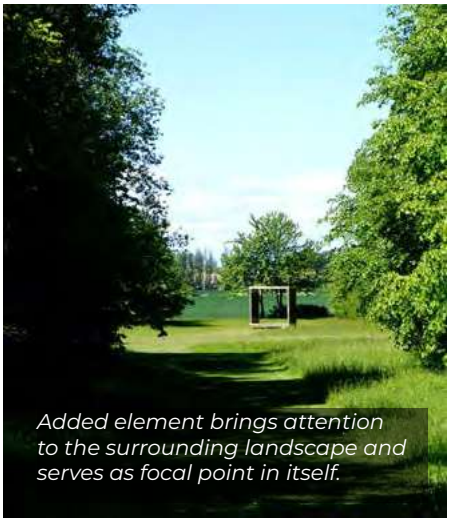
Aside of linking academia to practice, Alnarp, Västerskog is providing recreation possibilities for a whole region. The usefulness of the multifunctional and dynamic arena that Alnarp Västerskog offers will surely play an important role in facing climate change and future urban dilemmas.

The contrast of pruned vegetation in relation to free-growing.

Temporary Playful elements for childrens play and imagination.

A display of light and shadows provided by a glade in the forest interior.

Fig. 61-65. *On of the beauties of the laboratory of Alnarp, Västerskog, is the opening hours - 24 hours a day, every day, for everyone.*



Added element brings attention to the surrounding landscape and serves as focal point in itself.

DESIGN TOOLKIT

Presented in this chapter is our design approach which has been produced on the basis of the knowledge derived from previous chapters: literature study of involved sites, reference projects and concepts and theories that can be linked to the challenges of the site.

This 'toolkit' of sorts holds strategies which narrow down into concrete elements for the design proposal which will be presented in our site editing.

First, we will establish the use of *Evolutionary Design* as our main source of inspiration and key element to our design. Thereafter we will stress four measures of specific consideration to a waterscape like Arroyo Morón, which all will be handled and further detailed in Part 3.

EVOLUTIONARY DESIGN

As our landscape proposal will have to handle a variety of unpredictabilities such as consequences of climate change, floods and diffuse pollution, economic instability and political situations, the thought of having an initial design that is open ended and that can re-adapt to unexpected disturbances is crucial to the proposal.

Our interpretation of evolutionary design is as understood, revolving around the result as open ended. A key notion is also the unfinished design process, which we do not see a definitive end to. Either the design continues to be reshaped by management, activity at the site, unexpected occurrences or solely by the time that passes.

Not all areas within the site will be specifically defined but rather selected as spaces of value for holding certain functions. Like in the case of Parc Aux Angelique's strategic conversion of old industries to simple green blocks. We do not have an answer to the 'ideal' form and function of every square meter. Instead, these areas may be capable of providing arenas for future planning.

The design of the Landscape Laboratory Hurlingham-Morón is based on natural systems - ecosystems that have been shaped during years and years to best fit the current situation.

Our chosen reference projects are all in some way making the thought of human influence operating in the same way, concrete.

When it comes to landscape design, the evolutionary aspect is basically built in to the very notion. As our building material often are alive (vegetation) and in constant movement (water), the thought of an ever-changing space is easy to come to terms with.

MEASURES

VEGETATION

Green spaces such as woods, wetlands, meadows, and parks constitutes a fundamental component of any urban ecosystem (WHO, 2019), for Hurlingham - Morón it is no different.

Having access to green spaces has been shown to improve general well-being and mental health, which is much needed in today's rapid urban environment (Kaplan & Kaplan, 1989; Ulrich, 1993; WHO, 2019). The possibilities of physical activity and relaxation that green spaces provide, may also reduce health inequalities (WHO, 2019).

An implementation of urban green areas along Arroyo Morón may benefit many families who currently live in unsanitary conditions next to factories and industries.

Vegetation is also an important measure to the unpredictabilities of a water landscape.

Trees are capable of moderating the velocity of runoff water by simply being in the way and thereby hindering the water from taking the fastest way. The reduced velocity permits water to infiltrate and thereby lowering the risks of flooding. (Länsstyrelsen, 2018)

Banks with vegetation are less erodible due the roots of the plants (Bravard, Malavoi, 2010).

Trees and larger vegetation also have a large evapotranspiration, which permits rainfall to evaporate directly from the foliage. The root system of larger vegetation penetrates the soil which makes it more permeable. (Länsstyrelsen, 2018)

CROSSINGS

As Arroyo Morón works as the dividing line between the dense urban area on one side and the open landscape on the other, pedestrian crossings will be the mediator which connects the two sides.

Besides making the waterlandscape accessible, pedestrian crossings allow increased contact with the water in the sense of walking over the water or standing over it.

The highly uneven spatial use on either side makes crossings even more important. This is how we implement the social aspect into our proposed design.

By closely analyzing the site we can find the optimal places to insert a crossing, as we have learnt from the project River Aire, infrastructural crossings offers possibilities of implementing pedestrian closeness to the stream with small impacts.

It is important to think about material and design when implementing crossings and bridges across watercourses. If the crossing is too narrow, flooding can occur upstream of the bridge (the longitudinal connectivity is negatively impacted). If the construction affects the flow pattern and sedimentation velocity, aquatic habitats may be affected which has a negative impact on biodiversity. (European Commission, 2013)

RE-MEANDERING

As the Reconquista River and the Morón stream historically had a more meandering channel pattern, re-meandering interventions would be a suitable measure.

Rivers have historically often been straightened for rational farming purposes (Eden River Trust, 2019). But a straight running watercourse is rarely a natural form, especially not in low lying plains (Bravard, Malavoi, 2010). Re-meandering efforts often leads to a decreased flow velocity having positive impacts on habitat conditions and sedimentation (European Commission, 2013).

Re-meandering interventions of the Morón stream could also lead to a more just land distribution. Since the urban grid is very oppressing on the stream banks of Hurlingham, it rules out many valuable functions. A re-meandering of the stream could help create a riparian zone and a waterclose green space on the side of Hurlingham.

WETLANDS

Restoration of wetlands often focuses on the reestablishment of a lost area, with native vegetation attracting native wildlife (Zedler, Miller, 2018). However, the creation of artificial or constructed wetlands in urban territories has proven to be of great value as well (European Commission, 2013). Probably as a result of the increased comprehension for its ecosystem services as flood retention, carbon storage and water quality improvement (Zedler, Miller, 2018).

Wetlands provide a necessary measure to the ongoing pollution and killing of Arroyo Morón. Wetlands clean and increase the water quality by removing sediments, pathogens, toxic contaminants and nutrients. They also function as an important habitat for many species, making a difference for the damaged flora and fauna in the watershed. Apart from contributing to eco-system services, the wetland's wide display of wildlife offers great experience value for visitors.

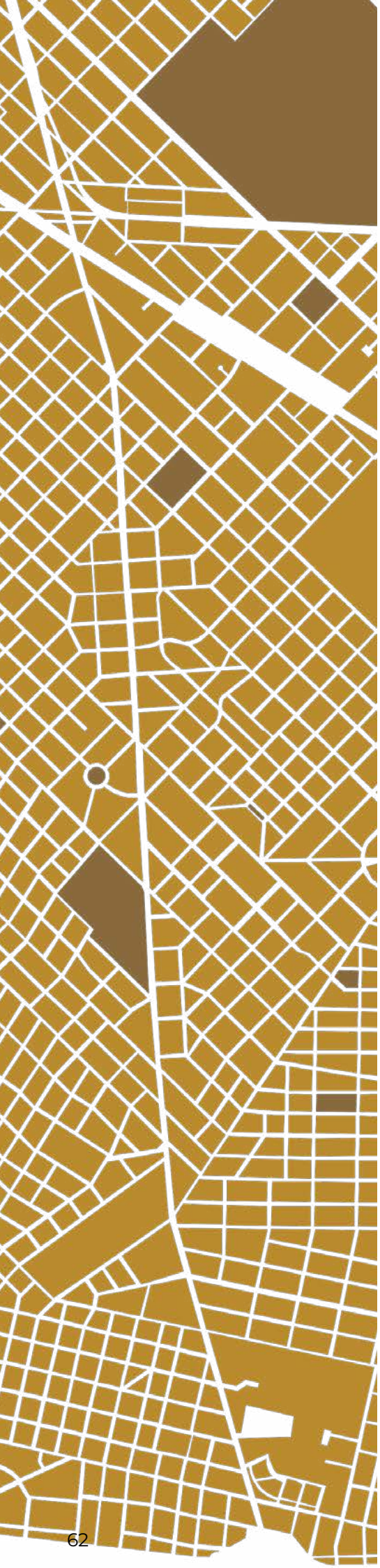
PART 3: LANDSCAPE LABORATORY HURLINGHAM—MORÓN

In this chapter follows a design proposal of a Landscape Laboratory. In the following chapter we will use the terminology site reading and site editing, referring to a re-writing of a site with existing qualities and not starting with a blank sheet of paper (re-inventing it).

Visual material like plans, sections, infographics and drawings plays a key-role in this chapter of framing the challenges and solutions of the site and will make for a better understanding for the reader. Though, this is necessary and beneficial, it is foremost a way of thinking and producing Landscape Architecture for us.

Firstly comes our site reading, where the context and the conditions of the site is apprehended and then follows the site editing where we will introduce incentives and the design of the Landscape Laboratory.

This chapter will not contain figure numbers.



SITE READING

The design project is framed by our own investigations presented in our literature study (part 1 & 2) as well as the studio project course PUPA_NEO-PERIFERIA where the site has been discovered (field trip, lectures, interviews), discussed and analyzed together with the course participants.

As expressed earlier when talking about solutionism, that 'solutions' may just lead to more problems.

Our intention in this Part 3, is first of all to 'frame the problems' connected to the site.

The second step is introduced in the *Site Reading* chapter as an evolutionary design proposal.

We assume, like put forward in JPI Urban Europe's agenda, *SRIA 2.0* (2019), that the intertwining of issues cannot be 'solved' but the situation can be improved in a step by step process while adapting to the ever-evolving realities on site.

CONDITIONS

The area of interest is the leftover green space identified primarily east of Arroyo Morón and west of the military airport.

The challenges and problems manifested on the site today are intangible interwoven with narratives of the past and the future. The large-scale planning solutions made with the intention of establishing a faster and better connection to the urban centrality of Buenos Aires have rendered problems on a much smaller scale.

One of the bigger challenges we find on the site is the lack of respect for the floodplains of Arroyo Morón.

As stated earlier on in this thesis, the Hurlingham urban and industrial tissue is placed closer to the stream then what the law admits. This affects the water quality, the inundation risks, the surface runoff, the natural behavior of the stream as well as the social barrier effect of the stream.

CHALLENGES OF THE SITE:

- *Damaged ecosystems*
- *Pollution*
- *Stream not capable of self purification*
- *Threat of climate change induced floods*
- *Threat of further fragmentation*
- *Lack of social, open and accessible space*
- *Lack of urban green spaces for recreation and leisure activities*
- *Lack of visual and mental connection to the stream*
- *Little cooperation over the municipal borders.*
- *Bad reputation*

Despite, all the components that belongs to a site and make a site tied together, we have chosen to separate the site into four layers in order to give clarity to ourselves and the reader but also to shine light on certain relationships and conditions present.

The urban grid (1) is to the west, the green areas (2) to the east, the watercourse (3) in between these two and the last layer, traffic infrastructure (4), is superimposed on the other three.

1 km


1.URBAN GRID
2. GREEN AREAS
3. WATERCOURSE
4. TRAFFIC INFRASTRUCTURE

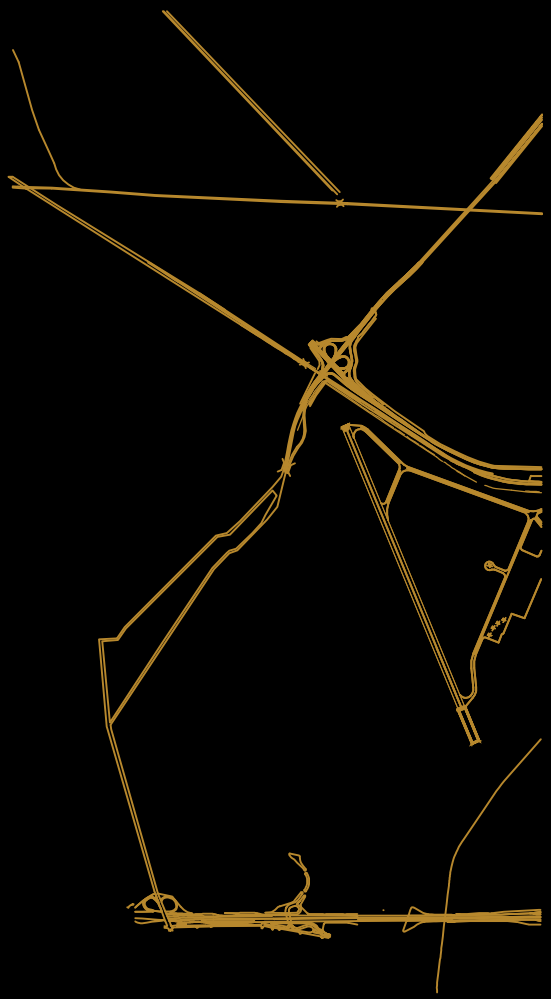
LAYERS

The following four layers will on the next pages be analyzed and detailed in order to find potentials and strengths connected to both area and function. We will try to map and assess the use and function, history and future of each category.

URBAN GRID

GREEN SPACE

TRAFFIC INFRASTRUCTURE



WATERCOURSE

URBAN GRID

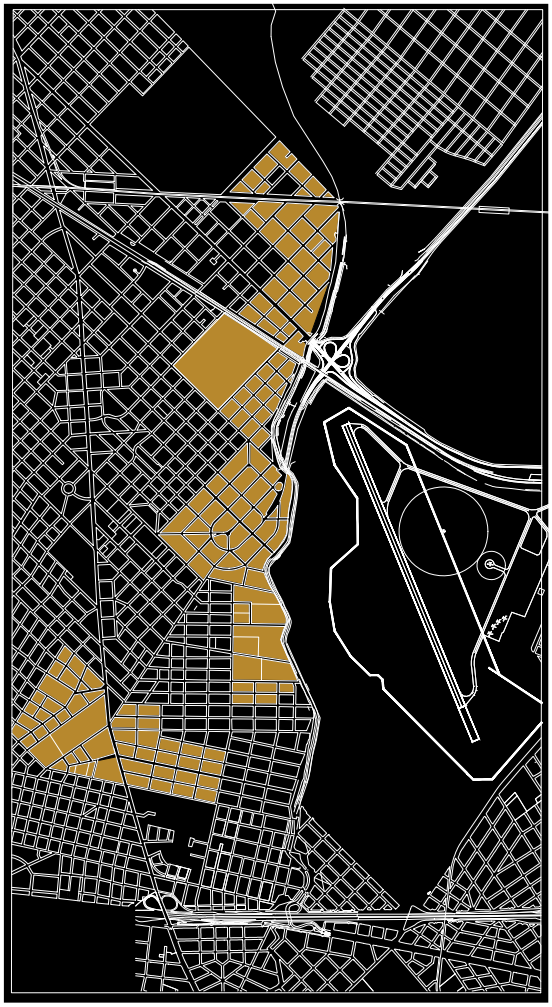
URBAN GRID
1:50 000

Quickly noticeable is how close the city grid stretches out and follows the meandering stream but also the vast difference of the urbanization's density on either side, of the stream. The lack of cross-municipal planning is here visually clear, the stream making the border between two areas that have no interest in mutual beneficial exchange. The only thing both sides have in common is turning their backs towards the watercourse.

Google Earth, 2019

URBAN GRID

INDUSTRY
1:50 000



Occupying almost the entire stretch of stream bank on Hurlinghams side, the factories is not only a hindrance for sustainable development and possible social space but also a polluting factor, discharging various of noxious substances.

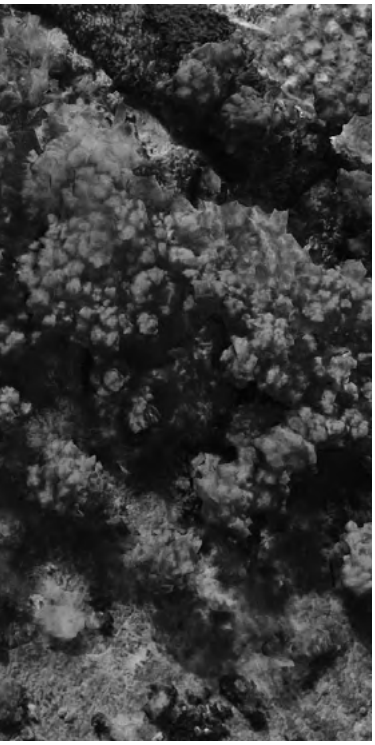
A future possible scenario may be the industrial sites transformation to open urban places, which would result in great possibilities of shaping a public green space along the stream bank.

Industry next to Morón stream

Source: Google Earth, 2019

URBAN GRID

RESIDENTIAL
1:50 000



Taking up the most urban space within the area, residential housing is the dominating land use.

The total population of the Morón basin is approximately 172 000 inhabitants (COMIREC, 2018).

URBAN GRID

VILLAS
1:50 000

Breaking the dominating presence of industries along the west stream bank are the villages or informal settlements. Beside the claim of land being illegal and on areas prone to flood, this occupancy puts further strains on the stream with household pollutants and waste, due to insufficient sewage systems.

There are 2397 families within the Morón basin that lives in informal settlements that are considered to have a high degree of socio-environmental vulnerability. The most critical situation is found along the stream banks of Morón, where 961 families live in a series of exposed neighborhoods. (COMIREC, 2017)

COMIREC have recently made plans to relocate some of the villas and informal settlements which obstruct the bordering street, running along the stream on Hurlingham's side.

In times of financial crisis, the informal housings expand and in times of economic stability, the informality declines. The villas are a symptom of a much greater cause which we cannot solve in this design proposal.

We have no intention of planning for the removal of families who are occupying the stream banks. Using the tools of a Landscape Architect we can instead try to shape spatial resistance to these changing occurrences.

Informal settlement located on top of the Morón stream

Informal settlement located on the Morón streambank on Hurlinghams side

Source: Google Earth, 2019

GREEN SPACE

TOTAL
1:50 000

There exists a large amount of green spaces within the area, also following the trend of irregularity between the two sides of the stream and the municipalities. In fact, these vast empty areas tend to be most valuable for their ecological function and capacity to infiltrate and store water. The configuration of the urban fabric doesn't leave much room for public green spaces, parks and plazas. As read from the map, the green areas are fragmented and strongly surrounded by traffic infrastructure.

PUBLIC/ ACCESSIBLE
1:50 000

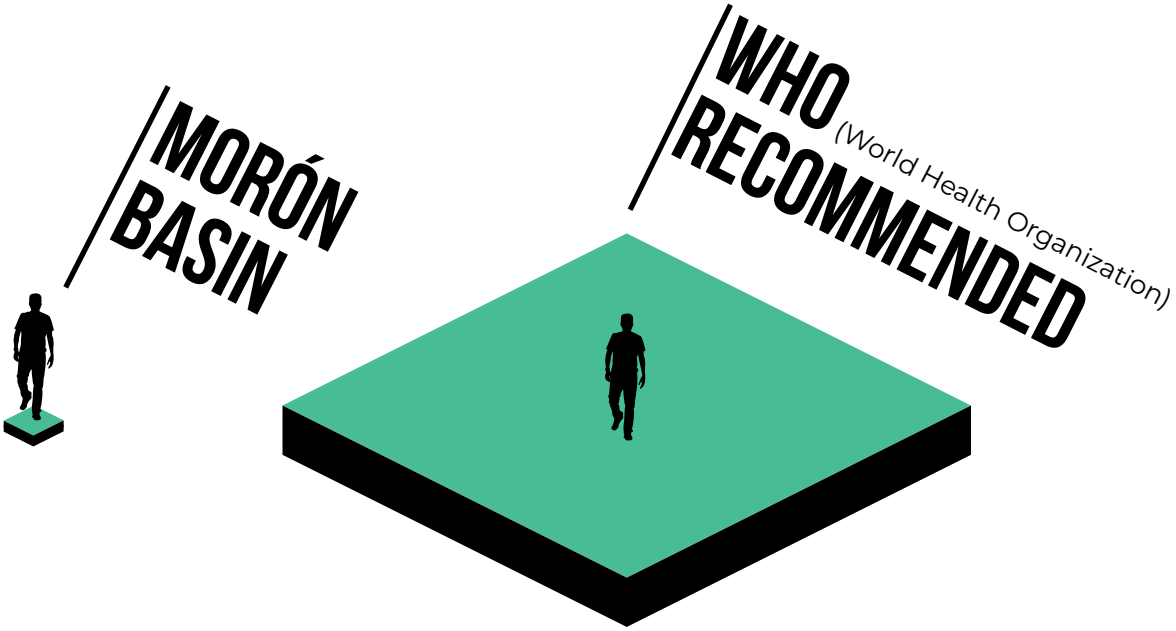
The large presence of green spaces is in the present, restricted by specific uses like military airport, leaving a tremendously small proportion of the total amount open for the public.

Our design proposal will provide another 160 hectares of accessible green space, securing it from further exploitation just by addressing and re-shaping what already is there.

Espacio de la memoria de Hurlingham.
Source: Google maps, 2019

Jorge Newberry Park.
Source: Google maps, 2019

The existing, public parks in Hurlingham seems to have little to offer their visitors. Open lawns are accompanied by sparse vegetation.



0,78 M²

PER INHABITANT

Publicly accessible green space for inhabitants in the Morón water basin.

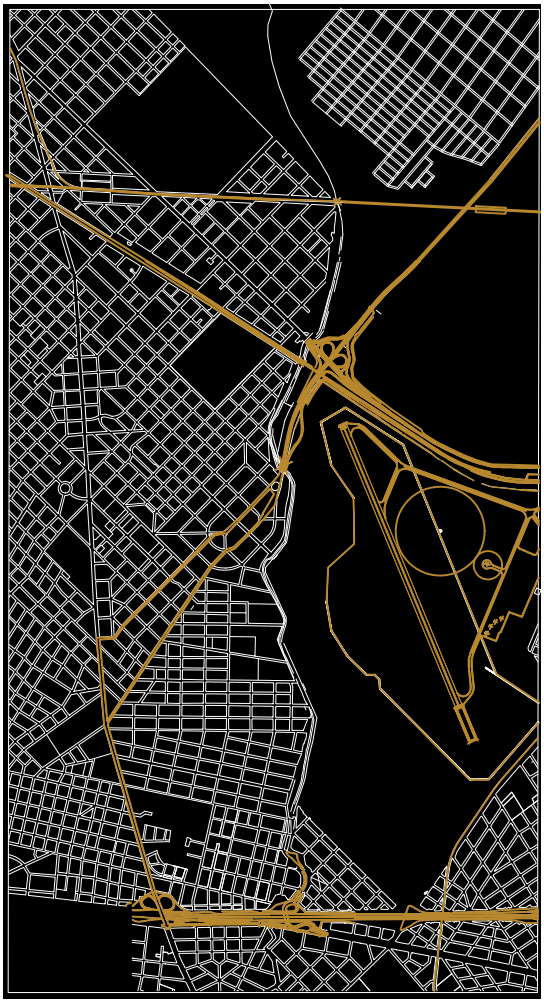
9 M²

PER INHABITANT

Recommendation by WHO, of minimum amount of green space that a city should have.

TRAFFIC INFRASTRUCTURE

EXISTING
1:50 000



The site contains major regional infrastructure like the Palomar airport, two train lines with several stations, the Acceso Oeste freeway and many crossing, provincial roads.

With an extensive existing infrastructure there are good possibilities for making connections to Hurlinghams green spaces, just by complementing them with pedestrian access.

PLANNED
1:50 000

Newly proposed infrastructure like extension of the airport facilities, a truck highway and a new road alongside Arroyo Morón follows the already established pattern of fragmentation of existing green areas and the aggravation of connectivity between the urban grid and natural areas.

What if the inhabitants of Hurlingham and Morón need a new stream rather than a new highway?

WATERCOURSE

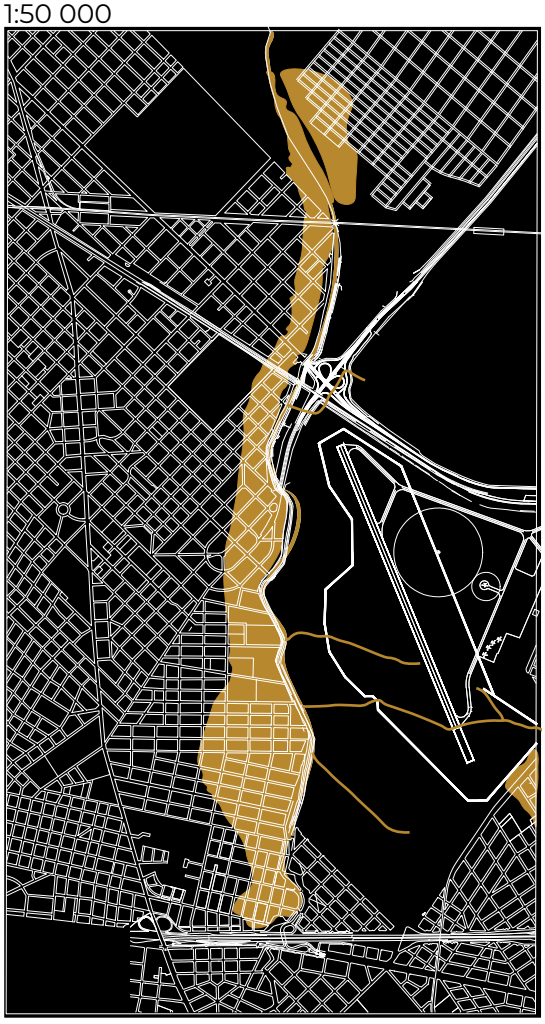
NORMAL CONDITION

1:50 000

As previously mentioned, Arroyo Morón and its floodplains is far from a natural, healthy eco-system.
It has under decades been under modification of anthropic forces; on certain stretches it has been piped and on others it has been canalized with construction of embankments. The watercourse which is hidden out of sight for the inhabitants with limited availability also has high levels of various pollutants.

CONDITION DURING FLOOD

1:50 000



The image above shows the impact of the floods of the Reconquista river that occurred 1967, 1985 and 2000 in the Morón basin. The floods are shown to almost solely happen on urbanized areas on Hurlinghams side which puts further strains on an already troubled area.

A part of making the area more livable must begin with re-introducing a floodplain to the non-urbanized area to the east. Still, facing heavy pollution and urban vulnerability, the water landscape will have to be re-shaped.

CHALLENGES & POTENTIALS

- A SYNTHESIS

Next follows the concluding part of the site reading.

Divided into three parts from south to north, the challenges and potentials of the area are lifted for potential site editing outlooks.

As basis for this process is a simplified synthesis plan of existing land usage to better spot the potentials.

The separation of the area is also done with the area of influence and area of effect in mind. As hydromorphology has taught us: the longitudinal connectivity of a watercourse will make particular measures more fit upstream than downstream.

INDUSTRY

RESIDENTIAL

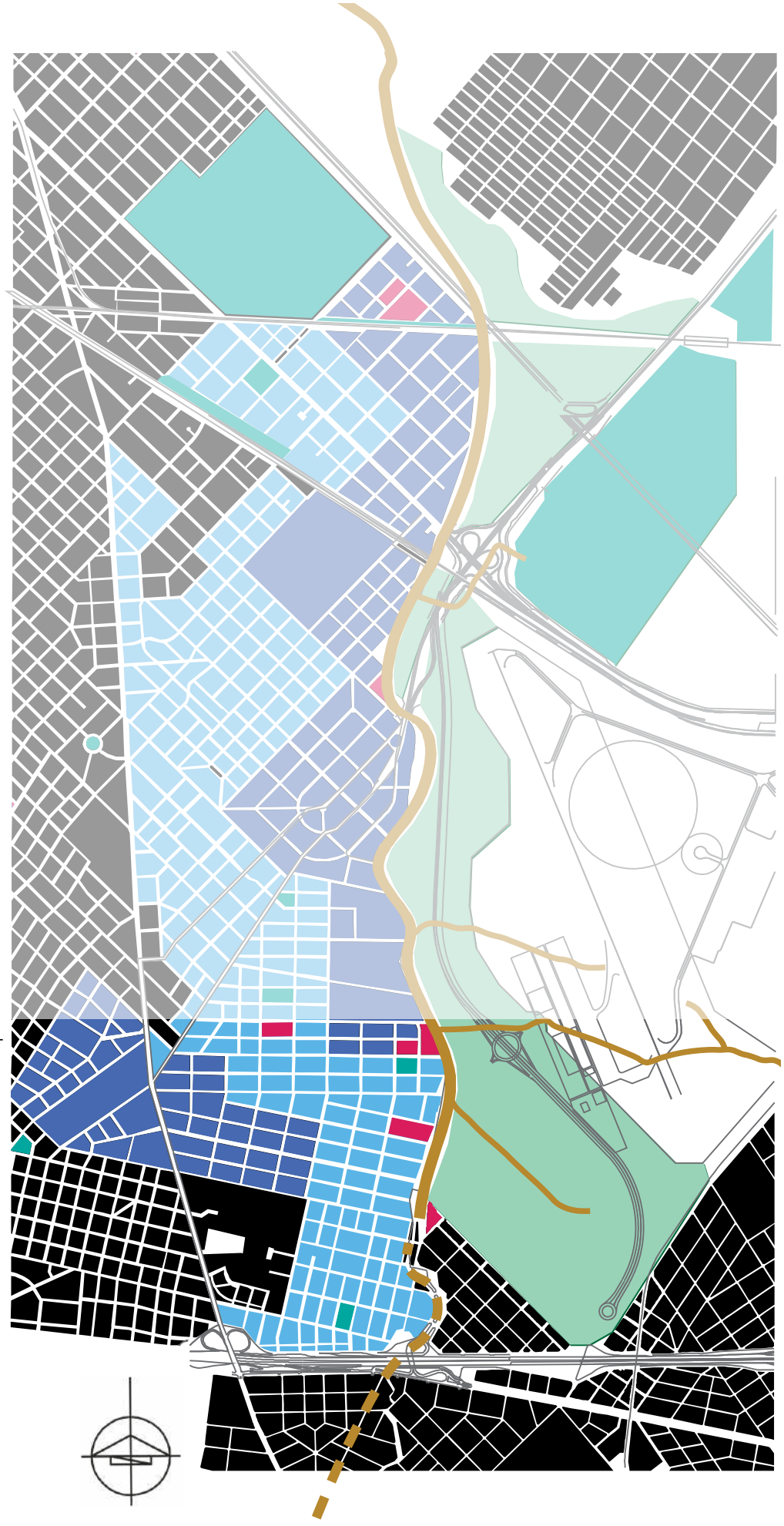
VILLAS

ACCESSIBLE GREEN SPACE

INACCESSIBLE GREEN SPACE

WATERCOURSE

TRAFFIC INFRASTRUCTURE



SOUTH:
Landscape Measures

Constituting the challenges of the southern part is largely connected to the stream being piped up until this point. Here you find higher levels of pollution, a larger area that has been historically flooded and a high degree of informal occupancy of the stream bank.

Though, this is a upstream located area with large coherent green spaces which gives unique potentials.

The generous green spaces can be used as flood retainment areas
Since there is large effluent of pollutants this may also serve as an area for water purification by infiltration and sedimentation.

The potentials and possibilities of ecological restoration measures are big.

INDUSTRY

RESIDENTIAL

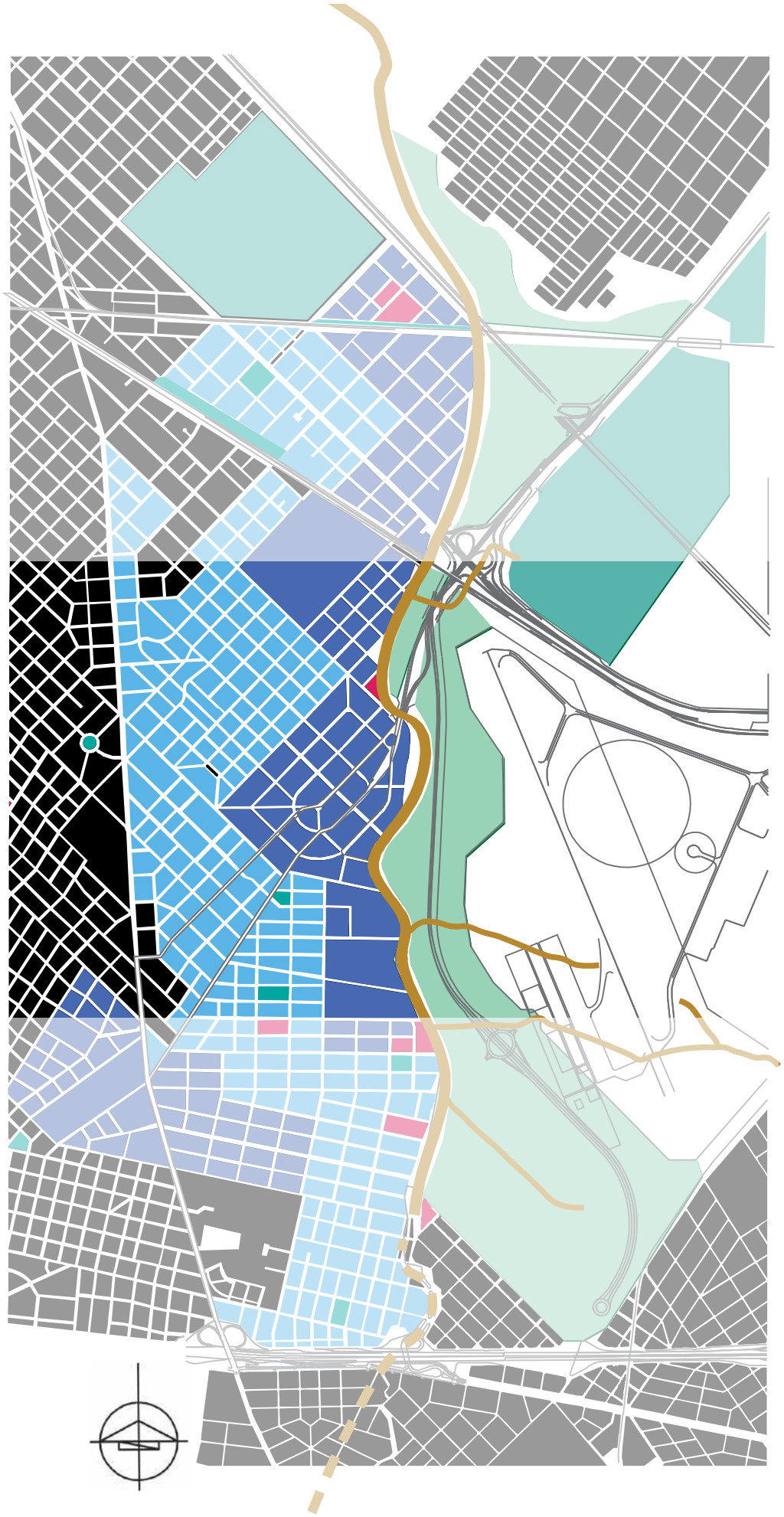
VILLAS

ACCESSIBLE GREEN SPACE

INACCESSIBLE GREEN SPACE

WATERCOURSE

TRAFFIC INFRASTRUCTURE



CENTRE:
Water Contact

Challenges of the middle part are primarily related to existing infrastructure and land use.
There is a barrier of industries on the stream bank and plenty of fragmentizing infrastructural crossings. The green area here is also the narrowest.

The strengths here are the existing crossings and nearby residential areas. There is also a recycle plant planned to be built.

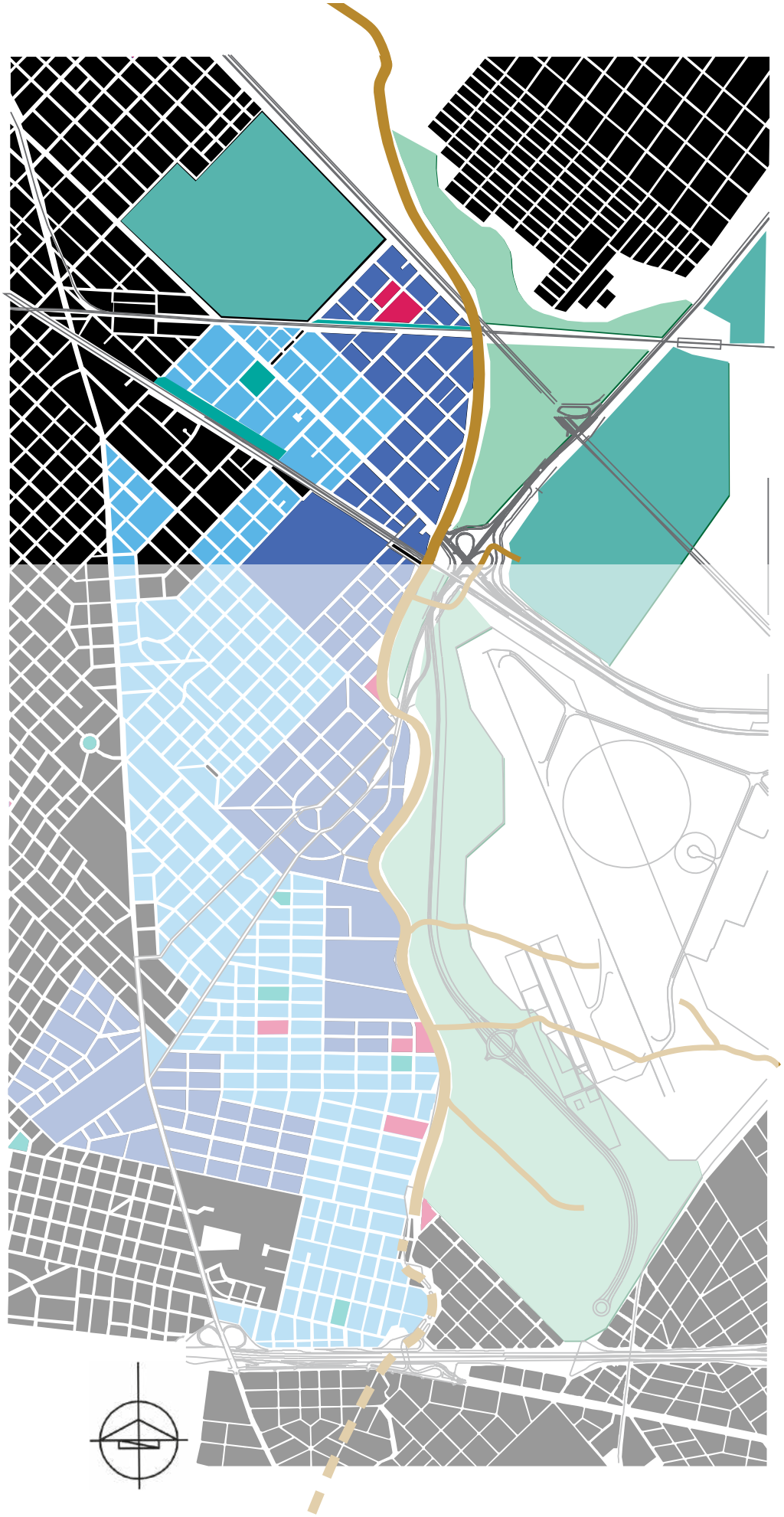
By using the existing crossings for pedestrian needs, the accessibility to the green area and the stream can easily be improved. Further, the vicinity of housing and traffic infrastructure make it a good location for developing a neighborhood park.

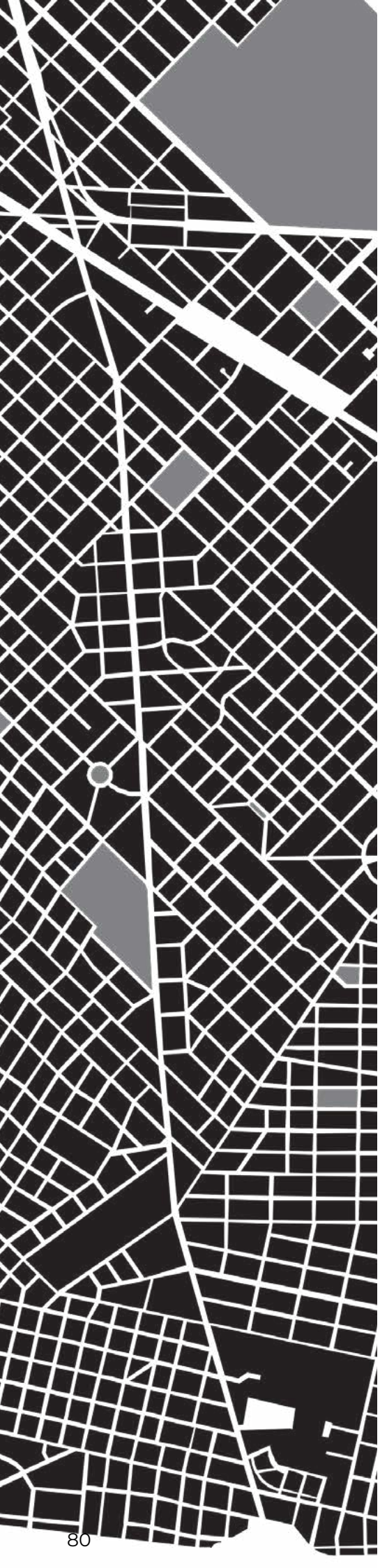
NORTH:
A Green Link

In the northern part, the challenges likewise comprise of existing infrastructure and land use.
The industries are functioning as a barrier against the stream and the green areas are fragmented by large infrastructure.

Still, the green area on the east side is large and coherent. There is also an existing green connection to the commercial center of Hurlingham.

With the proximity and already established connection to the city center, the area is ideal for a visitor's center. With easy accessible nature, the experienced qualities can turn out big.





SITE EDITING

Follows next is the site editing chapter where we will introduce the design proposal.

We will introduce it from bottom-up and begin with the building blocks of the proposal, where lessons learnt during the work have boiled down into concrete design elements.

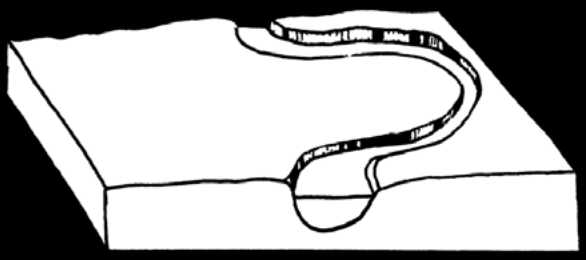
The proposed site editing should not be seen as an end-scenario, but as a first step in an evolutionary process.

AMBITION

The ambition of our new, proposed design is that it will ultimately enrich the landscape of today: the functions of its natural system, aesthetics, accessibility, attraction of people, animals and plants but also its reputation, how it is viewed upon and spoken about.

We will now detail the tools and techniques extracted from the literature study, reference project review and field study, with which we want to work in view of creating a design proposal.

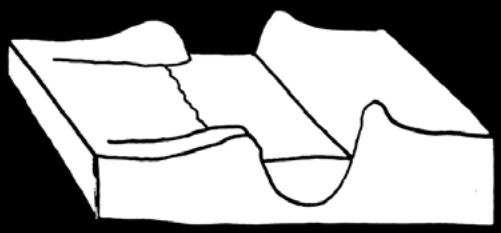
TOOLS & TECHNIQUES
FOR SHAPING
THE URBAN STREAM



RE-MEANDER

By adding and exaggerating the meander of the river the velocity of the water decreases and positive effects are noticed in the sedimentation process.

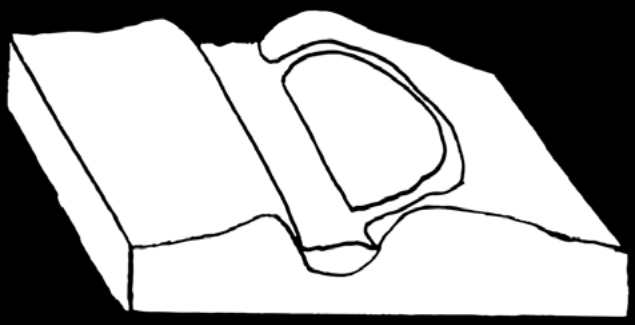
This measure allows us to move the stream and by doing so we can make more land accessible on the Hurlingham side. This might be a good strategy for connecting the both sides and enabling movement throughout the whole green area.



SLOPE

This measure is meant to replace the high stream banks with levées to minimize inundation.

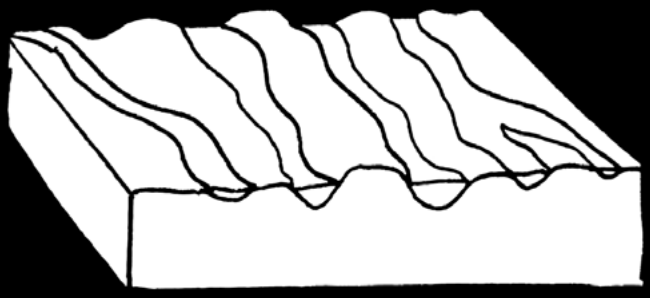
A positive spatial effect is the sightline created making the stream part of the surrounding landscape and letting people come closer to the water surface.



TEMPORARY ISLANDS

By creating a “swale”-inspired land formation on slightly higher grounds than the streambed we allow the stream to overflow this canal in an event of flood, with the effect that a temporary island is created.

This measure strengthens the image of the river as a living, dynamic system, constantly changing shape and matter. It also makes the water landscape interestingly different for visitors from time to time.



MULTIPLE STREAMS

Watercourses tend to do meanderings or braided-like patterns in the landscape. By adding soil and widening the streambed into multiple streams of different shallowness a wide range of biotopes are created along with a stream dynamic able to regenerate itself and the water quality.

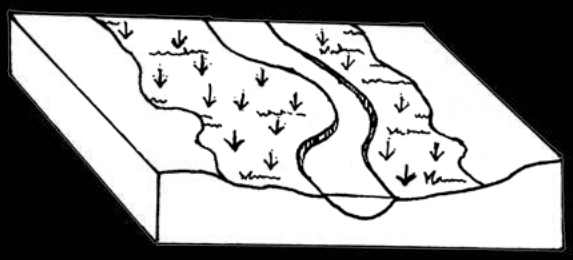
The area may mitigate floods and could be made more accessible with the implementation of an elevated path system for visitors to experience the flora and fauna.

WETLANDS

Wetlands are created by lowering an area in the flood plains, which will infiltrate and slow the water and sedimentation transport down.

With the possibility of providing nesting grounds and livelihood for native species including birds, they are essential for the water landscape. The wetlands may have different shapes and appearances, also allowed to change over time.

TOOLS & TECHNIQUES
FOR SHAPING THE URBAN WOODS



FLOODPLAIN BUFFER

The floodplain belonging to the Morón watercourse is today separated from the stream by flow-control measures like dikes, modified levées and channelization.

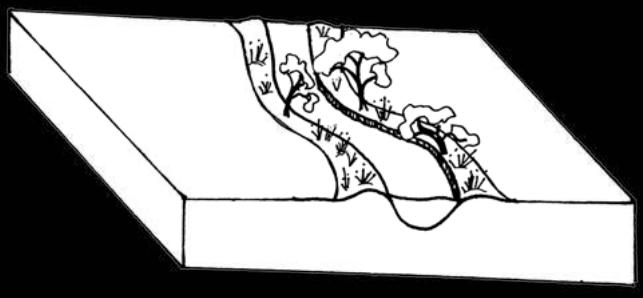
By reconnecting the floodplain to the stream, it will function as an important part of the ecological system; filter and store water, provide natural flood protection and help sustaining the biodiversity.

By using measures like afforestation (plantation of grasses, shrubs and trees) and modification of the channel to a more natural route, the lost role of the floodplain may be regained.

BIOSWALE

As a shallow, linear channel filled with vegetation, the swale is capable of different water management. A wet swale with constantly high-water table can with the help of vegetation, trap and extract pollutants.

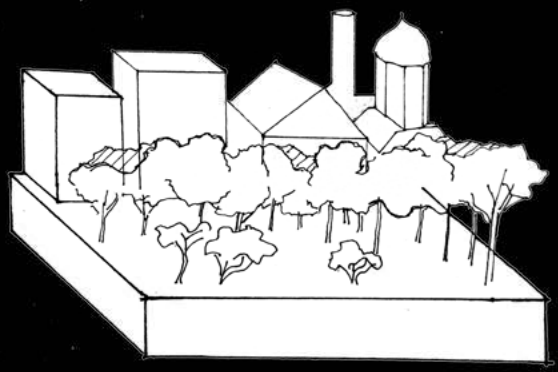
Introducing bioswales as water purification and drainage systems linked to the industries alongside the Morón river can be an effective measure against further contamination. The pollutants will be left visible and can be dealt with before causing damage to the watercourse.



RIPARIAN VEGETATION

Erosion control and stream bank stabilization is much needed but in such a way that the stream can still move freely. The stream banks of the Morón river is in some places artificial, leading to a degradation of the watercourse, increased flow and erosion. In other places the stream bank constitutes of a monoculture of grasses.

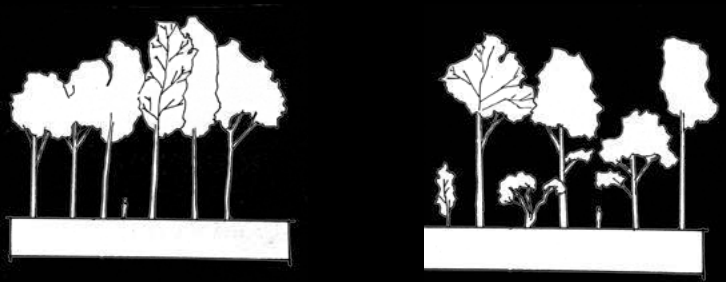
By introducing riparian trees to the stream bank, the reinforcement of the soil provided by the roots reduces erosion and enables a narrower stream cross-section. Trees alongside the watercourse also give a much-needed shade over the water - sustaining a vital habitat for many species.



URBAN WOODLAND

A woodland will be an essential structure to any landscape proposal.

Apart from the great recreational, aesthetic, social and health promoting values that an urban woodland can offer people, they provide a broad range of ecosystem services, contribute to climate change mitigation and moderate local climates.



PILLAR HALL STAND MULTILAYERED STAND

THREE PRINCIPLES:

We will now proceed to combine the tools and techniques crossed with the findings in the site reading of our four categories: Urban grid, green area, traffic infrastructure and watercourse.

This will be presented as 3 principles:

GROWING GREEN SPINE

Growing Green Spine is firstly the new foundation of the Landscape lab. The inclusive elements may recondition the ecosystems tied to Arroyo Morón but are themselves also apt to change to unexpected occurrences.

Re-meander, riparian vegetation and wetlands - all serve functions that will give life back to the stream and a range of experienced values.

In site reading of *Watercourse*, the historical flooding has to a high degree taken place in the urban fragment on the west side. Tools and techniques bound to the green spine will contribute to the possibility of instead making the green area to the west the retention zone of excess water.

URBAN GRID FOR URBAN WOODS

Urban Grid for Urban Woods is making up for a large part of the new afforestation in the proposal.

Site reading on *Green areas* tells us that there is a lack of public green spaces, both quantitatively and qualitatively.

Structuring the urban woods similar to the forest stands in Västerskog, Alnarp, there is chance of providing unique forest qualities for visitors and inhabitants meanwhile testing out native and exotic species for urban conditions of pollution and floods.

Locating the tree lines adjacent and parallel to the stream, it could function as the lost floodplain buffer of the Morón stream but also steer movements close to the water.

THE PEOPLE'S RIVER

The People's River is about the accessibility and user experience value of the Landscape lab. This principle will add the social perspective to each implemented measure where our site reading has found suitable areas for recreation and social interaction.

Negatives found in the site reading category, *Traffic Infrastructure*, are here seen as potentials.

Finding new ways of using the existing infrastructure like crossings and the rectified stretches of the stream could mean big improvements for the access to the green area as well as the water, with little resources spent.

PRINCIPLE 1:

GROWING GREEN SPINE

The map to the right suggests the placement of vegetation volumes.

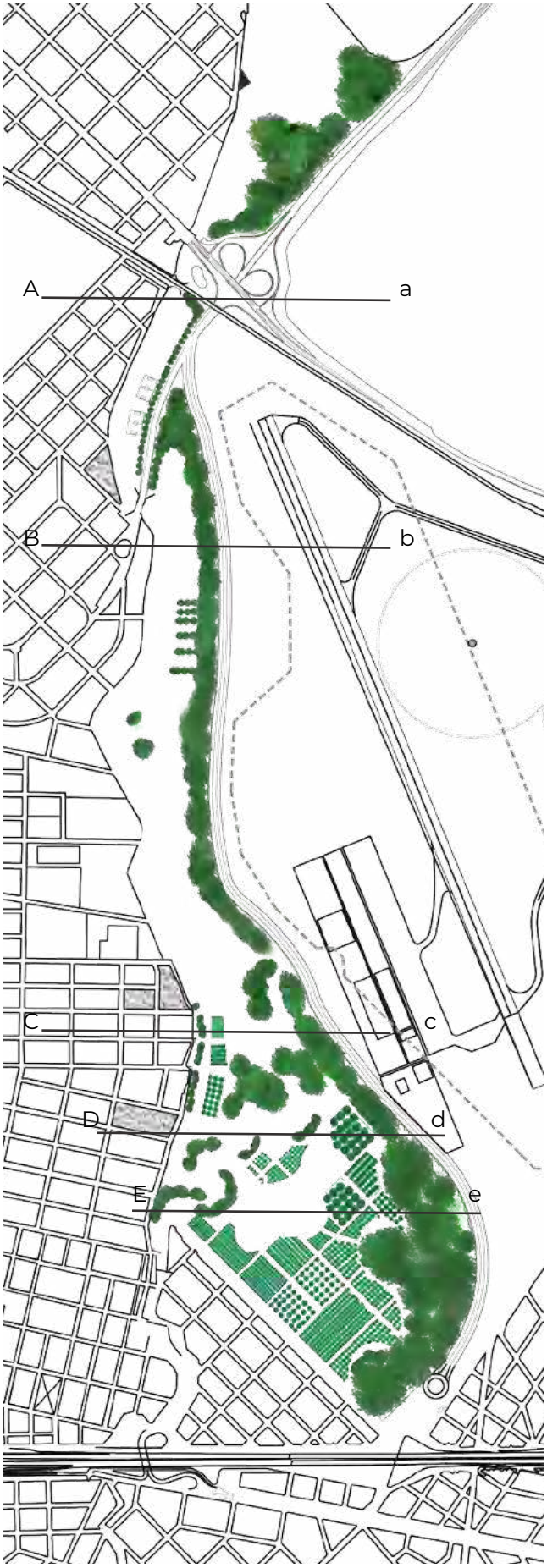
The point is to clarify where vegetation is needed as:

- *Noise reduction measure*
- *Air purification measure*
- *Visual barrier*
- *Erosion controlling measure*

With our four layers in mind (traffic infrastructure, urban grid, green area and watercourse) the aim of this map and sections is to describe how the green infrastructure will act as a mediator between these layers by creating a structural green spine throughout the site.

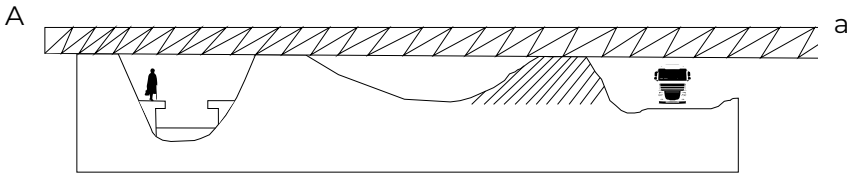
By combining mass balance with implementation of vegetation, water retention is enhanced, barriers towards large infrastructure are created and accessibility to park areas and water close environments are inserted.

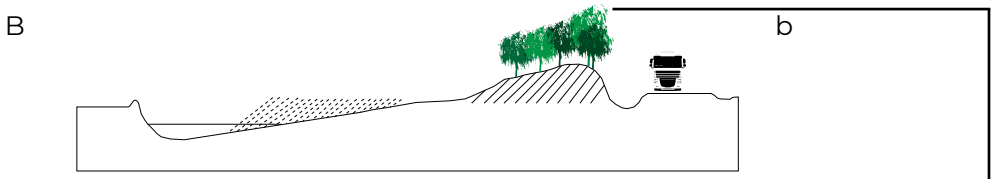
The “Tools & Techniques” presented on the previous pages make out the base for decisions shown in this map, but on a quite detailed scale.

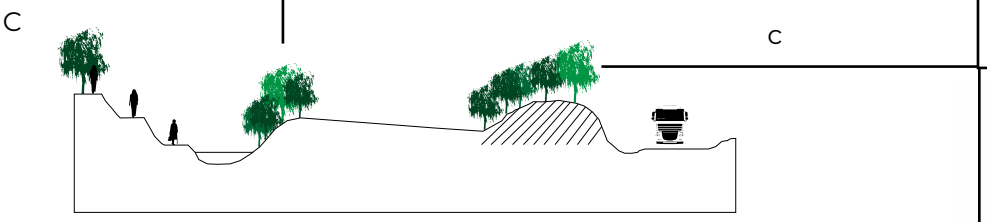


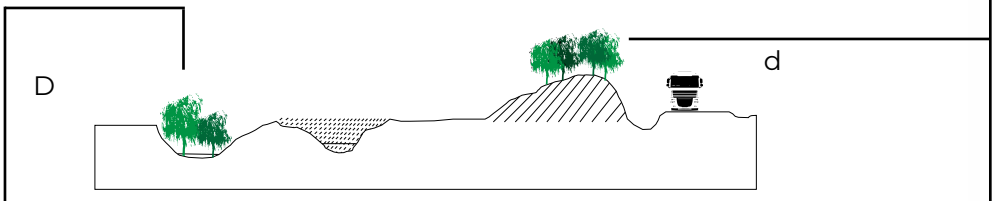
1:20 000

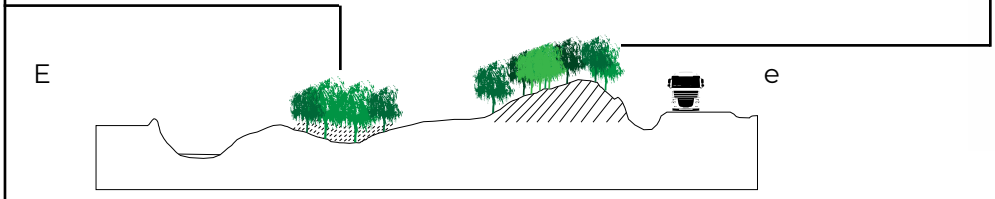
The sections below are simplified without a scale reference. The purpose is to clarify how a mass balance is supposed to be achieved and how the land modeling is planned to work out on an east-to-west-direction on site. Where double channels are planned, where a re-meander requires a removal of soil, where wetlands are lowered etc., where the masses are moved and used as a noise barrier against the new truck route to the east. Some sections describe how pedestrian movement and accessibility is meant to work out at certain points.











WATER'S EDGE/
RIPARIAN ZONE

MULTILAYERED FORESTS

WETLAND VEGETATION

PRINCIPLE 2:

URBAN GRID FOR URBAN WOODS

Apart from the Growing Green Spine, there is a larger space for afforestation, eventually to become an urban wood.

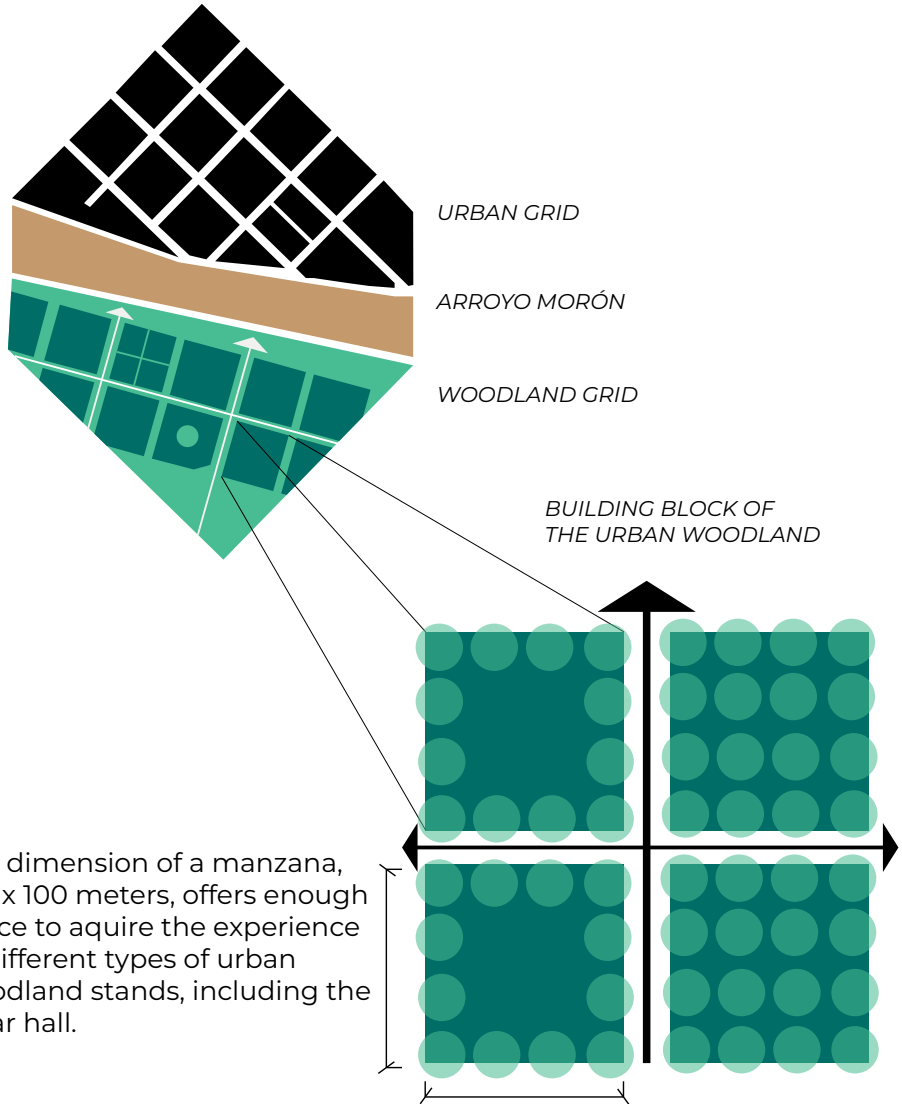
The search for a basis and a system of planting has ended in the extraction of the urban grid, from which the urban wood will start to develop in various ways and patterns.

Michel Desvigne's principles when turning the old industrial area in Bordeaux into an urban green net, has also inspired us to stick to the strictness of the grid, which offers sightlines and possibilities of movements to the streambanks of Arroyo Morón.

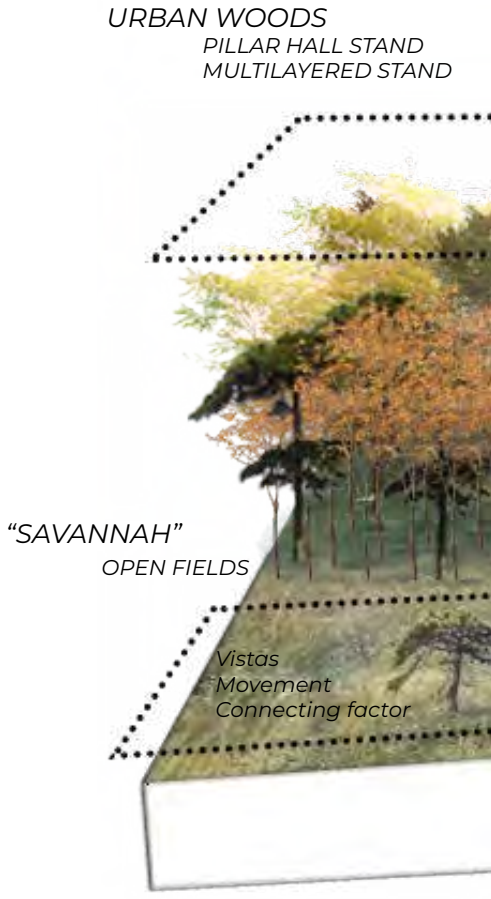
A basis for the structure of the woodland is found within the grid system, established by the Spanish crown in *Laws of the Indies*.

Perhaps the notion of rationality and fairness should be the building block of this new landscape, in an otherwise unjust urban setting?

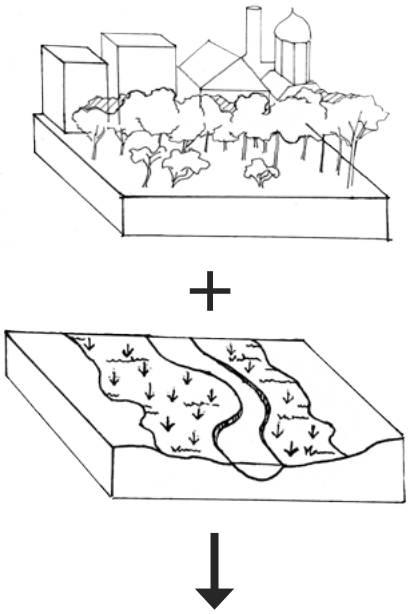
There is also a great familiarity to this system. The simple concept of the block or "manzana", which is how the Argentinians refer to it, is a spatial element and reference that the locals have a lifelong relationship to.



The dimension of a manzana, 100 x 100 meters, offers enough space to aquire the experience of different types of urban woodland stands, including the pillar hall.



PROTOTYPE of two tools and techniques. The afforestation of the urban woodland that also serve as a floodplain buffer.



The large coherent green area in the south makes the possibility of creating a variety of woodlands stands and woodland interiors that require more space.

The Pillar hall stand conveys a feeling that is much appreciated in form of a highly open and visible forest interior that favors movement.

The multilayered stand is able to provide a strong feeling of nature, already in a young stage.

Greenery is not a one-time intervention. The result of nature left alone, is not often what people are after.

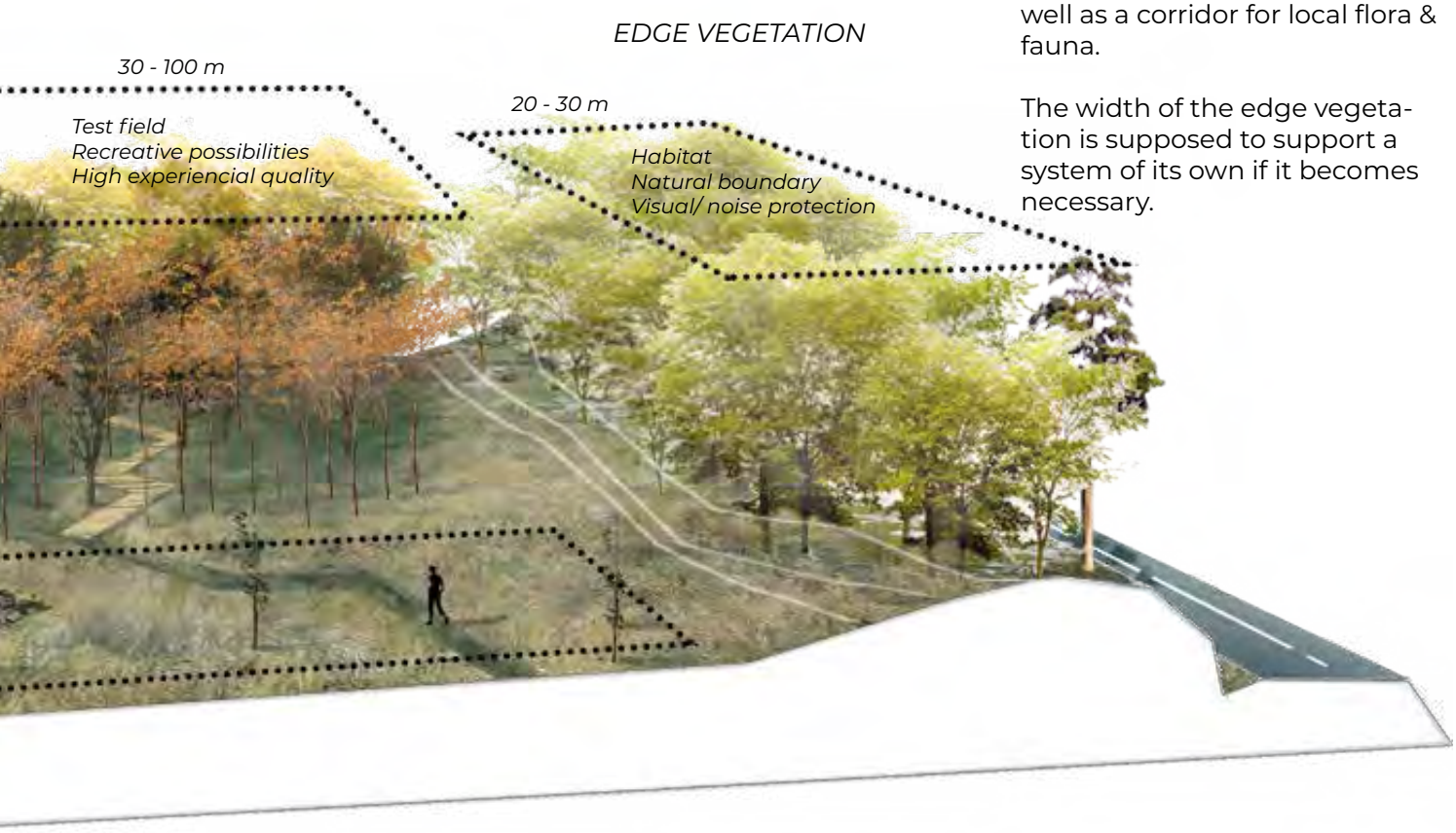
In the Landscape Laboratory of Hurlingham-Morón, there will be different intervals and methods of management.

The intensity for managing the **Urban woods** (pillar hall stand and multilayered stand), will be the most demanding. Serving as a test-field for plant communities as well as a recreational haven for people, the intensity needs to be high.

The edge vegetation
will have a little or no management after the establishment.

The aim is to provide a noise barrier to the new highway as well as a corridor for local flora & fauna.

The width of the edge vegetation is supposed to support a system of its own if it becomes necessary.



The spaces of open grass fields and the vistas that comes along, are a vital counterweight to the woodlands in the Landscape Laboratory. The large open fields do not require much management and serve as a connecting part in the landscape - between the new and the old but also as a mediator between closed and open structures.

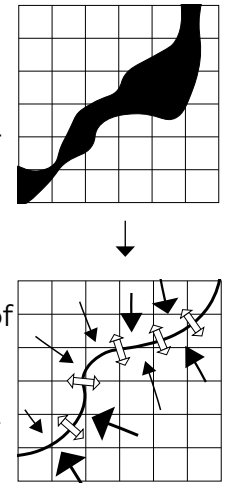
By keeping parts of the landscape open, the old character and idea of the pampean fields lives on.

PRINCIPLE 3:

THE PEOPLE'S RIVER

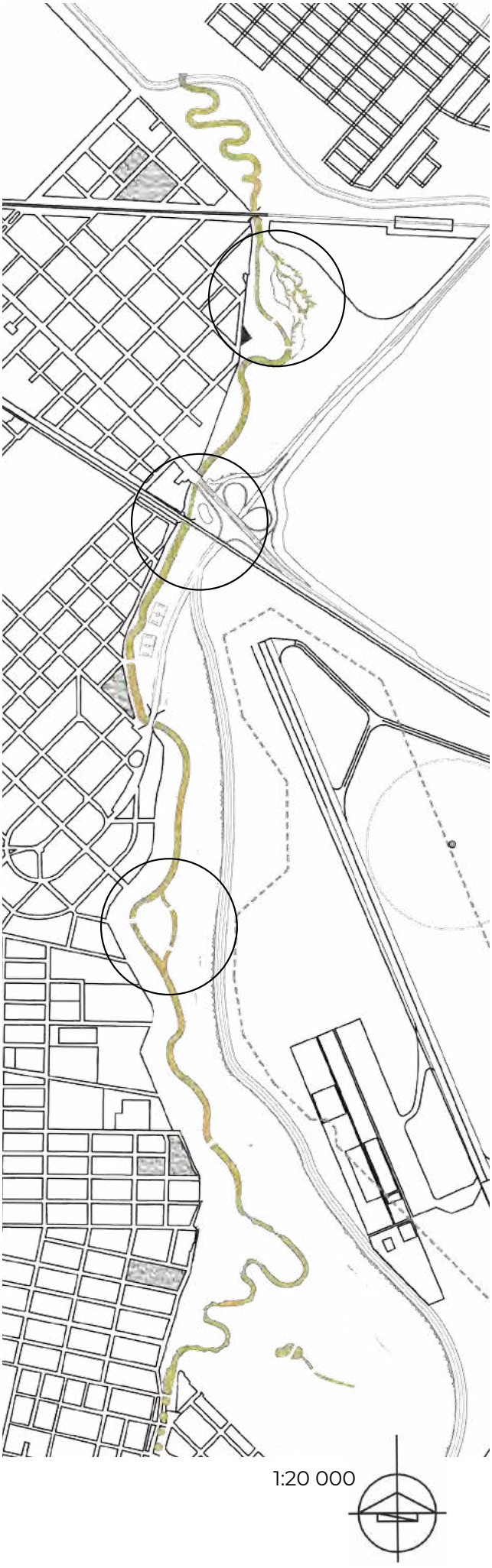
The third principle, the People's River is an attempt to incorporate the urban grid hence the social aspect into our proposal. By identifying ways of making the river banks accessible and creating new passages over the stream we invite life into the landscape laboratory. These passages are also the formal entrances.

The following ideas will transform the stream from a barrier into something similar to a zip lock.



Just as in the River Aire project, we have stabilized banks of concrete due to infrastructure crossings. At these places we can develop a close water contact that does not exist today.

The passages will be linked to path systems throughout the laboratory and provide promenades along the stream, socializing the banks and thus creating the People's River.



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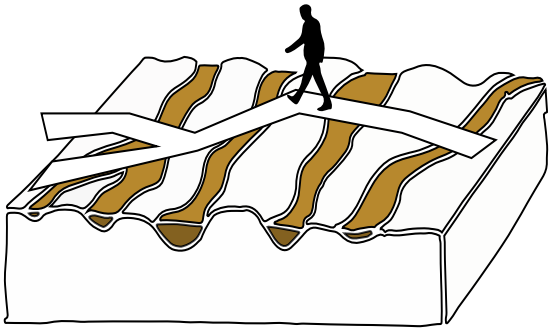
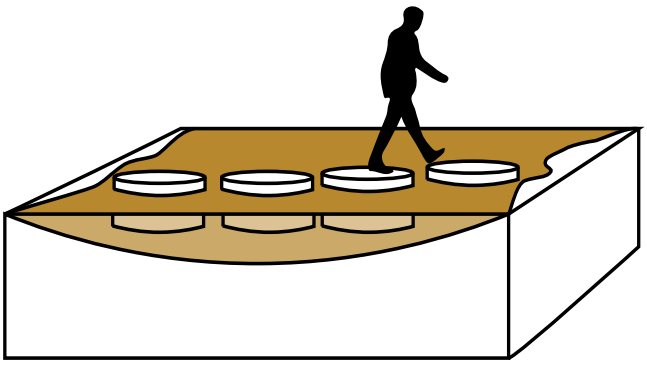


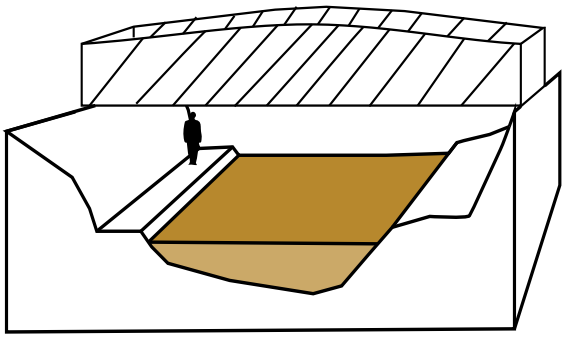
Wooden Pathways

To make areas of multiple streams and wetlands accessible, a network of wooden paths can be constructed.

Temporary Crossings

Informal stepping stone crossing. Little effect on existing streambanks. Sometimes flooded, sometimes not? Playful.



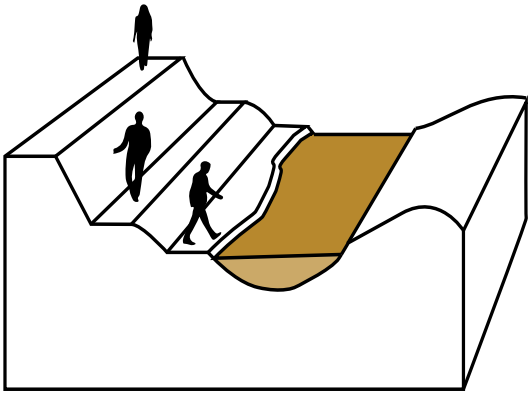


Infrastructural Points

At least four larger infrastructural crossings are identified with concrete/or in other way stabilized banks. By reusing existing constructions, we allow pedestrians to pass beneath larger constructions. A close water contact is created.

Multiple Levels of Interaction

Create pedestrian paths on perhaps three different levels, interesting differences in visual perception and interaction of the water and the landscape as a whole.



PRINCIPLE 3:

THE PEOPLE'S RIVER

As stated above the People's River is as much about providing crossings as pedestrian paths and areas of close water contact.

This prototype shows how we combine two of our tools & techniques and thereby offers a social accessibility. The increased social values are byproducts of the measures aiming to create sound water management.

Another potential of this design could be the absence of further eradication of informal settlements, as the flooding risks are mitigated by our interventions.

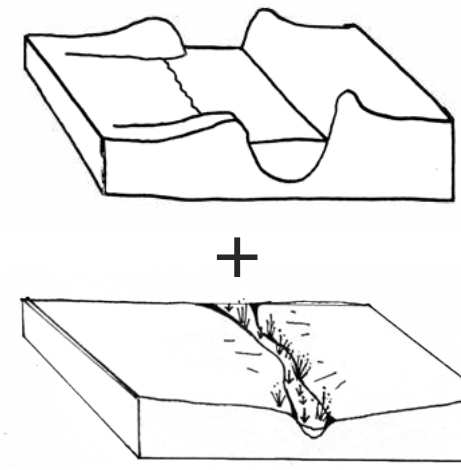
A vital part of the streams function and habitat is the **Riparian Vegetation**, that will be located on a large part of the stream bank stretch. Mainly, on the stream bank edges where the meander is the strongest, to provide erosion control.

Some areas will be left unplanted, to be self-seeded from nearby sources.

Bioswales will be placed in the centre area, where the green corridor is the most limited by the adjacent, planned highway but also next to the polluting factories.

The swales will serve many functions whilst not demanding much space: they will store water, remove pollutants and offer an elevated walkway to visitors.

PROTOTYPE of two tools and techniques combined. The bioswale in relation with the sloped bank.



Slopes are a very simple measure. Providing sight lines, water accessibility as well as a slightly higher tolerance to fluctuating water levels. The removed masses may serve as noise barriers in other areas of the Landscape Laboratory.

BIOSWALE

Fighting pollution
Promote biodiversity
Experience of water landscape

SLOPE

Visual connection
Acces to the water
Recreative possibilities

INFORMAL SETTLEMENT

LANDSCAPE LABORATORY HURLINGHAM–MORON

In Hurlingham–Morón we are not providing the inhabitants with a classic park, but rather 'securing' open urban space that is located in the flood plain to an experimental landscape design.

By claiming these green spaces for the purpose of the Landscape Laboratory, they may firstly be preserved and secondly, used as a test field for evolutionary design, mitigation measures and recreation.

The preservation of the non-built up area is the first important act which comes by our design. It is an action against the continued degradation of the natural surfaces and soils in the watershed of Morón and a call for introducing the urban woods.

In the case of Parc aux Angeliques, we can already find examples of this in practice: where an enormous area in central Bordeaux (rive droite) was renounced to be built upon but rather designated as a recreational green area.

Built up areas needs not built up areas. Since the Landscape Laboratory is a space beyond today, keeping a relation between the two offers resilience towards future instability and fluctuating effects of environmental, economic and societal conditions.

The Landscape Laboratory provides Hurlingham–Morón with a multi-purpose, open urban space. An area designated for social interaction, research and wildlife, that is partly defined but also undefined.

The proposal's idea is to make Hurlingham and Morón an active part of the ongoing change instead of being a passive bystander.

DYNAMIC PROCESSES

The explorative structure of the Landscape Laboratory allows the insertion of features and measures that are permitted to change appearance and function over time. The wetlands created may at first act to purify water, but at a later stage its role as a rich habitat for wildlife perhaps becomes its most striking feature.

The meander and multiple streams are allowed to carve new routes and courses depending on the dynamics of sedimentation and erosion. Changes are expected and allowed to happen in the Landscape Laboratory, which is why the design approach is evolutionary.

The social and recreational aspect is as well looked upon as changeable as it is too dependent on the succession of the urban woods, fluctuation of water levels and the development of rich habitats. Neither vegetation, water nor humans are static, so why should they be part of a static design?

Now that the approach of 'Evolutionary design' combined with the 'Tools & Techniques' and the three principles are presented, it is time to put it all together in a synthesis plan on the following page.

LANDSCAPE LABORATORY HURLINGHAM—MORON

RESIDENTIAL AREAS

A second step after securing the open urban space for the Landscape Laboratory is to connect the residential areas to crossings, boardwalks and entrances by green corridors providing a pedestrian friendly transport towards the Landscape Lab. The conceptual linkage is already established (the mirroring of the urban grid/urban woods), the internal connections however need a smaller scale.

WETLANDS

Wetlands of different character are implemented in the floodplain. The aim is to reduce the velocity of water transport and enhance water purification.

NOISE REDUCTION

The dense, green belt stretching in a north-south direction acts as a noise barrier composed of both an embankment and plantations. It is meant to shelter the Landscape Lab from the airport and the trucks road.

INDUSTRY

The vast industrial landscape in Hurlingham is today one of the most prominent features (and barriers) at the site. But as it has come to our attention that the industry grounds to an extent are declining, it is important to formulate a strategy of how we are handling the industrial heritage. As learnt from Parc aux Angéliques, the former industrial sites can easily be incorporated into the Landscape Laboratory by systematic plantation.

INFORMAL SETTLEMENTS

The informal settlements are not relocated in our proposal, we have rather tried to enhance its geographic conditions by the landscape design. As the growth and decay of informal settlements are depending on large political and economic situations, we have chosen not to intervene in these areas. The informal occupancy is rather the area of influence and area of effect in this proposal.

ARROYO MORÓN

The stream has been modified based on our tools and techniques for shaping the urban river.

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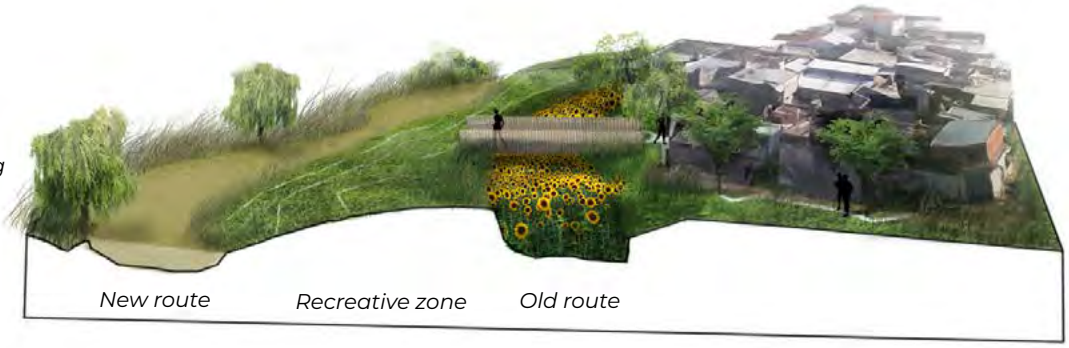
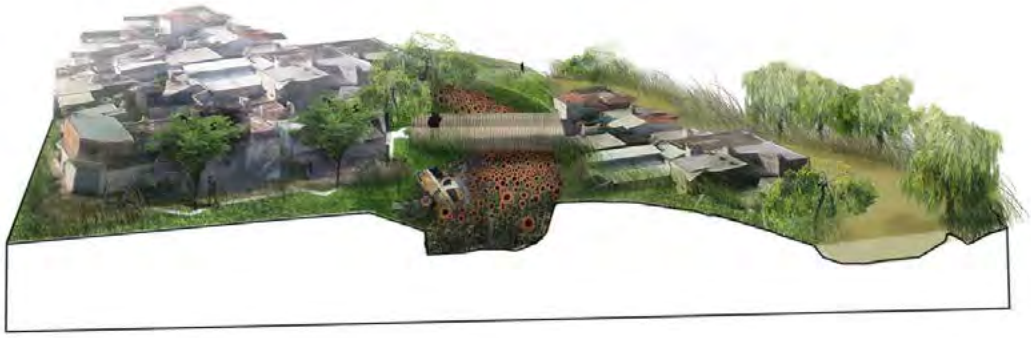
Our proposal does not put forward a finished masterplan of how everything should look like. The design is rather meant to work dynamically with the site's ever ongoing change. Here follow different scenarios of how the future might shape the open urban space of the Landscape Laboratory of Hurlingham-Morón.

SCENARIO 1

In the means of creating a riparian zone and a recreative corridor along the streambanks, the old stream route turns into a test ground for removing soil pollutants.



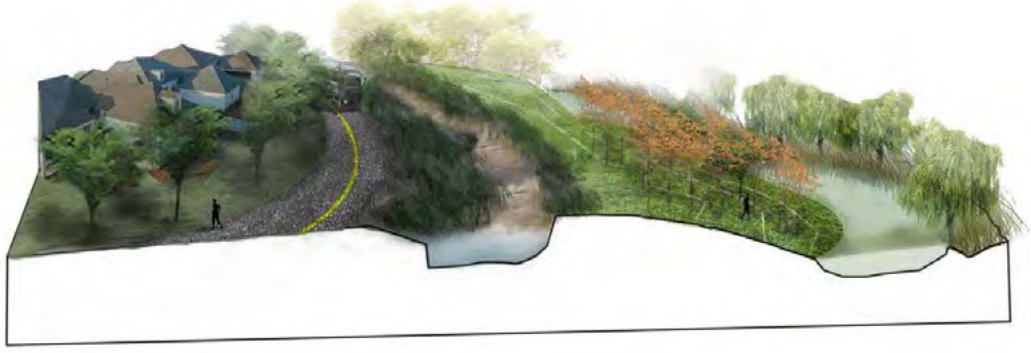


SCENARIO 2

A period of great societal crisis leads to further growth of informal occupancy.
The test field of decontamination turns into an open trash dump.

SCENARIO 3

What could have been a catastrophic flood has been avoided due to the landscape's improved resilience in form of water storage capacity and infiltration.



SCENARIO 4

The informal settlements along the streambanks have been removed as planned by the municipality in order to secure room for a new bordering road.

DISCUSSION

The question this thesis aimed to answer was:

How can a Landscape Laboratory test out mitigation measures for flood and pollution in the area of Hurlingham–Morón, as well as providing social and recreational qualities for people's everyday life?

To answer the question: The Landscape Laboratory of Hurlingham–Morón, can test out mitigation measures by preserving open urban space and utilizing its character of constant change. The laboratory acts as a demonstration zone for water and vegetation approaches adapted to Arroyo Morón where the mitigation of the current flood and contamination issues may be initiated and studied over time.

The Landscape Laboratory is made accessible to recreational activities in people's everyday lives by pedestrian passages, crossings, bridges and paths offering closeness to woods, wildlife and water landscapes. However, it is not enough to just provide access. By making 'places' and non-places based on emerging qualities, an overall attractiveness can be achieved.

Understanding the interrelation between scales of water systems is described as a key for their management and alteration (Verdonschot, 2013). In the same way, a site is the ratio of multiple scales of time and spatiality with direct and indirect effects (Burns & Kahn, 2005). Our site editing of the water landscapes of Arroyo Morón has been developed according to the common perception of connectivity and scale which these two theories share.

As there are more than one design suitable for a site, the design proposal put forward in this thesis should be looked upon as one of many possible answers to the formulated research question.

METHOD DISCUSSION

Finding ourselves on the foreign grounds of Buenos Aires, literature studies were made to build extensive knowledge of contexts explaining the new locale. While Part 1 creates an understanding of the socio-ecological structures of Buenos Aires, it was a time-consuming work leading to a division of time where Part 2 & 3 had to be limited.

Part 2 could have been enrichened by using more sources: knowledge and concepts related to Landscape Laboratories such as *vegetation building*, c*reative management* and *Real-world labs* but also *governance* and *strategies for long-term management*. Similarly, *Place attachment theory* could have complemented Site theory about 'hidden values' and thus provide perspective on how to strengthen the local landscape against larger opposing planning incentives. Within the limited timeframe this was not possible, which also kept us from visiting the site more than once.

One can question the utility of NbS in this thesis, as it is mainly a concept of multiple ideas and does not offer anything in concrete terms. However, the whole of the Landscape Laboratory design proposal put forward in this thesis, can be regarded as a type of NbS action. The study of water

systems and hydromorphology also allowed us to build measures based on natural dynamics and occurrences which is the foundation of the concept NbS.

A NEUTRAL SITE READING?

A large part of the site reading is constituted by data gathered from the report Cuenca Arroyo Morón by COMIREC. The information consists of existing structures of physical and functional character along with a variety of statistics. The quality and credibility of a site reading made from mostly one governmental source can be questioned.

Collaboration and ongoing interaction with course participants at UBA, FADU, have on the contrary given multiple perspectives on the challenges and potentials of the site. These perspectives have gradually been re-shaped and incorporated into our design.

Concerns over safety and existing language barriers limited the possibilities of interacting with locals, hence reaching the more intangible values of the site.

More time spent immersed on-site would have benefited the site specificity of our design proposal. The result can now be seen as more general which instead leaves opportunity to apply the developed approach of evolutionary design and the principles of water and woods, on sites with similar challenges.

REPRESENTATION

Portraying the challenges of an urban area and a water system, located in the context of a large metropolitan area have proven to be difficult. Though, visual material such as images and maps have played an important part in trying to make situations and interrelations understandable to the reader. Much time have been put on this. The focus of Part 3 has likewise been on showing the reader, rather than telling.

The aspect of evolutionary design and what type of project this term entails, has made us move away from the conventional overall plan as representation method. It is replaced by elements that can be singled out. By regarding dynamic elements separated from one another, there is chance of individual transformation (Desvigne, 2016). Since ongoing processes is a key notion for any Landscape Laboratory, our design has been articulated via separated tools and prototypes to highlight this individual transformation. Though, a total absence of a unifying plan will possibly make the relation of interventions hard to grasp - therefore one synthesis plan was made.

FUTURE WORK

Looking back, we are grateful for having had the possibility of doing this exchange and collaboration with the University of Buenos Aires, FADU.

With this design proposal, we wish to add to the assembled knowledge of the Linnaeus Palme collaboration. The intention is that this design proposal will complement prior, more theoretical works.

A way of moving forward from this thesis is to detail our proposal and/or implement the proposal.

Working on the structure of a Landscape Laboratory composed of transdisciplinary knowledge, we recognize that an interdisciplinary collaboration would be beneficial.

A participatory approach could contribute to deeper knowledge and the empowerment of the locals' home environment.

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