

# REDEFINING MAPUTO DOWNTOWN

flood management through a sustainable landscape architecture intervention

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2011

**Glória a Deus Somente**

## PROJECT DETAILS

Full dissertation title:	REDEFINING MAPUTO DOWNTOWN Flood management through a sustainable landscape architecture intervention
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Degree:	Masters Degree in Landscape Architecture (Professional)
Department:	Department of Architecture
Faculty:	Faculty of Engineering, Built Environment and Information Technology
University:	University of Pretoria, South Africa

## PROJECT SUMMARY

Program:	Urban water-holding park
Site description:	Maputo downtown ( <i>Baixa</i> ) - creating a site for holding storm water
Client:	City Council
Users:	All users of the <i>Baixa</i> , of which some include commuters, tourists, strollers, business people, students, children, vendors, restaurant users, and so forth.
Site location:	Open site, north of Maputo Central Railway Station
Address:	<i>c/o Avenida 25 de Setembro and Avenida Guerra Popular, Maputo, Mozambique</i>
GPS coordinates:	25°58'11.44" S, 32°33'51.93" E
Landscape architectural theoretical aim:	The relationship between theory and practical implementation
Landscape architectural approach:	Developing a new water-holding park in the <i>Baixa</i> . This will form part of a larger green network of water-retention sites, all functioning on a similar principle
Research fields:	Urban infrastructure as a landscape architecture design determinant. Also environmental potential, cultural and historic landscapes and urban planning

## PLAGIARISM STATEMENT

In accordance with Regulation 4(e) of the General Regulations (G.57) for dissertations and theses, I declare that this thesis, which I hereby submit for the degree Master of Landscape Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

I further state that no part of my thesis has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this thesis is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

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Wessel Martinus Oosthuysen

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Ek haal graag die volgende Bybelvers aan. My insperasie en geloof in my Hemelse Vader:

### **Ecclesiastes 3 (New Century Version)**

"1 There is a time for everything, and everything on earth has its special season. 2 There is a time to be born and a time to die. There is a time to plant and a time to pull up plants. 3 There is a time to kill and a time to heal. There is a time to destroy and a time to build. 4 There is a time to cry and a time to laugh. There is a time to be sad and a time to dance. 5 There is a time to throw away stones and a time to gather them. There is a time to hug and a time not to hug. 6 There is a time to look for something and a time to stop looking for it. There is a time to keep things and a time to throw things away. 7 There is a time to tear apart and a time to sew together. There is a time to be silent and a time to speak. 8 There is a time to love and a time to hate. There is a time for war and a time for peace. 9 Do people really gain anything from their work? 10 I saw the hard work God has given people to do. 11 God has given them a desire to know the future. He does everything just right and on time, but people can never completely understand what he is doing. 12 So I realize that the best thing for them is to be happy and enjoy themselves as long as they live. 13 God wants all people to eat and drink and be happy in their work, which are gifts from God. 14 I know that everything God does will continue forever. People cannot add anything to what God has done, and they cannot take anything away from it. God does it this way to make people respect him. 15 What happens now has happened in the past, and what will happen in the future has happened before. God makes the same things happen again and again (Bible study tools . com, 2011)".

Laat die Byle huil!

## SUMMARY



**The following dissertation investigates the current situation and complexities of flooding in the downtown area of Maputo.**

As a solution to the flooding problem, conservation and reuse strategies are identified. In addition, the dissertation explores a way in which the system emulates the functioning of natural systems. This forms part of how landscape interventions can become the primary guiding force in the development process.

The problem was originally identified through a series of *landing* exercises. This was done through interviews and workshops held in preparation to the Masters dissertation.

The Maputo downtown area (known as the *Baixa*), currently undergoes extensive flooding during rain downpours. The *Baixa* is also an important historical core in the city. The low-lying or flat characteristic of the area, originates from a landfill project done early in the nineteenth century. The aim of the infill project was to connect the original island to the nearby mainland. This due to the requirements of an expanding city. The *Baixa* core as it is today, has its unique character due to the original location of this settlement.

The cause of flooding is due to storm-water accumulation. Additional reasons for flooding are caused by insufficient or blocked infrastructure and large areas covered by hard surface. The overall flatness of the site also plays a role.

Site selection derives from an investigation into the

area generally prone to flooding. The whole street of *Avenida 25 de Setembro* (25 September Avenue), is proposed as a possible storm-water channel to allocate water to new water-holding sites.

Water in these sites, depending on its nature and requirements, will typically be gathered, cleaned and then discharged. This solution is proposed on a city scale.

The author will aim to resolve one of the water-holding sites through detail design and technical investigation. This could serve as an important example for the other future interventions. This water-holding, or water-diversion site is given the general term: urban water park.

The site chosen, for an urban water park pilot project, is located north and adjacent to the Maputo Central Railway Station.

The main reasons being that:

- It is the lowest area in the whole of the *Baixa* (contours measured in 100 mm).
- It is an ideal arrival space for travellers and commuters.
- It is an important location for future development.

A final prerequisite was to develop a number of sustainable principles. This was achieved by studying the *Sustainable Sites Initiative (SSI)* and introducing it within the system.

## ABSTRACT

“All countries are vulnerable to climate change and instability in weather patterns but the poorest countries and the poorest people within them are most vulnerable, being the most exposed and having the least means to adapt” (IMF and World Bank Development Committee, 2006).

African cities, as other cities around the world, are prone to flooding within in urban areas. The increased flooding from climate change, could have seriously destabilising effects for Africa (Commission for Africa, 2005). Climate records shows that most of Africa warmed by approximately 0.7°C during the twentieth century (IPCC Working Group II, 2001). Future changes in rainfall will depend greatly on the influence of global warming.

In addition, a United Nations World Water Report states that in the beginning of the twenty-first century, the Earth with its diverse and abundant life forms (including over six billion humans), is facing a serious water crisis. Water needs to be conserved in any way possible. (United Nations World Water Report, n.d.).

This study aims to explore the role in which flooding in urban landscapes can be addressed, but simultaneously stored for future use. It argues that the negative element of flooding can rather be used, i.e the water could be conserved and used in the build environment, rather than inhibiting social, economic and ecological factors. The pilot project in this stage can at the same time, serve as an urban generator.

An innovative solution (urban water park) is analysed and tested and serves as a possible outcome to address flooding problems within an African city (Maputo, Mozambique).

## SAMEVATTING

Stede in Afrika, soos in ander in die wêreld, is onderhewe aan vloedrampe in stedelike areas. Die toenemende vloedgevalle, tesame met die impak van klimaatsverandering, kan uiterse destabilisering vir die Afrika kontinent inhou (Kommissie vir Afrika, 2005). 'n Klimaatsrekord, bewys dat gedurende die twintigste eeu, 'n groot deel van Afrika onderworpe was aan 'n hittetoename van omtrent 0.7°C (IPCC Werkgroep II, 2011). Toekomstige veranderinge in reënval sal grootliks afhang van die invloed van aardsverwarming.

Ter aanvoering van die argument word daar adisioneel toegevoeg dat die Verenigde Nasies se Wêreldswater Verslag die volgende aanlas: dat die aarde, met sy diverse en verskeidenheid van lewende wesens (wat oor die ses miljoen mense insluit), aan die begin van die een-en-twintigste eeu onderworpe sal wees aan ernstige watertekorte. Water moet dus in alle moontlike maniere gespaar word (Verenigde Nasies se Wêreldswater Verslag, geen datum).

Die studie beoog om die rol van vloede in die verstedelike landskap te ondersoek en aan te spreek tot voordeel van die bouomgewing. Die ontwerp poog om die huidige negatiewe element van water eerder te bewaar en die gebruik daarvan te aan te moedig. Hierdeur word word die omswaai in sosiale, ekonomiese en ekologiese faktore inplekgestel. 'n Projek sal dan terselfdertyd as verstedelike genereerder dien.

'n Innoverende oplossing, 'n stedelike water park, is geondersoek en getoets. Hierdie sal moontlik as die oplossing dien van die huidige vloedprobleme in hierdie Afrika stad (Maputo, Mosambiek).

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## LIST OF TERMS

- *Tracing concept*: Four tracing principles introduced by Christophe Girot and the main theory followed. Each concept focuses on particular gradients of discovery, inquiry and resolution. Each concept also designates a specific attitude and action that in turn nurtures a process of design and landscape transformation (Girot, 1990)
- *Landing*: First step in tracing concepts (Explained in Chapter 2).
- *Grounding*: Second step in tracing concepts (Explained in Chapter 4).
- *Finding*: Third step in tracing concepts (Explained in Chapter 5).
- *Founding*: Fourth step in tracing concepts (Explained in Chapter 8).
- *Baixa*: The word in the given context has the meaning of "down". In this instance it literally means "downtown" or the low laying area. From a topographical view, it is the alluvial depository of infill area of the Marginal (wordreference.com).
- *Water-holding site*: Term given to the generic intervention along Avenida 25 de Setembro, as proposed by the author. Forms part of a series of other water-holding sites.
- *Green space*: Planning Policy Guidance 17 (ODPM, 2002) defines green space as parks and gardens; natural and semi-natural green space, including urban woodland; green corridors, outdoor sports facilities, amenity green space, provision for children and young people, allotments, community gardens and urban farms and cemeteries (Millie, A. 2009:100)
- *Urban water-holding park (urban park)*: Proposed intervention and term given due to its main characteristic of retaining storm water.
- *The Framework*: Referenced in the text as, "The Framework". In this instance the framework is a full scope of documentation, which includes research, analysis and proposals for the Baixa, by the a group of UP students (2011).
- *City-wide scale*: The large scale project (within the Baixa) proposal of which the site forms part of.
- *Ramblas*: Often referred in the plural as *Las Ramblas*, the gently wending promenade of strollers, probably the most socially heterogeneous street in the city (Barcelona, Spain) (McNeill, 1999:16)
- *Sustainable Sites Initiative*: Developed by ASLA and entails the design, construction, operations, and maintenance practices that meet the needs of present without compromising the ability of future generations to meet their own needs. It is also the intention of the initiative to produce guidelines that enable built landscapes to support natural ecological functions by protecting existing ecosystems and generating ecological capacity where it has been lost (Van der Zaden, & Cook, 2011: 12).
- *Brownfield Site*: The most commonly accepted definition of "Brownfield" by planners and other stakeholders in the UK is "any land or premises which has previously been used or developed and is not currently fully in use, although it may be partially occupied or utilized. It may be vacant, derelict or contaminated. Therefore a *brownfield* site is not available for immediate use without intervention (Brebba, & Mander, 2006: 40).
- *Parti*: The initial sketch that indicates the overall character of the design, the distribution of rooms, the details of its form, and the specifics of entrance, circulation, light, ventilation, and views (Pai, & Pae, 2002: 250).

## ABBREVIATIONS

The following abbreviations have been used in the document:

AAI:	Action Aid International
CBD:	Central Business District
CFM:	Caminhos de Ferro de Moçambique (Railway Company Mozambique)
OCHA:	Office for the Coordination of Humanitarian Affairs
PEMM:	Unknown meaning, but refers to the previous framework by City Council of 2008
SSI:	Sustainable Sites Initiative
UP:	University of Pretoria
WSSD:	World Summit on Sustainable Development



FIGURE 1.1: VIEW ALONG AVENIDA 25 DE SETEMBRO TO THE WEST (DEVENISH, 2011)

# CHAPTER 1\_

## INTRODUCTION

## 1.1 BACKGROUND & RATIONALE

The proposed dissertation is a result of a final year program offered in collaboration and in relationship with the University of Pretoria (Pretoria, South Africa), the University of Eduardo Mondlane (Maputo, Mozambique) and the University of Delft (Delft, Holland).

As an introduction and grounding exercise a week-long workshop was held in Maputo in June and July 2010. During this workshop numerous students from the University of Pretoria worked on a series of studies in the inner city of Maputo (*Baixa*). This was done through a series of various quick-scan methods and documentation (see Appendix B). This was valuable in terms of the initial contributor and place setting towards the final proposed project (Initial Site Investigation June 2010).

During February 2011, a group of five architects and one landscape architect (the author) in collaboration with the other two universities, visited Maputo for further analysis and investigations. All of these students had chosen Maputo as their final year project and study area. The main focus of this exercise was to make use of the opportunity to find a dissertation theme, site and ideas for the future proposal. The two-week in-depth workshop was conducted through group work, analysis, observations, sketching, fieldwork, documentation, research, interviews, presentations and information gathering.

Later in 2011, the same students from the University of Pretoria finalised the site investigation and data gathering by individually recording and

examining their own respective sites. It was during this time that the author had the most success due to a better understanding of the context and problems of Maputo. It was then that the author decided on a relevant site and project theme for his final proposal (*The Framework*, 2011).

During the rest of the year, the project (the entire design intervention) and final proposal was directed from Pretoria, South Africa. The project aimed to address the following: initial conceptual idea, conceptual layout, group framework, design development, theoretical investigation, practical examples, technical resolution, documentation, communication, interviews, detail design, presentations and finally the publication of this document.

Initially, the specific study area and context was fairly unknown and the time and resources limited. The reasons are stated and discussed in Chapter 2. As an initial contributor to the process and being a main driver to the project, the *Four Tracing Concepts in Landscape Architecture* by Christophe Girot were followed rigorously. The concepts include landing, grounding, finding and founding (Girot, 1990: 58-67).

## 1.2 PROBLEM STATEMENT

***How can the problem of flooding in the Maputo Baixa be addressed and utilised through sustainable landscape architecture?***



FIGURE 1.2: LEAF ON AVENIDA 25 DE SETEMBRO (AUTHOR, 2011)

### 1.3 HYPOTHESIS

This dissertation argues that through a number of interventions, the flooding problem in the Maputo *Baixa* can indeed be solved. This is proposed through the implementation of a series of water-holding sites.

Through a network of open urban spaces, consisting of a series of retention dams (water-holding areas), the opportunity also arises to introduce a network of infiltrating greenery into the city. These sites will also provide for social interaction and economic sustainability within the area.

The main focus is on harnessing the negative flooding element, and using it favourably for social, economic and ecological needs. Water could then be harvested and used accordingly for irrigation, households and other purposes before excess water is discharged into the Maputo Bay.

The goal is to change the underdeveloped functions of current open spaces, and to create urban water-holding parks. These sites will then allow for regional upliftment and will serve as much needed urban park space.

It is argued that the most efficient way of transporting water to these sites would be by means of an open channel system. This will be achieved by possible adapting the current parking bays/sidewalks of *Avenida 25 de Setembro*.

A criteria defined in the 2011 UP Student Framework (*The Framework*, 2011), found that

the inner city needs a source of revitalisation, and that this project could possibly serve as valuable contributor towards this goal.

### 1.4 SUB QUESTIONS

- How can a project aid in flood management in the *Baixa*?
- How can the water-holding (diversion) sites allow for possible freshwater reuse and become aesthetically attractive nodes?
- How can the project on city scale, lead to a more sustainable green space development and finally add to social, economic and ecological identity of the city?

### 1.5 RESEARCH GOAL

The dissertation investigates the current situation of flooding within the city of Maputo's *Baixa* and finds a way it can be solved. The term given to the project is: urban water-holding park (urban park). The project should become part of a larger system of water-holding sites which main aim is to reduce flooding.

The key word in the dissertation theme, namely revitalisation, forms an integral part to the design approach and is indirectly aimed to encourage future developments. The project should thus act as a catalytic node to which surrounding de-

velopments (new and existing) could "plug into". This meaning, that the landscape intervention should become the primary initiator, which encourages new build fabric around it.

### 1.6 ASSUMPTIONS

- The *Baixa* Student Framework (*The Framework*) would be implemented.
- The proposed city strategy (by author) will be implemented. This consists mainly of the five water-holding sites and the water channel/parking bay system.
- The area of land (for the site) that is considered will be available for purchase or be donated by *CFM (Railway Company Mozambique)*. This company currently owns the plot of land.
- No other flooding intervention will be implemented and no other solution is investigated. The proposed intervention will be designed with this in mind.

### 1.7 STUDY DELIMITATIONS

The author acknowledges that:

- He is not an architect and will only provide concepts and guidelines for the building footprint, height and use.

- He is not a specialist in terrestrial or aquatic ecology and will aim to implement general ecologically sound principles in order to inform his decisions in a systematic design approach.
- He is not a hydraulic engineer in regard to volume quantities and water management properties. These include quality, catchment area, litter-accumulation and removal, channel slopes and water speed. All alterations designed is done through own calculations, research and intuitive response.

Although the author included all of these disciplines into the project, flood control practise is a large concept and the author can't study all the technologies. It can thus be summarized that:

- The author stays within the site boundary.
- The author are not going to be studying whether an alternative intervention (like green roofs) would also work.

- The author are not going to study whether practises like, changing all the hard surfaces is a plausible approach.

It should be remembered that Maputo is a unique Third World city and differs completely from our own major South African or Westernised cities. This for example, should be kept in mind due to the fact that there are no similar cases of any landscape architectural interventions in the city. Basic services that some might accept as a given, are not necessarily available, as the city lacks rubble removal, other basic services and maintenance issues.

Difficulties exist in the consultation process in terms of culture, distance between the countries, language and codes of business conduct. Recognition, understanding and overcoming these barriers was vital to the success of the proposed project. Patrick Nichol describes that there is currently a limited degree of information, experience, expertise and physical resources in Mozambique. These are all contributing factors and need to be addressed in order to empower the people of Mozambique. The lack of basic communication tools such as the internet, digital cameras and so forth currently make effective communications with the city difficult (Nichol, 2007: 1-8).

As an example, students were confronted on a regular basis by police and other security officials while measuring and photographing buildings and measuring street dimensions.

As a second example, it was sometimes difficult to take pictures of public parks and streets with people in it. Many locals (people making use of the *Baixa*), made use of these opportunities to chase students away or discouraged having pictures taken of them. It was interesting to note that these relevant spots ("where no pictures was allowed to be taken"), were identified as the crime or dangerous hot spots.

It should thus be an underlined statement that photographs and other documentation media are encouraged in these public parks and spaces, without interference from anyone. A democratic mind shift is required for these spaces to work and should run independent from political or restrictive institutions.

## 1.8 METHODOLOGY

The dissertation aims to establish guidelines and principles by evaluating the historical and current contextual layers, theory and precedent within the *Baixa*.



Many of the influential factors in the decision-making process were gathered through group work, research and documentation through interviews and expert advice from the *Boukunde Faculty* (Department of Architecture at the University of Pretoria).

Lastly, the *Sustainable Sites Initiative (SSI)* will be introduced to serve as a guideline on the proposed site and act as prerequisite for point allocation (to be discussed in Chapter 3).

All of the factors that have been mentioned are overlaid by the four tracing concepts of Girot (1990) and implemented accordingly.

The study will be based on quantitative and qualitative research. This type of study requires sound and critical technical evaluation along with a subjective approach to human needs in regard to movement patterns, material choice and other relevant design decisions. Figure 1.3 illustrates

the Girot-inspired design process, while the table pictured in Figure 1.4, indicates a nonlinear process research methodology will be applied. These are:

- Qualitative research deals with descriptions; data that can be observed but not measured; colours, textures, smells, tastes, appearance, beauty, and so forth.
- Quantitative research deals with numbers; data which can be measured; length, height, area, volume, weight, speed, time, temperature, humidity, sound levels, cost, members, ages, and so forth. (Roberts, 2011).
- Intuitive research deals with the author's feelings that poses to be true, even without conscious reasoning; instinctive (Google Dictionary, 2011).

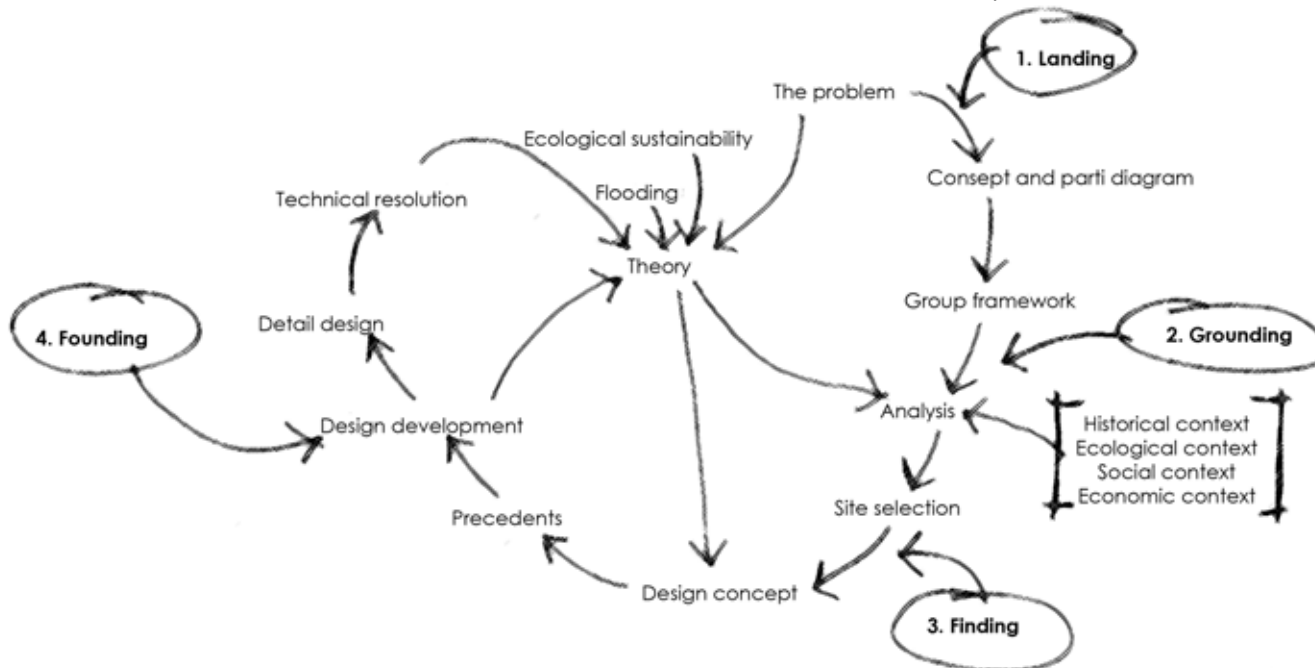


FIGURE 1.3: DESIGN PROCESS TO BE FOLLOWED (AUTHOR, 2011)

- Data types ranged from all sources used and added to decision making.

## 1.9 CONCLUSION

In summary, all the decisions made are based on the current conditions and context of the *Maputo Baixa*. Many of the decisions made have been generated through discussions within the student group, analysing The Framework done by the UP students (*The Framework*) and an intuitive response by the author.

Due to the problematic issues like mismanagement, lack of the maintenance and general low-per-capita income of local inhabitants, it is not possible to cover all social and environmental problems. Although the *Baixa* lacks in many of these categories, it offers many valuable attributes to this kind of intervention being a vibrant modern African city, rich with colonial and war histories; a unique climate and topography; and some interesting approaches to materials, styles and detail.

	Data type	Data type	Data type
<b>Research type</b>			
Quantitative research		Site & context analysis	
Qualitative research	Theoretical investigation	Site & context analysis	Precedent studies
Intuitive research		Site & context analysis	
Data type	Published documents and journals	Published documents, observations, measurements.	Observations, interviews, published documents

FIGURE 1.4: RESEARCH METHODOLOGY TABLE (AUTHOR, 2011)



FIGURE 2.1: DRY DOCK, MAPUTO HARBOUR (DEVENISH, 2011)  
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# CHAPTER 2\_

## CURRENT KNOWLEDGE: FRAMEWORK SUMMARY



FIGURE 2.2: MAPUTO CENTRAL MARKET (MAOCHA, 2011)



FIGURE 2.3: STUDY AREA & MAPUTO LOCATION IN AFRICA (AUTHOR, 2011)

## 2.1 LANDING

Girot's first trace concept is *landing*. *Landing* is the first act of site acknowledgement and marks the beginning of the odyssey. It describes the specific moment when the designer still knows nothing about a place and yet is prepared to embark on a lengthy process of discovery. It therefore invokes the passage from the unknown to the known, from the vastness of the outside world to the more exact boundaries of a specific project:

- It thus requires a particular state of mind where intuitions and impressions prevail, where one feels before one thinks, where one moves across and stalks around before seeking full disclosure and understanding. It must induce a sense of complete displacement and outsidership to be really

effective.

- It also refers to the moment when a designer reacts to the difference between his or her preconceived idea of a place, and the reality that appears during the first steps of a visit. Often, one comes to a site with a set of ready-formed impressions and opinions. Nothing is allowed to remain obvious or neutral to the designer; rather everything is apprehended with wonderment and curiosity, with subjective and interpretative eyes.
- It also refutes the idea of where nothing can be learned or retained from the given site and where everything can be resolved by detached conceptual thinking. Every detail counts. The state of landing plays a vital role in the genesis of design. Initial



FIGURE 2.4: STUDY AREA (AUTHOR, 2011)



FIGURE 2.5: MAPUTO (PERS-ANDERS PETERSSON/GETTY, N.D.)

landing provokes impressions and insights that often last through the entire design process.

- Finally, it represents a sense of entry and is therefore personal. It escapes methodology and is almost always the result of chance. It is a living manifestation of the experiential potential of a site and thus has potent spatial and psychological effects on the subsequent thinking through the design project (Girof, 1990: 61).

## 2.2 INTRODUCTION FROM RESEARCH

The world's population is estimated at about 6.6 billion people. An indication by the United Nations shows that about 3 billion people live in urban areas (UNCHS, 2007). This is in comparison with studies done in the 1950s, where 66% of the world's population lived in the countryside (World Bank, 2000), (IMF, 2006).

Currently, it is estimated that by 2030 about 61% of the world's total population will be living in cities. In addition it was found that the world's popu-



FIGURE 2.6: LAGOS, NIGERIA (MENDEL, N.D.)

lation will increase, with the largest percentage increase being in low- and middle-income countries like Mozambique (Peters, 2000:2), (UNFPA, 2007).

At the 2002 *Johannesburg's World Summit on Sustainable Development* (WSSD) all governments were called on to address the overwhelming challenge of providing basic urban services to the teeming people in slums where the quality of life is appalling.

While continents such as Europe and the Americas have stabilised their population growth and economy to a large extent, most countries in Africa have not been able to deliver on their promises of alleviating the precarious state of living environments within their countries (UNHABITAT, 2003), (Daramola & Ibem, 2010).

The commission for Africa is quoted: "Africa is not a driver of climate change, but a victim" (Commission for Africa, 2005).

Flooding has been identified as one of the major factors preventing Africa's growing population of city dwellers from escaping poverty (Figures 2.5 and 2.6). This stands in the way of the United Nations' 2020 goal of achieving significant improvement in

the lives of urban slum dwellers (Action Aid, 2006). This is because many African cities lack the infrastructures to withstand extreme weather conditions.

Poor urban planning and other urban governance challenges contribute to the risk of African urban slum dwellers. A lack of planning as urban development increases is evident in areas where new development should be prevented. It should be encouraged that unprotected areas should be left undeveloped, for instance wetlands. In the *Baixa's* case, the natural green ridge to the north-east of the city, poses to be undermined the same threat. This green strip of natural vegetation serves an important ecological role within the area. These green areas are pointed out as important role players and act as buffers against flooding risk (Adelekan, 2009). That is way these green spaces should be protected and reintroduced.

According to Action Aid International (AAI), Mozambique is rated to have the second-highest number of people that were affected by flooding from 1990 to 2004. It is estimated that 3.43 million people were affected during flood-related disasters. The main reasons thereof are climate change,

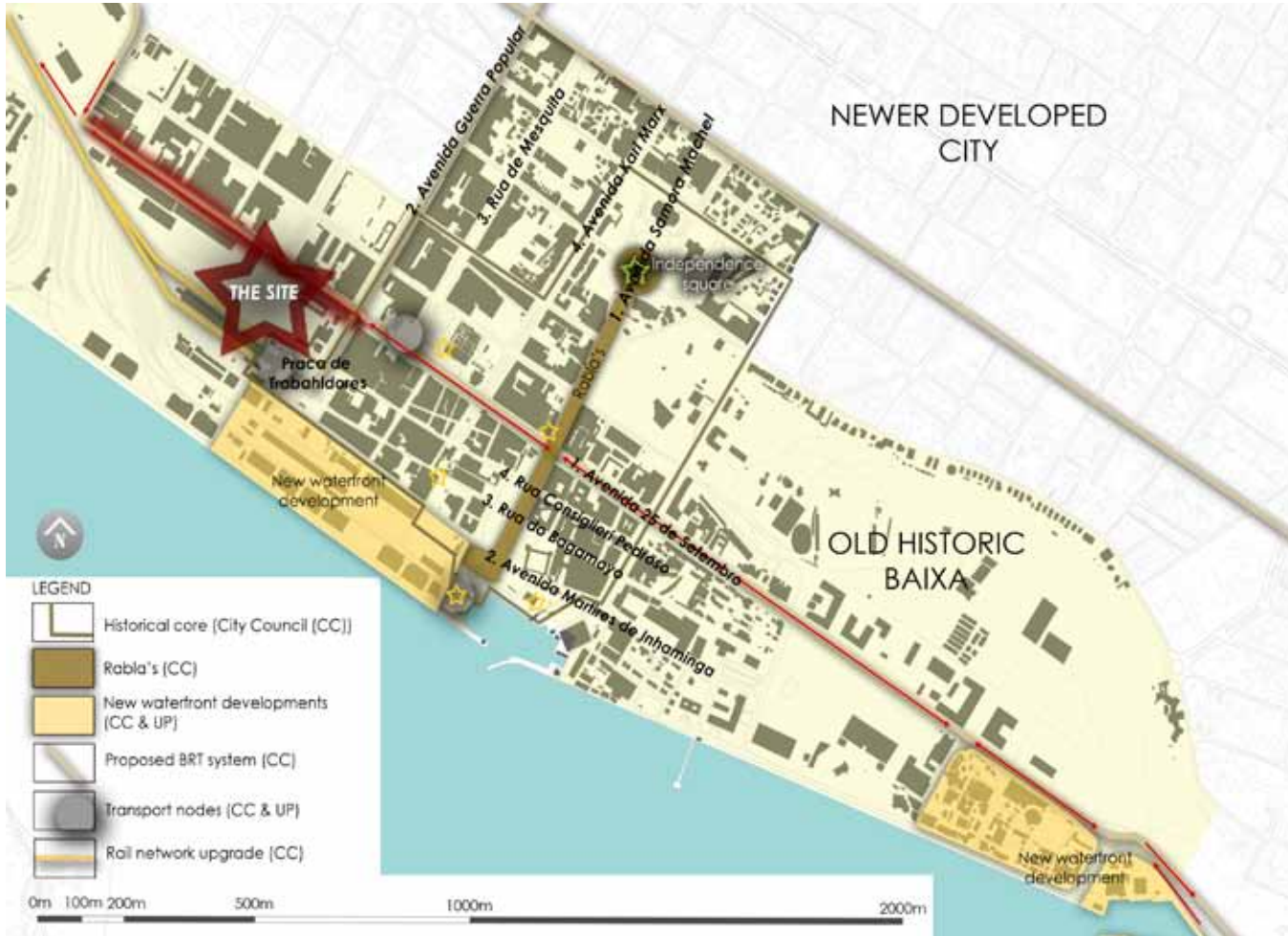


FIGURE 2.7: OVERLAY OF MUNICIPAL FRAMEWORKS (AUTHOR, 2011)

large built-up areas, poor urban planning, lack of infrastructure and so forth (Action Aid, 2006).

### 2.3 INTRODUCING THE FRAMEWORK

In 2011, a group of students attempted a collaborated urban design exploration. The group consisted of five architecture students and one landscape architecture student (the author) from the Department of Architecture of the University of Pretoria (UP).

Through this joined group effort a theoretical approach was identified, and as result a group framework (*The Framework*) was compiled (see Appendix A).

The theory used as main driver is that of Kevin Lynch's *Five Elements of Mental Maps* as well as *Finding Lost Space* by Roger Trancik (Trancik, 1986). Lynch (Lynch, 1960) describes paths, edges, districts, nodes and landmarks as the five elements from which users understand their surroundings in consistent and predictable ways (ebid).



FIGURE 2.8: INDEPENDENCE SQUARE (FORJAZ, 2011)

These five maps form an important base from which analysis was done and conceptual opportunities were identified. These range on all aspects, from movement patterns and important building locations, to open space location and mixed use functions (*The Framework*, 2011).

### 2.4 FRAMEWORK DEVELOPMENT

Over the years three main planning schemes have addressed Maputo and the *Baixa* and the urban planning thereof. Figure 2.7, which summarises these schemes, include:

- The *Baixa Urban Design Framework* by the UP students–2011 (*The Framework*, 2011).
- *PEUMM Framework* by the Maputo City Council –2008 (*PEUMM*, n.d.). *PEUMM* was translated out of a Portuguese presentation and has an unknown meaning. It refers to the proposed framework done in 2008, by City Council.
- Proposed- or future projects by City Council –2011. Some future ideas was mentioned in a class interview (CC, 2011)



FIGURE 2.9: RAMBLA'S IN BARCELONA, SPAIN (GREEN NEWS ADMIN, 2009)

The 2011 Urban Design Framework by the UP students, conceived the following vision for the city and was identified in assistance with the relevant theory. Refer to Appendix A for *The Framework* (*The Framework*, 2011).

In 2008, the City Council, created a framework namely *PEUMM*. This framework was guided by principles of urban development and is consistent with the fundamental laws of the country (*PEUMM*, n.d.).

The *PEUMM* Framework forms part of the UP students' framework. The *PEUMM* Framework was sourced from a presentation during a Maputo visit. The *PEUMM* Framework was originally presented in Portuguese and had to be translated by the author by means of *Google translator* (<http://translate.google.co.za>) and may thus appear somewhat incoherent.

The *PEUMM* Framework was drawn up to ensure the following basic rights to citizens with regard to urbanity:

- The right to the city.
- The right to urbanised land.
- The right to decent housing.



FIGURE 2.10: PROPOSED WATERFRONT TO THE EAST OF BAIXA (DO JOSE, 2010)

- The right to sanitation.
- The right to safe transit and urban mobility.
- The right to infrastructure, services and equipment for urban education, health, information and culture, sport, leisure and public safety.
- The right to participation. (University of Eduardo Mondlane, 2011)

The third and final framework that influenced design decisions, was proposed for future projects. During one of the various interviews, information was made available regarding future developments due to take place in the city (City Council, 2011).

In this "Future Projects" Framework, a spokesman from the city council briefed the students on future developments, soon to take place. These included a *Rambla's* project along *Avenida Samora Machel* similar to the one in Barcelona, Spain (Figure 2.9); An Independence Square were the *Rambla's* "originates" (Figure 2.8) and a proposed waterfront along the harbour front (Figures 2.10 and 2.11).



FIGURE 2.11: PROPOSED NEW WATERFRONT (DO JOSE, 2010)

## 2.5 CONTEXT INFLUENCING THE SITE

### Streets:

1. **The first street** under discussion is *Avenida 25 de Setembro* (Figure 2.12 - next page). Through a process of intensive height analysis (by the author) within the *Baixa*, *Avenida 25 de Setembro* (the street) was found to be the lowest part of the *Baixa*. As further analysis showed, a part within the relevant street was calculated to be the very lowest point within the *Baixa*. Due to this state, water accumulates along the street and results in urban flooding of great extent. All water accumulation is from storm-water run-off from buildings and the other hard surfaces in the *Baixa* (fresh, inland water). This is discussed in more detail in *Chapter 4*.

The main focus of this site intervention will be to "divert" storm water to more suitable sites and allow for treatment and urban reuse. Excess water is proposed to be discharged into the Maputo bay.

To state the importance of *Avenida 25 de Setembro* to the reader and the final site design, the street is analysed and discussed in detail:

The street is a strong vehicular artery feeding traf-



fic into the *Baixa* from the west, and leading access towards the east and vice versa. It is strongly vehicle-orientated, forming a barrier between the old, historic *Baixa* in the south, and the newer developed city to the north (Figure 2.7). The area to the north is mainly commercial and residential, while the southern part is mixed use. The street does, however, have a strong pedestrian and informal trade character due the presence of the Central Market, located centrally in the street. The street acts as an important pedestrian connector, but does not cater for movement across.

This also serves as connection link to the new developments occurring to the east and west in the street. The intention of the street within *the framework* is to retain its vehicle hierarchy, whilst ensuring adequate sidewalks for pedestrian movement, informal retail and formalising of parking bays. Bridging the barrier between new and old *Baixa* will be addressed

at the intersections through traffic-calming methods such as surface change and level differences.

The changes proposed by the author regarding the introduction of storm-water channels along the street, will also serve as possible motor calming method and pedestrian movement encourager. This could possibly be done through speed bumps and warning signage along the street and bridging and steel grids along the water channels (Figure 2.13) as original sketches show.

The aim would be to adjust the street in such a way as to keep its important vehicular function, but also to serve as a water channel to which water can be allocated and then be transported to the specific site (of the project) and the other sites within the *Baixa*. The challenge for that reason, is to keep the existing parking bays along the street and merge it with the open water channel system.

It is aimed that the outcome will add to the city's rich and unique *genius loci*.

Compared to suggested street types by Llewelyn-Davies (Llewelyn-Davies, 2000) in his book *Urban Design Compendium*, the streets in the *Baixa* are identified within the group's framework. These are identified as having the following potential characteristics (Llewelyn -Davies, 2000):

The avenue is potentially a vibrant linear spine for a public open space network in the future. This spine can possibly include numerous soft green spaces, public squares, both passive and active. Roger Trancik in his book, *Finding Lost Space*, describes linkage through a network of streets as one of the key ingredients of place making (Trancik, 1986). Streets, their layout and connectedness are pivotal within a greater urban design vision.

**2. The second street** under investigation is *Avenida Guerra Popular* (People's War Avenue) demonstrated in Figure 2.14 for the reason that the site falls within an important crossing and link between *Avenida 25 de Setembro* and *Avenida Guerra Popular*.

*Avenida Guerra Popular* is a strong vehicular artery linking the historic core of the *Baixa* with the

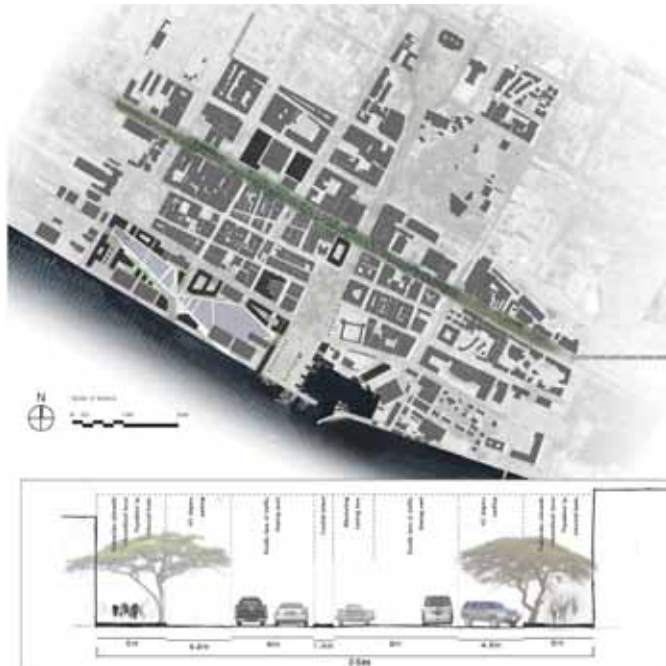


FIGURE 2.12: AVENIDA 25 DE SETEMBRO HIGHLIGHTED (THE FRAMEWORK, 2011)



FIGURE 2.13: SKETCH SECTIONS OF THE STREET WATER CHANNELS (AUTHOR, 2011)

newer parts of the “cement city” further inland. The street acts as an important connector of public transport facilities. It was designed as a wide boulevard which allows for multilane roads. The street is congested largely due to the taxi rank located to the north of the intersection, for which the available space is insufficient. Due to this public transport facility the street is full of pedestrians.

Infrastructure is provided for pedestrians, such as wide pavements, but similar to most other streets in the *Baixa*, vehicles take over by parking on streets and inhibiting pedestrian movement.

It culminates to the south in *Praca de Trabalhadores* (Workers Square), to which the railway station faces. To the north the avenue leads to *Maputo International Airport*.

The intention for the street within The Framework is

also to retain its vehicular hierarchy, whilst ensuring adequate sidewalk for pedestrian movement and informal retail, and the formalising of parking bays both in parallel and on the central island. Pavements will be defined for the pedestrian by demarcating parking for vehicles. Access across the road will be defined by way of pedestrianised routes linking across via the central island. The island will also provide for controlled sectional diagonal parking.

Similar to the function of *Avenida 25 de Setembro*, *Avenida Guerra Popular* can also be characterised as a district distributor. It has traffic throughout the different parts of the urban area. It is suggested as an avenue or boulevard with formal and generous landscaping and tree planting (*The Framework, 2011*).

## 2.6 SUMMARY ON SITE SELECTION

Through analysis, it became clear that *Avenida 25 de Setembro* should provide the following attributes:

- Relevant avenue or boulevard with formal and generous landscaping proposed by UP students (*The Framework, 2011*).
- A water channel on the side of the road which will serve as 45 degree parking during dry spells. By making use of an adjusted water system, the flooding problem can be successfully lowered (proposed by the author).

The main site intervention (the site) should provide the following characteristics:

- Brown field site (current state).

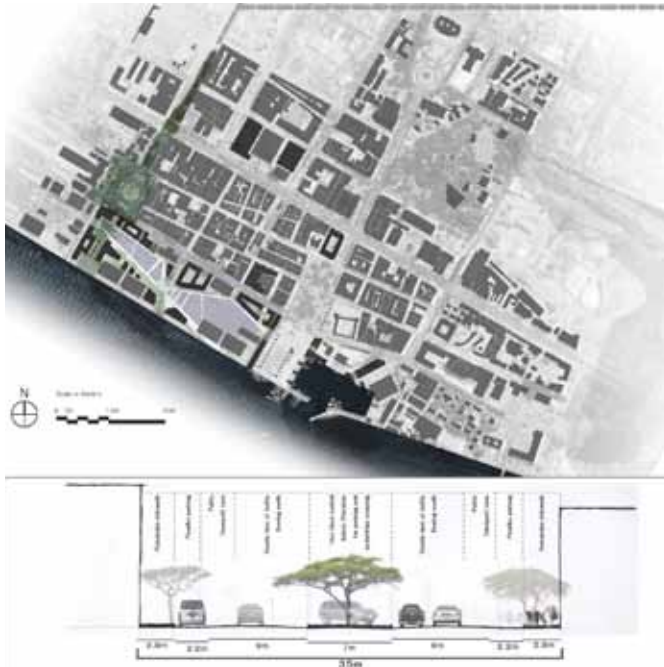


FIGURE 2.14: AVENIDA GUERRA POPULAR HIGHLIGHTED (THE FRAMEWORK, 2011)



FIGURE 2.15: SITE AS INFRASTRUCTURAL AND GREEN LINK (AUTHOR, 2011)

- Lowest point of water accumulation in the whole street (as measured by the author).
- The site lies within an active transport zone on an important axis, intersected by two district distributors and the railway station.

The *Baixa* is seen as the heart of the city and the place of origin and everyday business. The site for that reason lies in the historical core of the city and serves as an important economic and social function (Figure 2.16).

## 2.7 CONTEXTUAL OVERVIEW

Figure 2.15 shows that the site forms an important link from east to west in terms of a green link (green corridor) in regard to open spaces in the city. On a city-wide scale, the site (and the street), reconnects the gap between the undeveloped, natural green ridge from east to west.

On a more local scale, the site connects the sta-

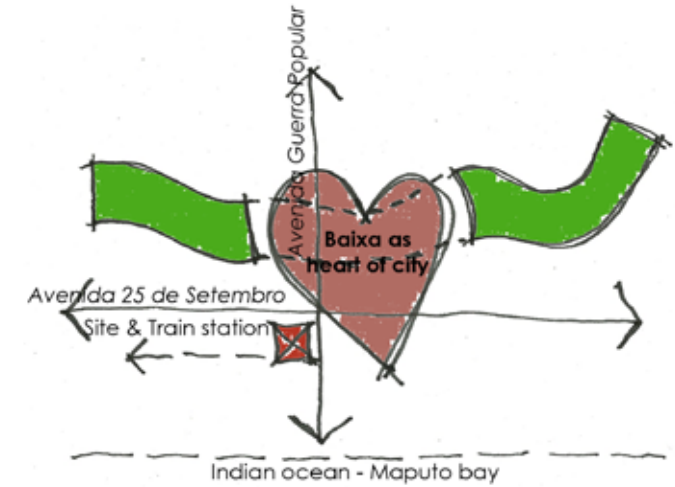


FIGURE 2.16: BAIXA AS HISTORIC HEART OF MAPUTO (AUTHOR, 2011)

tion and *Praca de Trabalhadores* to the newer developments in the west. The site is located on the edge of the *Baixa* and for this reason will encourage new developments along the perimeter of the historical core. This catalytic concept acts as one of the main drivers within the dissertation and framework. The catalytic approach aims to use this type of intervention, to introduce and encourage new developments to take place around the site.

Potential users for the site as proposed are:

Primary users:

- Daily commuters and tourists that make use of the station.
- Business people before, after and during working hours.
- Local residents that will utilise the site as a neighbourhood park.
- Students for educational purposes.

Transport & pedestrian movement



FIGURE 2.17: TRANSPORT & PEDESTRIAN MOVEMENT (THE FRAMEWORK, 2011)

Secondary users:

- Purpose bound pedestrians.
- Users of on-site retail facilities.
- Office users around the site.

## 2.8 DESIGN OBJECTIVES

Design objectives will aim to address the following city-wide scale (Figure 2.15) and site-specific issues:

City scale:

- The Baixa-wide (city-wide scale) problem of flooding during annual rainy seasons (Figure

Flooding map



FIGURE 2.18: BAIXA FLOODING (THE FRAMEWORK, 2011)

2.18) as set out by the problem by Chapter 1.

- The lack of green spaces in the general Baixa precinct.
- Ecological, historical and cultural memory of the area by relating to what was there before and how it could be in the future (elaborated in Chapter 6 and 7).
- Implement the vision of the Baixa student Urban Design Framework (*The Framework, 2011*) for Avenida 25 de Setembro and Avenida Guerra Popular, as discussed.

Site specific:

- A design of a vibrant public open space

that entices use throughout the day.

- Enhancement and protection of the openness of the site.
- A metaphysical connection between the people and the water (water gathered from flooding).
- Seasonal change and use, in regard to rainy to dry season.
- Ecological, historical and cultural memory of the site by relating to what was on-site before and how it could be in the future.
- The introduction of systematic components to create diverse ecosystem components.

## 2.9 POSSIBLE FUNCTIONS

The project proposes an urban water-holding park that will:

- Act as an precedent to the other open and vacant sites along *Avenida 25 de Setembro*. This proposal will be illustrated on city-wide scale, due to the fact that an entire system along the street will be proposed.
- Gather surfaced storm water and then attempt cleaning, harvesting and discharging the excess.
- Create a project of importance to address the social, economic and ecological needs of the immediate *Baixa* environment.
- Innovative landscape design to such extent to educate users of the project and make certain principles clear. This in regard to water conservation, water management

and water quality in urban environments.

- Additionally, people are made aware of the system and strategies involved by means of signage or an information centre. This can illustrate how flooding can possibly be solved or at least be minimised.

The following functions is proposed by the author:

- An information centre.
- Visible on-site water treatment through:
  - Litter traps.
  - Oil traps.
  - Sediment settlement.
  - Constructed wetland.
  - Dam structure.
  - Treated water to be used as irrigation and other purposes.
- Public park that:
  - Provides space for relaxation, social interaction, meetings.

- Has multifunctional green spaces.
- A public plaza (hard surface), bordered by restaurants, an office, a market and a waterfront.
- Establishes a metaphysical connection between the city dweller and the wetland and dam structure.
- Celebrates the *Baixa* and its context in regard to its history, people and natural surroundings through material use and allowing for change.
- Should be safe with adequate security and lighting. This could possibly be encouraged through photography and other methods of documentation.

## 2.10 CLIENT

The project is an integration of users and functions. Stating this, it is lastly aimed to identify a number of patrons to uncover the potential of the city.

Possible patrons:

- Maputo City Council .
- Department of Parks and Gardens, Maputo
- *Portos e Caminhos de Ferro de Moçambique (CFM) (Mozambique Ports and Railways)* Currently involved in relevant projects of upliftment within the city of Maputo.
- Private companies, like *Vale*, a Brazilian mining corporation (second-largest mining company in the world) who is interested in regeneration projects (Nichol, 2007).
- Schools in the area that will make use of the park.
- New developers that will develop around these proposed sites.



FIGURE 3.1: PRACA DE TRABALHADORES (DEVENISH, 2011)

# CHAPTER 3\_

## CURRENT KNOWLEDGE: SUSTAINABILITY THEORY



### 3.1 INTRODUCTION

**Sustainability is about bequeathing a high quality of life to future generations.**

(City of Cape Town Facilities Management, n.d: 2)

The study aims to address the current state of decline within the *Baixa* through a number of sustainable landscape principles. In short, the focus is to describe a wide range of effective actions that include the selection of nonpolluting materials, recycling, conserving energy and water, improving landscaping, and purchasing the most environmentally enhancing products and equipment (ibid).

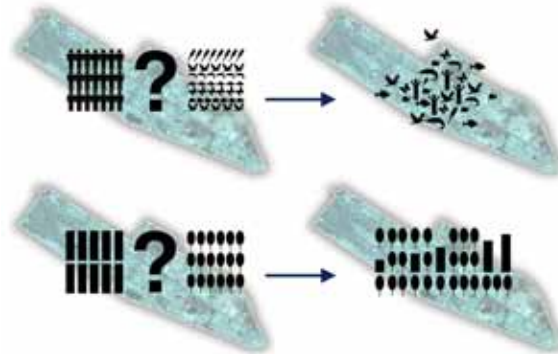
In the document *Sustainable Landscapes, Practices and Guidelines* issued by the City of Cape Town Facilities Management it was similarly aimed to address and highlight the following (ibid):

- Invest in improvements that have quick payback and make economic sense.

- Increase the productivity, comfort, and health of employees and building occupants.
- Work within the ongoing operations and procedures of Facilities Management staff; and most importantly to reduce environmental impacts.

These principles as documented in *Sustainable Landscapes, Practices and Guidelines* endeavour to (ibid):

1. Enrich and cultivate the natural assets through a variety of innovative, productive and sustainable uses of the landscape.
2. Create a park-like landscape system for year-round outdoor recreation and relaxation for local staff and community.
3. Design for outdoor comfort by moderating harsh environmental factors such as high winds and rain.



#### Background

The Maputo *Baixa*'s natural systems is under threat. Due to a large amount of developments taking place, the last remaining pocket of natural vegetation is on the brink of its existence. On larger scale (the study area), something should be done to introduce a systematic approach to emulate nature.

#### Concept

A transition region, where buildings, ponds and wetlands mutually interweave. An ecological system, where human, animal and plant live in perfect harmony. A multiple zone, where social, economic and natural characteristics are mutual. An experimental base, where offers a solution to the urban and natural conflict.

FIGURE 3.3: PROJECT OBJECTIVES (AUTHOR, 2011)



FIGURE 3.2: VIEW OF SCHIZOLOBIUM PARAHYBUM IN PRACA 25 DE JUNHO (AUTHOR, 2011)

4. Utilise ecosystem services such as water management, improved air quality, carbon sequestration and so forth.
5. Improve the aesthetic experience of the city's landscape.
6. Manage the landscape to realise its full potential by the use of resource-efficient materials for long-term durability, management and sustainability (ibid).

Referring to these principles it is important to introduce sustainability practices within the project as a main focus to reduce environmental impacts.

The *Sustainable Sites Initiative* (SSI) has been reviewed and utilised from a landscape architect's point of view. It is a programme developed for landscape architects and similar to the *Green Star Rating System* (GSRS) used by architects. The SSI enables the designer to measure the designed intervention according to points allocated to sustainable design (to be mentioned later in the chapter). This rating system was used due to the lack of any similar, or any landscape inter-

ventions currently present in the city of Maputo.

### 3.2 WHAT IS SUSTAINABILITY?

Sustainable development, in technical terms, can be defined as a development path along which the maximisation of human well-being for today's generations does not lead to declines in future.

Attaining this path requires eliminating those negative externalities that are responsible for natural resource depletion and environmental degradation. It also requires securing those public goods that are essential for economic development to last, such as those provided by well-functioning ecosystems, a healthy environment and a cohesive society (OECD, 2001).

### 3.3 THE ROLE OF THE LANDSCAPE ARCHITECT

Typically, sustainability is illustrated as three intersecting circles connecting community, economy, and the environment (Figure 3.3). As three-dimensional problem solvers, architects and landscape architects are well suited to lead the change toward sustainability.

The fact that landscape architects are three-dimensional problem solvers is central to the resolution of nonlinear, spatial problems. These must be solved simultaneously, and spatial thinkers are best at doing that. Since these spatial relationships are essential and connected parts of sustainable design, spatial thinkers are best equipped for the challenge, responsibility, and stewardship of multidimensional solutions. Sustainable landscape architecture thus, account for the following (the three intersecting circles):

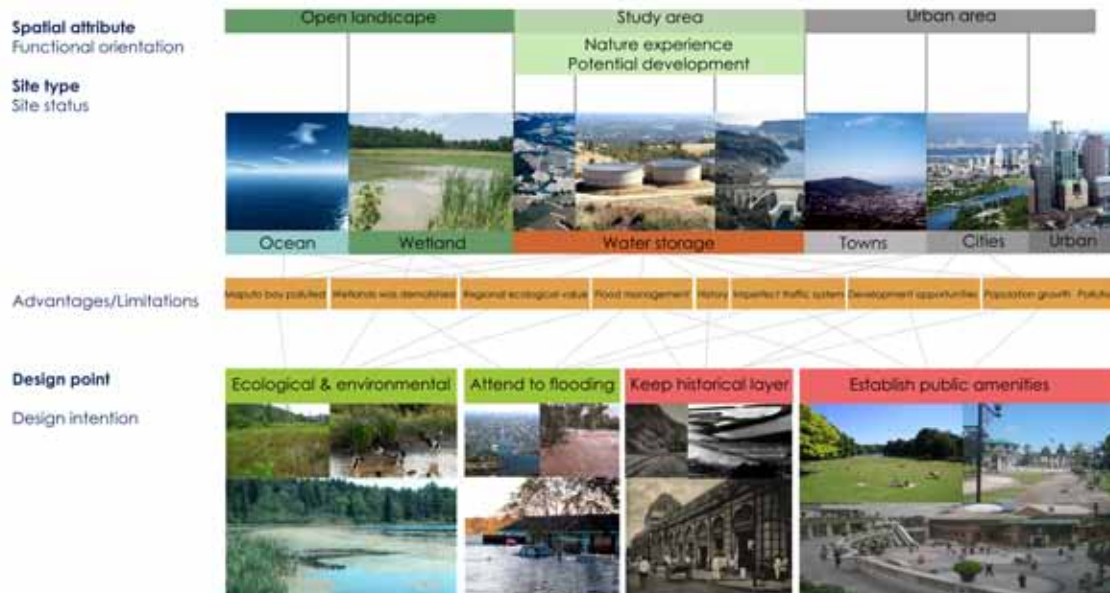


FIGURE 3.4: PROJECT OVERVIEW (AUTHOR, 2011)



FIGURE 3.5: SUSTAINABILITY AND THE THREE INTERSECTING CIRCLES (SIEMENS, 2011)



FIGURE 3.6: GREEN STAR RATING SYSTEM LOGO (GSSA, 2011)

- *Ecological*: the natural forces that shape a landscape, including climate, geology, hydrology, soils, elevation/landform vegetation, wildlife, and other living organisms.
- *Social/Cultural*: the human forces that shape a landscape including history, communities and customs, development patterns, agriculture, and social behaviour and uses.
- *Economic*: the budget realities and cost-saving considerations that shape the built environment and the fiscal requirements necessary to support liveable places and communities. (National Institute of Building Sciences, 2010).

This three-dimensional thinking becomes important in context, working in a city such as Maputo with its unique identity. The unsustainable approaches to designing and building energy-consuming structures must evolve to place-based energy and self-sufficient designs, and they need to evolve rapidly.

### 3.4 GREEN STAR SOUTH AFRICA

Through studying the dissertation done by Mahne (Mahne, 2009: 27), it was found that only 44.2% of the GRS (Figure 3.4) can be applied to landscape architecture and the proposed



## THE SUSTAINABLE SITES INITIATIVE™

FIGURE 3.7: THE SUSTAINABLE SITES INITIATIVE (SSI, 2011)

project. This reveals the notion that a more suitable rating system such as the SSI should be identified and implemented (Mahne, 2009).

The GRS's aim is to ensure that all buildings are built and operated in an environmentally sustainable way so that all South Africans can work and live in healthy, effective and productive environments.

### 3.5 THE SUSTAINABLE SITES INITIATIVE

The author decided to rather focus on the *Sustainable Sites Initiative*, for the reason that it is a landscape architectural specific guideline. The SSI (Figure 3.5) consists of voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices.

The prerequisites and credits are organised into nine sections that are based on the process of site development and can guide an integrated design team through the project phases.

The initiative strongly urges project teams to review and consider all the benchmarks at the beginning of the process, rather than waiting until the pertinent stage of development:

1. Site Selection
2. Pre-design Assessment and Planning
3. Site Design—Water
4. Site Design—Soil and Vegetation

5. Site Design—Materials Selection
  6. Site Design—Human Health and Well-being
  7. Construction
  8. Operations and Maintenance
  9. Monitoring and Innovation
- (SSI, 2009)

Guiding Principles of a Sustainable Site:

1. *Do no harm*:  
Make no changes to the site that will degrade the surrounding environment. Promote projects on sites where previous disturbance or development presents an opportunity to regenerate ecosystem services through sustainable design.
2. *Precautionary principle*:  
Be cautious in making decisions that could create risk to human and environmental health. Some actions can cause irreversible damage. Examine a full range of alternatives—including no action—and be open to contributions from all affected parties.
3. *Design with nature and culture*:  
Create and implement designs that are responsive to economic, environmental, and cultural conditions with respect to the local, regional, and global context.

4. *Use a decision-making hierarchy of preservation, conservation, and regeneration:*  
Maximise and mimic the benefits of ecosystem services by preserving existing environmental features, conserving resources in a sustainable manner, and regenerating lost or damaged ecosystem services.
  5. *Provide regenerative systems as intergenerational equity:*  
Provide future generations with a sustainable environment supported by regenerative systems and endowed with regenerative resources.
  6. *Support a living process:*  
Continuously re-evaluate assumptions and values and adapt to demographic and environmental change.
  7. *Use a systems thinking approach:*  
Understand and value the relationships in an ecosystem and use an approach that reflects and sustains ecosystem services; re-establish the integral and essential relationship between natural processes and human activity.
  8. *Use a collaborative and ethical approach:*  
Encourage direct and open communication amongst colleagues, clients, manufacturers, and users to link long-term sustainability with ethical responsibility.
  9. *Maintain integrity in leadership and research:*  
Implement transparent and participatory leadership, develop research with technical rigor, and communicate new findings in a clear, consistent, and timely manner.
  10. *Foster environmental stewardship:*  
In all aspects of land development and management, foster an ethic of environmental stewardship—an understanding that responsible management of healthy ecosystems improves the quality of life for present and future generations (ibid).
- The initiative's products are aimed to achieve:
- Elevate the value of landscapes by outlining the economic, environmental and human well-being benefits of sustainable sites.
  - Connect buildings and landscapes to contribute to environmental and community health.
  - Provide performance benchmarks for site sustainability.
  - Link research and practice associated with the most sustainable materials and techniques for site development construction and maintenance.
  - Provide recognition for high performance in sustainable site design, development and maintenance.
  - Encourage innovation. (American Society of Landscape Architects, 2011)

### 3.6 WHY SUSTAINABILITY?

The crucial link is carbon in the form of carbon dioxide (CO<sup>2</sup>) as well as nitrogen. All plants and animals are carbon-based life forms. Plants absorb carbon from air and bond it with hydrogen to store energy.

This is the world's only source of either food or fuel. Oxygen breaks these bonds and releases energy, which emits CO<sup>2</sup> into the atmosphere. Carbon dioxide acts like glass in a passive solar design: light passes inward through the atmosphere, but CO<sup>2</sup> prevents heat-producing ultraviolet rays from escaping. The more CO<sup>2</sup> in the atmosphere, the more Earth's average temperature rises. CO<sup>2</sup> appears to trigger other "greenhouse gases", which are actually more potent. Burning fossil fuels has released large amounts of CO<sup>2</sup> into the atmosphere and raised the average global temperature. Of the

many planetary reservoirs of CO<sub>2</sub>, plants and soils are the most active in exchanging CO<sub>2</sub> with the atmosphere. Plants take CO<sub>2</sub> out of the atmosphere and hold it in its sugars and woody tissues. Soil is also a major reservoir of stored carbon (Williams , 2007).

Scientists tell us that in order to avoid dangerous climate change we must keep global warming below 2°C above pre-industrial levels (we are currently at 0.7°C above pre-industrial levels) (ibid).

The project will aim to address these issues through innovative design and use of information gathered from analysis and theory and work towards an approach on sustainability. This could be done by making use of the SSI.

### 3.7 ENVIRONMENTAL DESIGN THEORY

Sustainable landscape architecture is the enduring production of space with artistic, effective and low cost, and low- or zero-energy design. It frees ecological, social, and economic resources from the illusory, and “black hole” sur-

plus economies of consumerism, and in effect create a result that can, “accommodate pleasure and the unforeseen” (Hotten & Diprose, 2009).

In his book, *Design with Nature*, Ian McHarg (McHarg 1969: 173) states that “we need as much nature in the city as in the countryside. In order to endure we must maintain the bounty of that great cornucopia which is our inheritance.” He further states that “it is not a choice of either the city or the country side: both are essential, but today it is nature, beleaguered in the country, too scarce in the city which has become precious’.

In addition, in his book *An Ecological Approach*, Alan Ruff (Ruff, 1982: 175-176) says that, “if we accept that the current level of ecological consciousness is part of the beginning of a long-lasting, fundamental change in attitudes and environmental values, then landscape architecture must bear a large measure of responsibility for making aesthetic sense out of this attitudinal metamorphism”.

By ignoring and not responding to these design terms, the landscape architect is not only sacrific-

ing all the goodwill and free publicity that is being generated by the media and environmental education programmes, but is abdicating responsibility for aesthetic form of the urban environment.

In future, designed landscapes must convey more than just function and symbolism but serve potentially as visual indicators of healthy environmental ethic. The landscape architect must assume a considerable responsibility for making this possible through the design of the urban landscape (ibid).

If we are to create ecologically inspired landscapes that are to contain the characteristics of spontaneous landscape, the following points should be observed:

1. Working with nature.
2. Enrichment through complexity.
3. The landscape as process.
4. Creativity on-site.
5. Involvement of the user.
6. Minimal energy consumption.
7. The natural landscape outside the front door.

A landscape developed along these ecological lines will serve to create a powerful aesthetic form that can both reflect and affect positive environmental change. Only in this way will landscape design reflect humanity's dependence upon the land ethic (ibid).

### 3.8 ECOSYSTEM SERVICES

Ecosystem services are goods and services of direct or indirect benefit to humans that are produced by ecosystem processes involving the interaction of living elements, such as vegetation and soil organisms, and nonliving elements, such as bedrock, water, and air. These factors are relevant due to the fact that these natural elements all play an important role in the project.

Examples of utilising ecosystems services are:

1. *Global climate regulation:*  
Maintaining balance of atmospheric gases at historic levels, creating breathable air, and sequestering greenhouse gases.
2. *Local climate regulation:*  
Regulating local temperature, precipitation, and humidity through shading, evapotranspiration, and windbreaks.
3. *Air and water cleansing:*  
Removing and reducing pollutants in air and water.
4. *Water supply and regulation:*  
Storing and providing water within watersheds and aquifers.
5. *Erosion and sediment control:*  
Retaining soil within an ecosystem, preventing damage from erosion and siltation.
6. *Hazard mitigation:*  
Reducing vulnerability to damage from flooding, storm surge, wildfire, and drought.
7. *Pollination:*  
Providing pollinator species for reproduction of crops or other plants.
8. *Habitat functions:*  
Providing refuge and reproduction habitat to plants and animals, thereby contributing to conservation of biological and genetic diversity and evolutionary processes.
9. *Waste decomposition and treatment:*  
Breaking down waste and cycling nutrients.
10. *Human health and well-being benefits:*  
Enhancing physical, mental, and social well-being as a result of interaction with nature.
11. *Food and renewable nonfood products:*  
Producing food, fuel, energy, medicine, or other products for human use.



FIGURE 3.8: CHESAPEAKE BAY WATERSHED PLAZA, USA  
(JOST, 2009)

12. *Cultural benefits:*  
Enhancing cultural, educational, aesthetic, and spiritual experiences as a result of interaction with nature.  
(Sustainable Sites Initiative, 2009)

### 3.9 SUSTAINABILITY CASE STUDY: CHESAPEAKE BAY WATERSHED PLAZA

The following article was retrieved from a article on sustainability from *The Landscape Architecture magazine* issued by The American Society of Landscape Architects (Jost, 2009). The following was mentioned.

First, it was be deduced that the outdoor exhibits representing the ecosystems were not very large, so it was important to keep the paved areas spacious for people milling around but packed with many different plant species.

It was not always possible to reproduce these environments on a larger scale. Certain species that have a significant presence in the mountains nearby could not survive on this site, which is very hot and exposed, and were eventually removed from the planting list.

Signage within the exhibits teaches people about the natural environments and tries to encourage visitors to use native plants in their own landscapes. As one sign explains, one of the main advantages of using native plants in the landscape is that they attract native birds and insects. For such small pockets of vegetation, the plantings in this plaza are attracting a surprising amount of wildlife.

Using native plants is only one of the ways the designers have tried to make this landscape more sustainable. Benches along the edges of the pier and tables and chairs in a small café area contain large amounts of recycled steel. The architects included a green roof on a small part of the addition, and run-off from other parts of the aquarium building is captured and stored in a cistern, then used to irrigate the

plantings in the park. Some of the surface run-off from the plaza is also directed into planting areas where it can be filtered before spilling out into the harbour.

Sustainability factored strongly into the selection and detailing of the pavers. The paver's matrixes include locally quarried stone and industrial by-products such as fly ash (created when coal is burned for power generation) and lamp black (a pigment created by burning oil, tar, or resin). The pavers are set on an aggregate bed, which allows maintenance crews to remove and reuse them when accessing utilities below.

Finally, they (the design team) were produced within 50 miles of the site, so transportation emissions and costs were reduced. Some strategies commonly used to make a site more sustainable were not possible here.

Because of the site's urban context and the historic nature of the granite bulkhead, the landscape architects would not have gotten very far proposing a new wetland edge. "Something like

porous paving would have required excavating and removing what was under the pier, and they would have created a problem someplace else.

But they committed to doing what was possible. If they could convince a client to do something that was green oriented, they did that gesture, even if it was a small gesture. The more of those small gestures they integrated into our design, the closer they could get to sustainability. Furthermore, through exhibits such as a Chesapeake Bay Watershed map within the paving, they are teaching the general public to demand more" (Jost, 2009).

### 3.10 CONCLUSION

Sustainable design creates solutions that solve the economic, social, and environmental challenges of the project simultaneously. The combined beauty and function of the design make it something that endures and is cherished; endurance and beauty are central to sustainable thinking. If sustainable design is the foundation of the

program requirement, then energy, form, construction processes, materials and long life are integral to the design solution (Williams, 2007).

To conclude from *The Inconvenient Truth*, which is a 2006 documentary film directed by Davis Guggenheim about former United States Vice President Al Gore's campaign to educate citizens about global warming via a comprehensive slide show.

Gore states that "each one of us is a cause of global warming, but each one of us can make choices to change that with the things we buy, the electricity we use, the cars we drive; we can make choices to bring our individual carbon emissions to zero. The solutions are in our hands, we just have to have the determination to make it happen. We have everything that we need to reduce carbon emissions, everything but political will. But in America, the will to act is a renewable resource" (An inconvenient truth, 2006).





FIGURE 4.1: FISHING HARBOUR (DEVENISH, 2011)

# CHAPTER 4\_

## CURRENT KNOWLEDGE: MAPUTO'S FLOODING

## 4.1 GROUNDING

*Grounding* is the second step in landscape discovery and understanding and comes after the landing exercise of Girot's four tracing principles (Girot, 1999: 61).

It has to do with orientation and rootedness, both in the literal and figurative sense of the word. The difference between *landing* and *grounding* is essentially linked to time and moment. *Grounding* recurs indefinitely and is more about reading and understanding the site through repeated visits and studies. It contains both residue and promise; its surrounding context, its soil, climate, water, ecology and history that are unique and special. Thus it encompasses research and analysis (Girot, 1999: *ibid*).

It is a process implying successive layers, both visible and invisible, the intangible and the forces and events that undergrid the evolution of a place (*ibid*).



FIGURE 4.2: FLOODING IN AVENIDA 25 DE SETEMBRO (MAOCHA, 2011)

Through this process, flooding was identified as the major real-world problem within the *Baixa*.

## 4.2 BACKGROUND

Flooding is not a new problem to African cities on the continent. Uncontrolled development, insufficient infrastructure and geographical issues have left its print on rural and urbanised areas. The extent or urgency should thus not be underestimated or ignored.

It is for that reason that other examples of flooding occurrences in Africa are investigated to establish the causes, and to find ways it can be solved. The *Office for the Coordination of Humanitarian Affairs (OCHA)*, states that a similar situation remains critical in West Africa where floods have displaced thousands of people.

The region's annual floods reflect "savage ur-



FIGURE 4.3: BAIXA 2001 (GOOGLE EARTH, 2011)

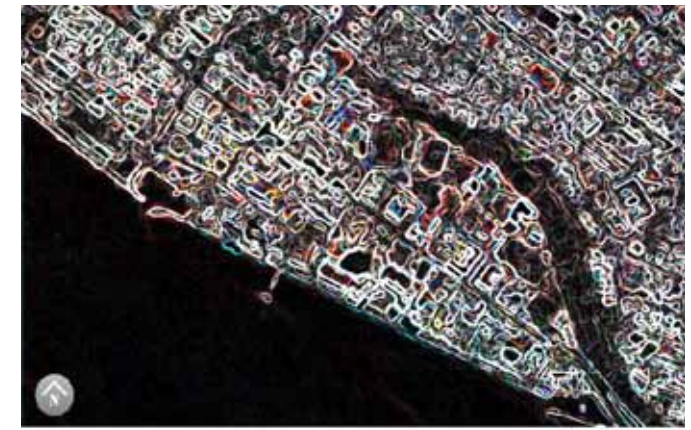


FIGURE 4.4: BAIXA 2011 (GOOGLE EARTH, 2011)

banism” that is taking place in major cities like Dakar the capital of Senegal where an estimated 6 million people are living (Sambira, 2011).

Sambira continues by stating that “Savage and abusive constructions are being carried out in naturally inundated areas, in addition to blocking the natural flowing of water. So when it rains a little over 5 mm, there is flooding everywhere. Changes must be made in the near future to fight the overcrowding of cities or else the situation will become more dramatic with floods” (Sambira, 2011).

From investigating other cases it can be seen that the relevant instance of flooding in the *Baixa* is different from those occurring in the Netherlands for example. (External) floods in the Netherlands are caused by the accumulation of water due to tidal floods, overflowing from nearby oceans or water bodies. The *Baixa*’s flooding source is primarily from inland storm water. The possibility of

creating dikes or similar structures would thus not be applicable in this instance, although the idea of creating channels could possibly be an answer.

### 4.3 THE CURRENT SITUATION

A narrative can be drawn on the current social and economic circumstances in the Maputo landscape and how it has changed throughout the years. These range from the impact of man’s influence to the ignorance of incorporating natural green elements into city.

Regular meetings with Jorge Maocha of *City Council: Department of Environment, Parks and Gardens* were arranged. He highlighted that international investment and capital growth development receive the upper hand. This results in the focus being on economic privileges and not in any way on the environment.

An example of this is that the north-eastern boundary of the *Baixa* is defined by a natural, green ridge. This is an important environmental asset, due to the fact that the vegetation on the ridge keeps sand dunes and the escarpment intact.

This important ecological zone is in decline due to a number of “ignorant”, controversial developments taking place because of “foreign political pressure from East-Asian countries”. The last remaining pocket of existing natural fauna and flora is disappearing and should thus be protected and reinstated (Figure 4.3, 4.4 and 4.5) (Maocha, 2011).

### 4.4 INVESTIGATION

During a personal interview with Joze Forjaz, an *architect* who has been practising in Maputo for the past sixty years, it was mentioned that the flooding problem has never been dealt with. Ac-



FIGURE 4.5: NEW DEVELOPMENT TAKING PLACE ALONG EASTERN RIDGE (AUTHOR, 2011)

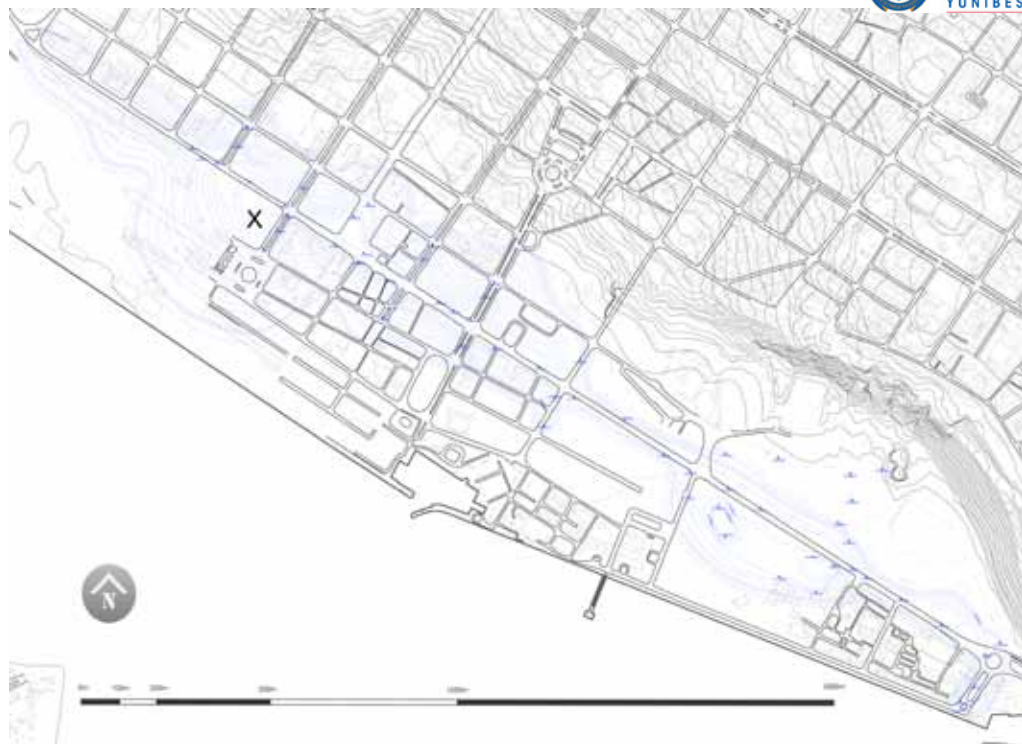


FIGURE 4.6: CONTOUR HEIGHTS AS MEASURED (AUTHOR, 2011)

According to Forjaz, flooding has been a problem since the city's expansion projects (to be discussed in Chapter 6 and 7). During these precipitation intervals, the streets (especially Avenida 25 de Setembro) can fill up overnight (Forjaz, 2011).

The flooding has become part of the way of living and the built environment has adapted accordingly, or at least made the best out of the given situation. Along Avenida 25 de Setembro and its precinct, buildings have introduced raised entry stairs or large steel doors to keep water out, mainly to protect products and goods on the inside. The predominant use of tiles and low outdoor maintenance is further indication of the influence of flooding on the economic sector of the *Baixa*.

Apart from the above, it is obvious that the economy of the *Baixa* comes to a standstill during flooding. No

cars are able to enter the area and no streets filled with people. According to Moacha, it usually takes a few days for water to clear via pipes, and for the busy *Baixa* streets to return to normal (Maocha, 2011).

## 4.5 CAUSES

Originally it was assumed that the flooding was a result of oceanic high tides overflowing into the city. It was later discovered that all water accumulation was a result of inland storm water gathered by the catchment in the lower-lying areas.

Additionally, it was believed that rising ocean tides had an influence on sufficient pipe outflow. According to Maocha (2011), storm water trapped in pipes and exiting below seawater level, is unable to discharge. This assumption was dismissed by Chris Brook-



FIGURE 4.7: STORM WATER MANHOLES FILLED WITH LITTER (AUTHOR, 2011)



FIGURE 4.8: BAIXA ADAPTATIONS (AUTHOR, 2011)

er, *Hydraulic Engineer*, who said that water from a higher gradient will still flow into the bay, regardless of pipes being lower than sea level (Brooker, 2011).

It was discovered that the main reason for the flooding is mainly due to insufficient sewer infrastructure as well as blocked pipes caused by litter and sediment accumulation (ibid).

## 4.6 FIELD WORK

During a weeklong site visit in June 2011, the author set out to survey the exact location and extent of flooding in the *Baixa*. Levels were measured by means of a *Dumpie Level*. Until now, it was roughly estimated where flooding occurred and more concrete data was needed. By doing this, contour heights were taken along Avenida 25 de Setembro,



FIGURE 4.9: FLOODING IN AVENIDA 25 DE SETEMBRO (2)  
(MAOCHA, 2011)



FIGURE 4.10: FLOODING IN AVENIDA 25 DE SETEMBRO (3)  
(MAOCHA, 2011)



FIGURE 4.11: FLOODING AT THE CENTRAL MARKET  
(MAOCHA, 2011)

where the majority of flooding was said to occur.

The results hereof are illustrated in Figure 4.6. A re-worked image (Figure 4.7) shows a colour illustration on contour heights. The colours illustrate heights, defined by 100 mm intervals, and the lowest point can be identified (marked x). In Figure 4.6 it should be noted that only the dotted heights were measured. The rest of the contour lines were interpolated as far as possible with this limited primary data.

The lowest contour was calculated to be 4000 mm above mean sea level (Devenish, 2011).

Worth noting are the following fields:

- The street (*Avenida 25 de Setembro*) is the lowest area of the whole *Baixa* (Figures 4.8, 4.9 and 4.10).

- Almost all intersections seem to be lower than the surrounding areas. In other words this gives way to a water-bowl formation at intersections, meaning that intersections become effectively the primary water catchment areas.
- It can also be assumed that *Avenida 25 de Setembro* is the rough borderline where the manmade infill meets the natural historic coastline.

As mentioned, other interventions like sewage management is not investigated, but the author proposes that this system is revised.

Saying this the author recommends the incorporation of a litter management plan to address the inadequate mismanagement of litter

in the city. This is due to lack of basic cleaning and garbage removal, because of accumulation on sidewalk all over the *Baixa*. It seems to be a big threat on the sustainable issue. The implementation of an economic feasible institution, like a recycling centre, could serve the city well.

## 4.7 SOLUTIONS

Possible solutions to flooding could be:

- Using sloped street areas to get rid of excess water. Water already accumulates here and possibly needs a way of discharge.

- Utilising the street as a possible waterway for getting rid of water by means of a channel of some sort. It should however be a surfaced system, since the current subsurfaced systems pose to be one of the many contributors litter blockage.

- Avoid the use of element like surfaced steel grid systems. According to the author these systems currently, doesn't seem to be the ideal solution and in contrary acts as an additional cause of blockage within the current system.
- Locating open space along the street to harvest water, clean, retain and finally discharging into the bay.

- Creating suitable capacity for removed water. The possibility of creating a water channel that leads to water-holding sites. These sites would allow for water diversion during wet months and effective usage, all year round.

Various amounts of input were considered from all sources. These range from a hydraulic engineer in the form of C. Brooker (private practitioner), Architects

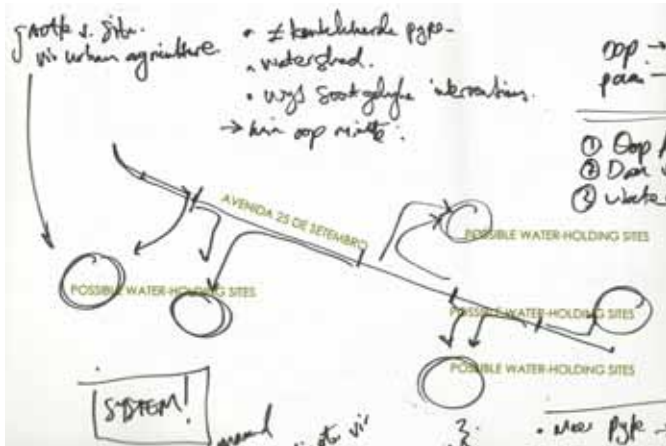


FIGURE 4.12: CITY SCALE CONCEPT (AUTHOR, 2011)

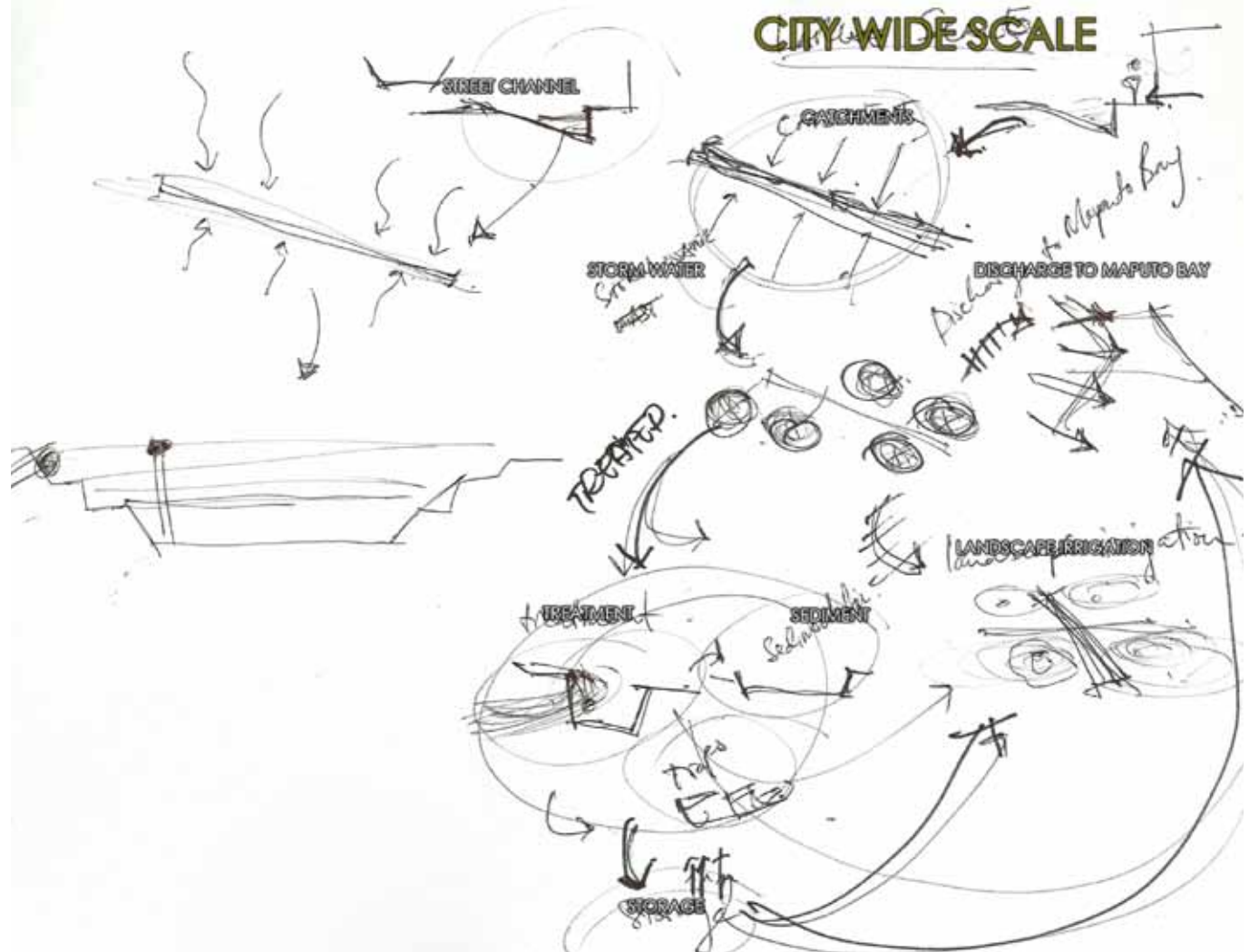


FIGURE 4.13: CITY SCALE WATER SYSTEM (AUTHOR, 2011)

from the Department of Architecture (UP) and finally unknown sources from Maputo City Council's. Decisions were thus made at hand of these influences.

## 4.8 CONCLUSION

It should be stated that the extent of flooding in the *Baixa* is severe, with a large catchment of water accumulating in the area. Due to the historical con-

text and importance of the intervened area, the least amount of disturbance should be aimed for. It is for this reason that the author proposes a single possible solution, using the street of *Avenida 25 de Setembro* (Figure 4.11). The main focus will still be aimed on a single landscape intervention that could pose as a possible precedent to the other water-holding sites.

Whether all water can be successfully removed and managed, poses to be a more in-depth

and extensive, calculative exercise with a variety of specialists acting on the project. With the amount of time and resources available, the author decided on certain number principles and methods to be implemented (Figure 4.12).





FIGURE 5.1: STATION AND PRACA DE TRABALHADORES (DEVENISH, 2011)

# CHAPTER 5\_

## CURRENT KNOWLEDGE: PRECEDENTS

## 5.1 URBAN RENEWAL: GANDHI SQUARE JOHANNESBURG, SOUTH AFRICA

In the late 1990s property developer Gerald Olitzki was granted permission to revamp the terminus as part of Johannesburg's inner-city renewal project (Figures 5.2-5.5), which aimed to restore the central business district (CBD) into the city's business hub.

Energy of the development then spread through the surrounding area with many buildings being upgraded since then. The entire precinct surrounding the square area is now experiencing significant property investment and upgrading. This is due to a clean and functioning public environment as a prerequisite.

In an article written by Gerald Garner in the *Urban Green File Magazine*, he believes that the attitude towards the public environment determines the ultimate success or failure of individual building refurbishment projects. The secret to success, it seems, lies in the precinct approach. The Johannesburg Development Agency refers to it as "area-based regeneration projects" which involve upgrading the urban landscape and not just the buildings (Garner, 2011).

Urban-design theory dictates that urban regeneration cannot be achieved in isolation. Massive investment in upgrading a single building is almost sure to fail unless the surrounding landscape is upgraded.

By upgrading the public environment, investor confidence in an entire precinct is boosted and this, invariably, leads to massive scale redevelopment of properties.

The bottom line: the best investment any property developer could make is to invest in the upgrading and upkeep of the environment (Garner, 2011).



FIGURE 5.2: GANDHI SQUARE (WORLD SOCCER JOURNEYS, 2011)



FIGURE 5.3: GANDHI SQUARE (2) (GOOGLE EARTH, 2011)



FIGURE 5.4: GANDHI SQUARE (3) (SOUTHERN AFRICAN TRAVEL AND INDIAN OCEANS ISLANDS, 2011)

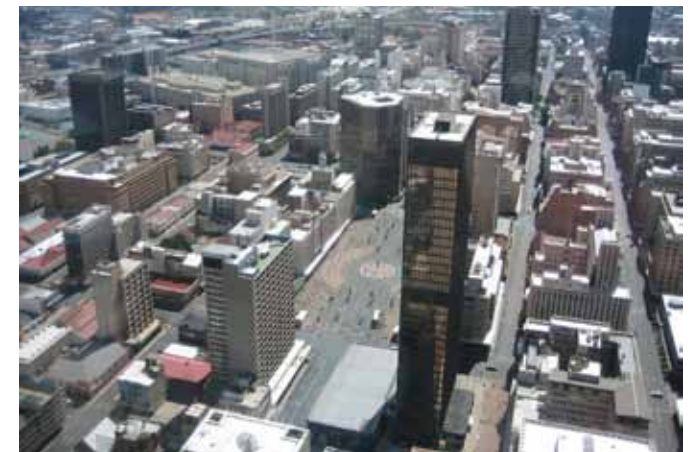


FIGURE 5.5: GANDHI SQUARE (4) (WORLDISROUND, 2011)



FIGURE 5.6: TORONTO WATERFRONT (HEART OF TORONTO WATERFRONT, 2011)

## 5.2 CREATING HEALTHY ENVIRONMENTS: TORONTO WATERFRONT TORONTO, CANADA

The Toronto Waterfront (Figures 5.6-5.9) is an example of urban revitalisation, using the harbour front as a *brownfield* site and altering it to its previous natural state. The project was aimed at putting people first and reconnecting them with the waterfront. Emphasising parks and public spaces, designed in a way that is environmentally and economically sustainable.

By improving the aquatic environment, the project aimed to restore the marine ecology and create a living ecosystem. The waterfront revitalisation coupled efforts through conservation and enhancements of terrestrial and aquatic habitats.

Water is the central theme in the project through water conservation measures, creative and effective storm-water management systems and use of grey water recycling. Wetlands were built to replace destroyed ones of the nineteenth century and to provide social and environmental benefits.

Five broad goals included the remediation of *brownfield* sites; reducing energy consumption; construction of green buildings; improving air and water quality; expanding public transit; and diversifying, vibrant downtown communities (Toronto Waterfront Website, n.d.).

Other intentions of the project included:

- Reduction of vehicular dominance along the waterfront by increasing pedestrian links.
- Increasing vegetation.
- Increasing mixed use activity. (Spens, 2007)



FIGURE 5.7: TORONTO WATERFRONT (2) (GOOGLE EARTH, 2011)



FIGURE 5.8: TORONTO WATERFRONT (3) (TORONTO, 2011)



FIGURE 5.9: PROPOSED TORONTO WATERFRONT (WATERFRONT TORONTO, 2011)



FIGURE 5.10: THUNDURU BOTANICAL GARDENS (AUTHOR, 2011)

### 5.3 CHANGING FUNCTION: THUNDURU BOTANICAL GARDENS MAPUTO, MOZAMBIQUE

Patrick Nichol, Head of Landscape Architecture of the British company, *Groundwork North East*, introduced a project for the renovation of the Thunduru Botanical Garden (Figure 5.10-5.13) in Maputo.

In his journal, *Thunduru Botanical Garden, Maputo, Mozambique: Global Learning for Local Regeneration*, he states that the garden has the potential not only to provide a recreational space for the people of Maputo and visitors alike, but also to meet the many vital roles of a modern botanical garden. These include environmental education and urban agriculture practices.

During a site investigation it was evident that the gardens were once a social hub within the city. Traces of an empty music stage, a ruined aviary and an algae-invested fish pond, refers back to the “heyday” of colonial times. Currently the garden has become a completely different space as to what were planned initially. Over time it had lost and changed from its initial function as a botanical garden. Rather than protecting and displaying the natural elements, it has become a mismanaged space for vandalism, misuse and criminal activity.

It is clear that the specific function as originally intended changed to something different. Successful social spaces with grounded principles (as identified at *Praca 25 de Junho*), should rather be introduced as part of a new project. A space in this context should not necessarily have a designed function, but rather be designed as a space for interaction and cultural interchange, thus allowing the context of the surrounding elements to guide the programme (Nichol, 2007).



FIGURE 5.11: THUNDURU BOTANICAL GARDENS (2)  
(GOOGLE EARTH, 2011)



FIGURE 5.12: WATER SOURCE IN THUNDURU BOTANICAL GARDENS (AUTHOR, 2011)



FIGURE 5.13: AVIARY RUIN IN THUNDURU BOTANICAL GARDENS (AUTHOR, 2011)

## 5.4 PARK REGENERATION: GROAKY PARK, MAPUTO, MOZAMBIQUE

During an arranged site visit with *Jane Flood*, local tour operator in Maputo, Groaky Park (Figures 5.14-5.17) was identified as an important precedent to the project.

This park is important in the context of the proposed intervention, due to the fact that it is an example of residential regeneration. The site, a former unused brown field site, was transformed into a major attraction node within the immediate area around it.

It is located in a residential area in the northern outskirts of Maputo. Like the site in the study, Groaky Park was once undeveloped, dangerous and in a state of despair.

Today, the park is a catalyst and has a restaurant. Strategically placed in the centre of the park. The restaurant, designed by *Joze Forjaz Architects*, consist of a bar and kitchen, and on the outside seating and tables on a verandah. The restaurant is located on a main route through the park, thus adding more eyes and movement. The park is busy throughout the day.

The programme is:

- Central restaurant
- Children playground
- Clean and sufficient rest rooms
- Water feature

The park is successful because of the intervention in its centre which attracts users from all over. All of these elements add to the value of the park (Flood, 2011).



FIGURE 5.14: RESTAURANT IN GROAKY PARK  
(AUTHOR, 2011)



FIGURE 5.15: GROAKY PARK (GOOGLE EARTH, 2011)



FIGURE 5.16: PATHWAY IN GROAKY PARK (AUTHOR, 2011)



FIGURE 5.17: SEATING IN GROAKY PARK (AUTHOR, 2011)



FIGURE 5.18: ENTRANCE AND RESTAURANT IN ACACIA PARK (AUTHOR, 2011)

## 5.5 EDUCATIONAL: ACACIA PARK MAPUTO, MOZAMBIQUE

Acacia Park (Figures 5.18-5.21), is located on the natural ridge to the east of the *Baixa*. It forms a true landmark in modern Maputo. This is due to safety and its effective and unique character. It is a main attraction point for tourists and locals alike.

The park, similar to *Groaky Park*, owes its success to the architectural element (a restaurant) in the centre of the park. It also has the advantage of location, due to the fact that it forms a focal point on an axis with the Polana Hotel, university, school, bus rank and petrol port. It is ideally located on a route that leads from the higher ridge area to the lower *Baixa*. A pedestrian route that is used intensively passes through the park. Lastly, the view from the restaurant over the city makes the visiting experience unique, unlike other parks in Maputo.

The park at first glance is informative with a host of programmed activities. Informative signs are successfully implemented with relevant information about green spaces in Maputo and plant identification.

Programmed elements as listed are:

- Central restaurant area with outdoor serving area overlooking the *Baixa*
- Chess and other table games on ground level
- Children playground
- Amphitheatre
- Grass lawns and seating for visitors
- Efficient clean rest rooms
- Well-maintained indigenous trees
- Robust street furniture lamps, litter bins etc. (Flood, 2011)



FIGURE 5.19: ACACIA PARK (GOOGLE EARTH, 2011)



FIGURE 5.20: ACTIVITIES IN ACACIA PARK (AUTHOR, 2011)



FIGURE 5.21: INFORMATION IN ACACIA PARK (AUTHOR, 2011)

## 5.6 PROGRAM AND WATER RETENTION: GREENLYN VILLAGE PRETORIA, SOUTH AFRICA

The Greenlyn Village Complex (Figures 5.22-5.25) is situated in the Menlo Park region of Pretoria and is an example of a central water body and landscape intervention that allows the surrounding built environment to develop around it. The buildings around consist of restaurants, offices, a theatre and curio shops.

The project shows valuable amenities to edge conditions, spacial exploration, placement and organisation. It provides a range of different possibilities within the designated area and is aesthetically welcoming to all. It also boasts an all-day and night usage due to shows held in The Performer theatre.

On the negative side, this precedent's water approach lacks water movement. Water in the system is drafted from only a windmill, which makes the system less complicated. Stagnant water will serve as a threat in the *Baixa* and will cause mosquitos to breed and infest.

It is also apparent that the landscape is not visually linked to the surrounding areas, that being the busy streets surrounding it on all sides and the general sales complex to the south. It is on the other hand, well-maintained and accessible from all sides. The variety of materials used also adds to the special character of the site, with boardwalks crossing the water at intervals.

The use of indigenous plants and biodiversity are encouraged, which allows fauna and flora to thrive. The park serves as an important example in edge condition design.



FIGURE 5.22: PATHWAY AND DECKING AT GREENLYN VILLAGE (AUTHOR, 2011)



FIGURE 5.23: GREENLYN VILLAGE (GOOGLE EARTH, 2011)



FIGURE 5.24: EDGE CONDITIONS AT GREENLYN VILLAGE (AUTHOR, 2011)



FIGURE 5.25: BRIDGE AT GREENLYN VILLAGE (AUTHOR, 2011)



## 5.7 PRECEDENT IMAGERY



FIGURE 5.26: COLLECTION OF PRECEDENT IMAGERY (BAUMEISTER, 2007)





FIGURE 6.1: HARBOUR (DEVENISH, 2011)

# CHAPTER 6\_

## CURRENT KNOWLEDGE: CONTEXT AND ANALYSIS: HISTORY



FIGURE 6.2: SKETCH OF STATUE ON PRACA DE TRABALHADORES (AUTHOR, 2011)

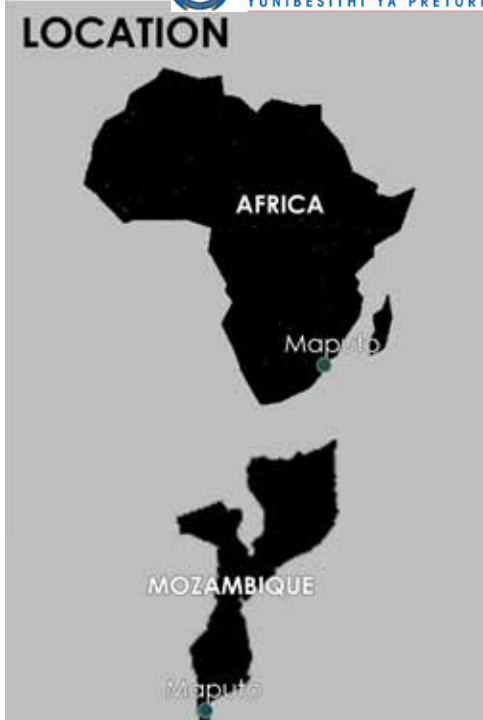


FIGURE 6.3 & 6.4: MAPUTO LOCATION IN AFRICA & STUDY AREA (AUTHOR, 2011)

## 6.1 FINDING

Continuing on Girot's *four tracing principles*, the following step within this chapter discusses the process of *finding*. This step entails the act of processing and searching as well as the outcome or the entity discovered. It is both an activity and an insight, and different activities yield different discoveries. This can either be tangible or evanescent and represents a distinct quality of a place or the *je ne sais quoi*. This process escapes design the invention, but rather imports the unique. It is something that definitely belongs to a place and contributes durably to its identity.

This act can also be performed and experienced by everybody discovering a site for the first time. It is not limited to the discovery of objects, but includes the experience of relating and associating ideas, places and themes. It comes down to what is found, it

is an open question and open possibility. *Finding* is the component in the design process, which may be permanent or impermanent and finally discloses the evidence to support ones' initial intuitions about a place (Girot, 1990: 62).

## 6.2 ABOUT MAPUTO

The country of Mozambique is located on the south-eastern coast of the African continent, as seen in Figure 6.3 (and Figure 6.4). Maputo, used to be a major attraction to developers and tourists alike. Due to political instability and a long-lasting civil war, the city is severely underdevelopment and its potential underused.

The Traveller Philip Briggs of the volume, *Mozambique, 5th: the Bradt Travel Guide 1997-2011*, states that post-civil war images of Maputo show

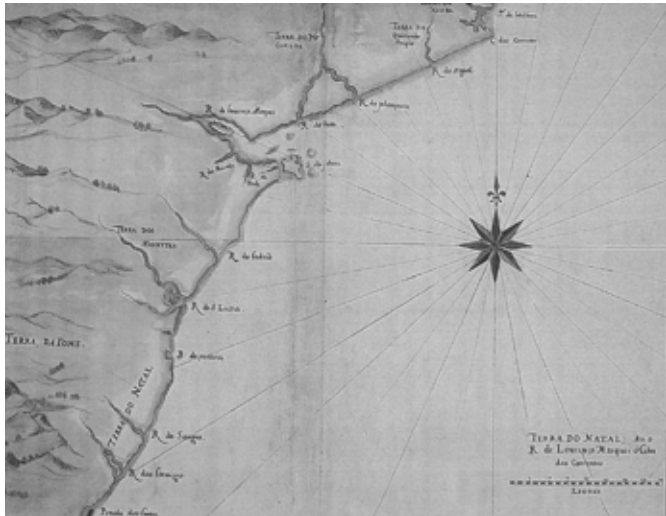


FIGURE 6.5: LOURENÇO MARQUES MAP IN 1887 (BRUSCHI, 2005: 83)



FIGURE 6.6: LOURENÇO MARQUES IN 1876 (BRUSCHI, 2005: 22)

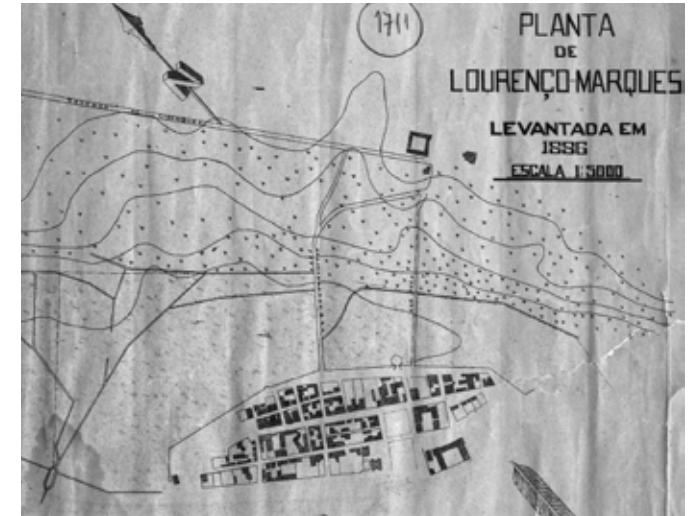


FIGURE 6.7: LOURENÇO MARQUES ORIGINAL EXPANSIONS IN 1886 (BRUSCHI, 2005: 83)

stereotypes of its intense poverty, flagrant corruption and rundown architecture (Briggs, 2011: 21).

Until recently, the city has undergone a transformation to gain lost function. No longer severely potholed, the avenues of the city centre are wide and tree lined, sloping down to an attractive sea-front and harbour and a number of architectural gems. A number of new developments and investment is taking place around the *Baixa*, which allows for additional compensation. Maputo has since 1898 served as the political capital and is inhabited by about 1,75 million people (Briggs, 2011).

### 6.3 HISTORICAL CONTEXT

The Historical Context section was translated by means of *Google Translator* from a Portuguese document. The document circulated within the UP students's group, briefly explains the historical context.

The historic context investigation focuses on the origin and development of Maputo. The area under investigation focuses on the location and the

state of the environment in the early days of *Lourenço Marques* (Maputo) and how it came about to be the seventh largest city in Africa (Volker, 2011).

A journal by the name, *O Desenho das Cidades: Moçambique até o Século XXI* (*The Design of Cities: Mozambique to the Twenty-First Century*) by Bruschi & Lage (2005) served as primary source and all information had to be translated.

#### The location:

Figures 6.5 and 6.6 illustrate the historical maps and the region that was originally discovered and settled by Portuguese settlers and proclaimed as the city of *Lourenço Marques*, known as Maputo today. The area was originally to be situated in a mixture of swampy, brackish water. Until 1887, the city was confined to an islet of sand and mud, surrounded by marshes.

The small village was built on the islet with irregular streets forming the perimeter of the bay. A fort was erected and placed in such way that they could organise themselves outside the line of defence.

In 1876, an initial idea was developed by the English engineer, Richard T. Hall, to address the issues related with swamp drainage. The plan was registered with the town of that time.

In 1877, following confirmation from the Portuguese, a plan (Figure 6.7) was drawn in preparation for expanding the city. This included the removal of houses outside the walls, the desiccation of the marsh, the construction of a dam, and the planting of *Eucalyptus sp* trees in order to soak up water.

The town began to expand quickly and a plan was initiated to dispatch public works to “conquer” the swamp in the city. This was to be done through a massive landfill project. It took more than ten years to complete and the following two trends of planning were identified:

1. Abandon the settlement of the initial low-lying area because of the unhealthy conditions and difficult recovery of land.



FIGURE 6.8: HISTORICAL IMAGERY (UNKNOWN SOURCE, N.D: 1-4)

2. Conduct and encourage sanitation of the area through landfills and to wipe out all wet areas.

In 1881, the commencement of the landfill project began. This allowed the orderly construction of dry zones and consisted of two phases, illustrated in Figure 6.11 (on the next page).

The first phase of the infills started in 1915. This included earthworks on the lower area of the Maxaquene (today the harbour's edge) and included the consolidation of barriers along the side of the city.

The extension project had to overcome issues such as dealing with geography, sufficient drying methods and layering of infill material (Figures 6.10 & 6.13).

In 1907, a plan was developed for the greater extension of the city and to define a new boundary by the City Council. This boundary was traced to a north-west

arc (circle) of 2,017 meters as illustrated by Figure 6.8.

An estate plan drafted by the Ministry of Overseas during 1947-1952, came at a particular time of Portuguese urbanism, known as the "heyday of urban planning". This reflected a new state policy namely to seek planning in an urban way and consolidate the image of the system. This plan affected the development of the city, with strokes and regulations and resulted in the approval of the master plan of 1969 (Figure 6.12) (Bruschi & Lage, 2005).

Much has changed since the start of nineteenth century. Maputo has since then experience a long lasting civil war and received independence from Portugal. Today, Maputo can be regarded as a modern African city, with a stable economy and vibrant character. It has developed from an early fishing town (primarily whale hunting), to a trade and destination mecca for people from everywhere (Bruschi & Lage, 2005).



FIGURE 6.9: NEW CITY BOUNDARY OF 2017 METERS (BRUSCHI, 2005: 89)



FIGURE 6.10: LOURENÇO MARQUES EXPANDING (BRUSCHI, 2005: 87)

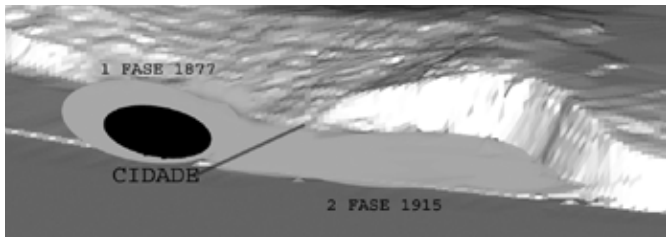


FIGURE 6.11: PHASED PROJECTS: FIRST - 1877 AND SECOND - 1915 (BRUSCHI, 2005: 87)

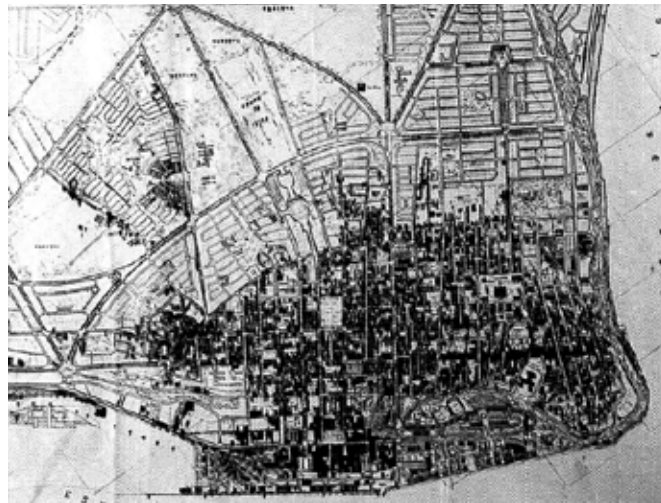


FIGURE 6.12: CITY MASTER PLAN - 1969 (BRUSCHI, 2005: 93)



FIGURE 6.13: LOURENÇO MARQUES EXPANDING (2) (BRUSCHI, 2005: 87)





FIGURE 7.1: FISHING HARBOUR 2 (DEVENISH, 2011)

# CHAPTER 7\_

## CURRENT KNOWLEDGE: CONTEXT AND ANALYSIS: SITE CHOICE & ANALYSIS

## 7.1 THE CURRENT DAY CONTEXT

For a complete context analysis on the city's growth, important dates and buildings, refer to *The Framework* in *Appendix A*. It illustrates an in-depth analysis done on general issues affecting the Baixa, which include movement patterns, open spaces, general functions and the different student intentions.

The chosen site is the open area to the north of the train station (Figure 7.3) on the corner of *Avenida 25 de Setembro* and *Guerra Popular*. Since the open site is the main location of the project intervention, a section of the *Avenida 25 de Setembro* will also be analysed and discussed. This is because it has a direct influence on water entering the site

through the street water channel. The site could thus be divided into two smaller interzones, namely:

- The street (*Avenida 25 de Setembro*) and the intervention taking place to create a water channel (parking bays to transport water to the site.)
- The main open site located on the open site, north of the station.

The site of the main design intervention is located adjacent, north of the Maputo Central Railway Station and designed by architect Gustave Eiffel who also designed the Eiffel Tower in Paris, France (*The Framework*, 2011).



FIGURE 7.2: NEW DEVELOPMENTS TOWARD THE EAST (AUTHOR, 2011)



FIGURE 7.3: THE SITE (AUTHOR, 2011)



FIGURE 7.4: STUDY AREA, CITY SCALE AND SITE (AUTHOR, 2011)

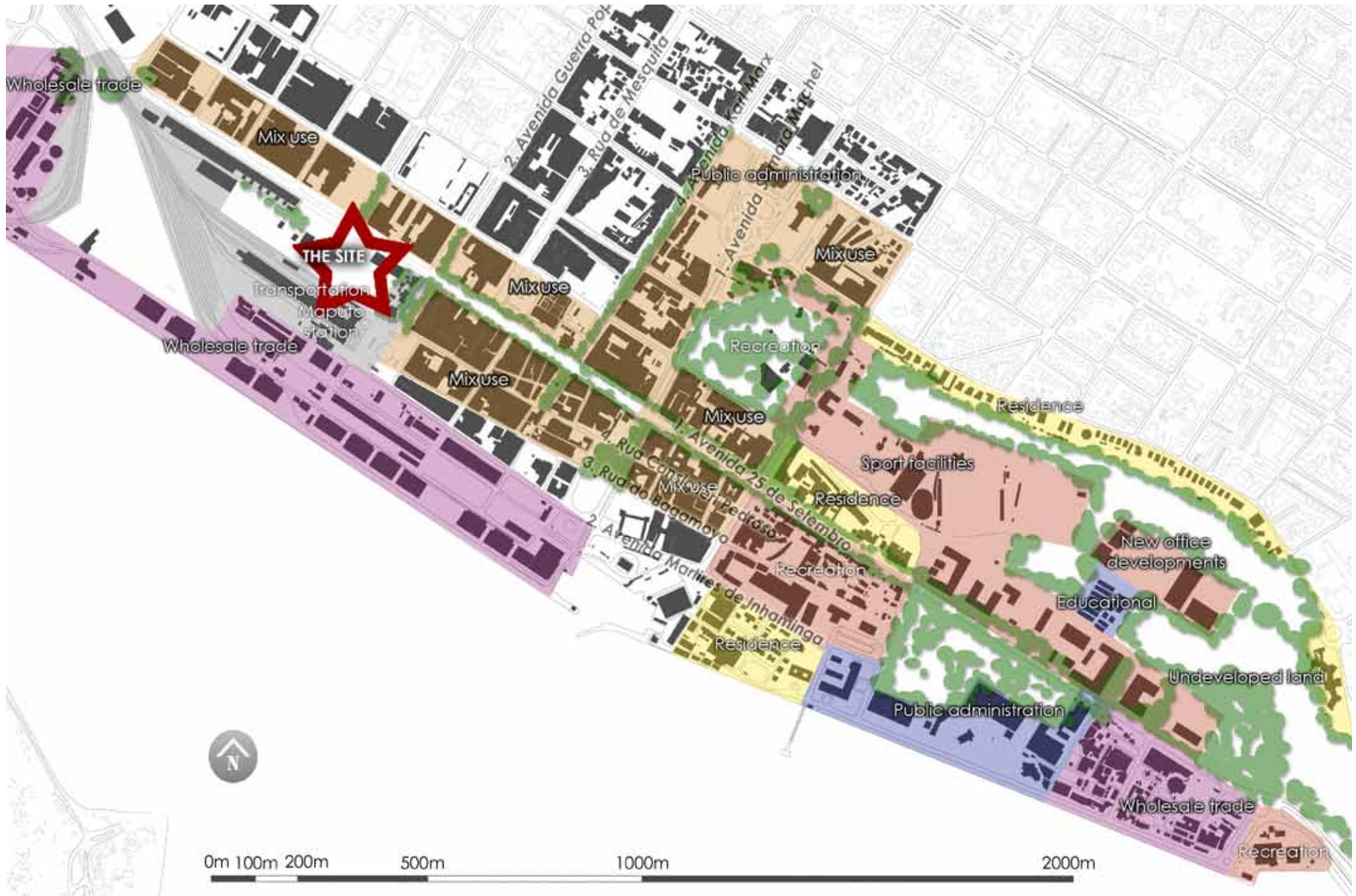


FIGURE 7.5: ZONES IN THE STUDY AREA (AUTHOR 2011)

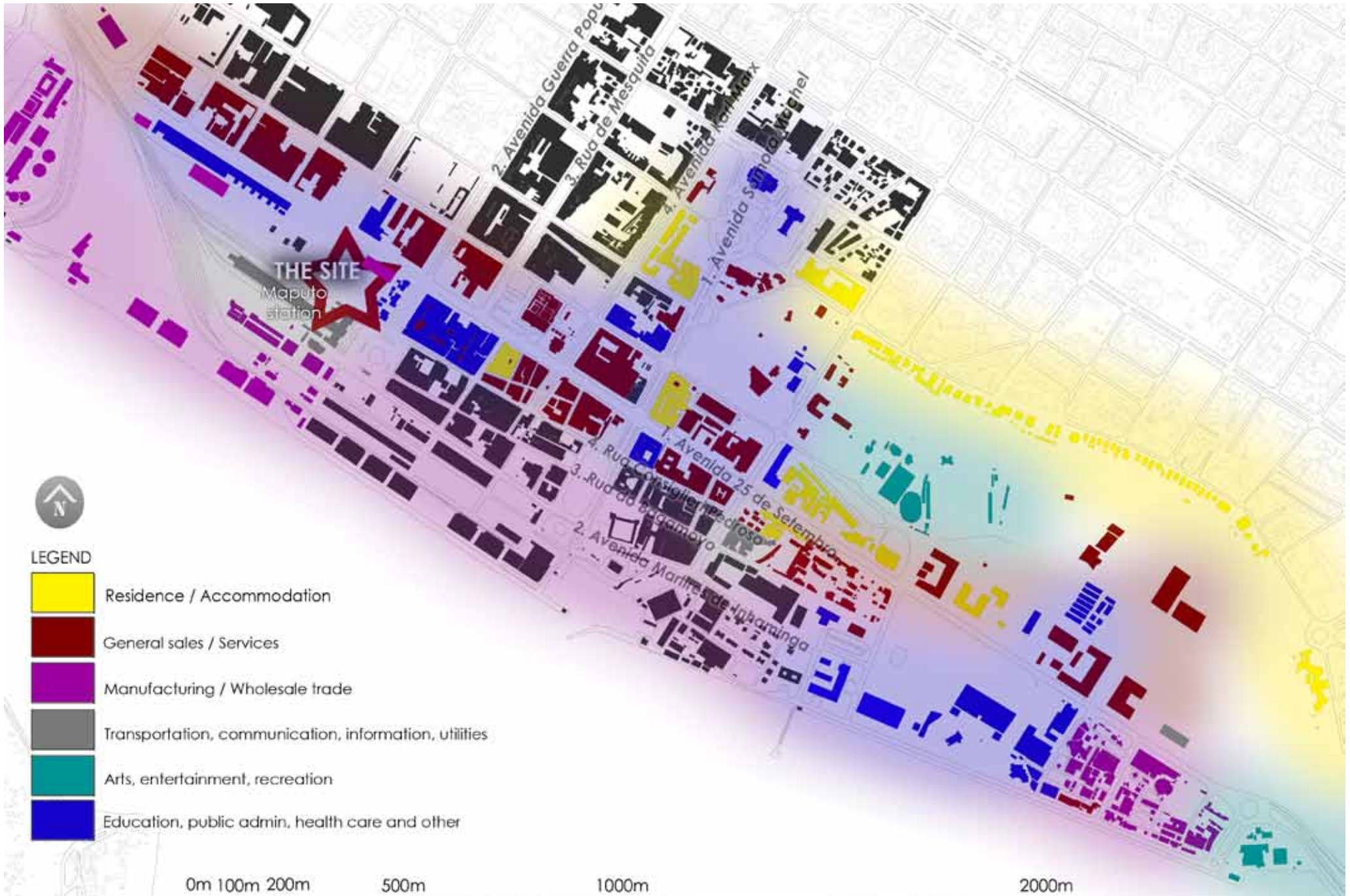


FIGURE 7.6: BUILDING OCCUPANCY IN STUDY AREA (not to scale) (AUTHOR 2011)

## 7.2 SITE ZONING

Figure 7.7 illustrates the zoning on-site (a section of Avenida 25 de Setembro and the open site to the north of the station).

The immediate zoning along the site includes the following uses in regard to:

Business (Private):

- Motor services
- Institutions
- Council/Government
- Offices
- Warehouses
- Industrial
- Parking
- Offices
- Residential
- Sales
- Ruins
- Banks and services
- Retail
- Vehicle retail
- Café and refreshments
- Privately owned space

Public space zoning:

- Public square
- Street and side streets
- Central station
- Informal vendor stands
- Central market

The proposed site will be zoned as a “public space”.



FIGURE 7.7: ZONING DIAGRAM WITHIN THE SITE(AUTHOR, 2011)

### 7.3 RESTRICTIONS AND SERVICES

Figure 7.8 indicates a summary of the site services and restrictions (Figures 7.9-7.11), acting on the site and its environment. It shows the current storm-water network (pipe system) that discharges into Maputo Bay. The sewage lines (also a piped system), leads toward the north of the city for treatment, although a certain amount exists into the bay (Cassimo, 2011).

Mozambique, Maputo is the only city with a central sewage system for collection and treatment of domestic sewage. However, it is estimated that only 50% of Maputo's sewage is treated. The rest of the population use septic tanks and pit latrines. Maputo area produces 71% of the total domestic sewage.

The sewage is emptied into rivers that flow into Maputo Bay. Studies in the bay have revealed that faecal coliforms, faecal streptococci and *Escherichia coli* were detected in marine water and shellfish tissues. Pathogens causing severe gastro-intestinal illness were also isolated from clams collected in different areas of the bay. An increase on the levels of total and faecal coliforms was reported from 1968 to 1996 in the Maputo Bay. As a result some areas are not safe for swimming. The city of Maputo produces about 4,3 million tonnes of solid waste per year (Mmochi & Francis, n.d).

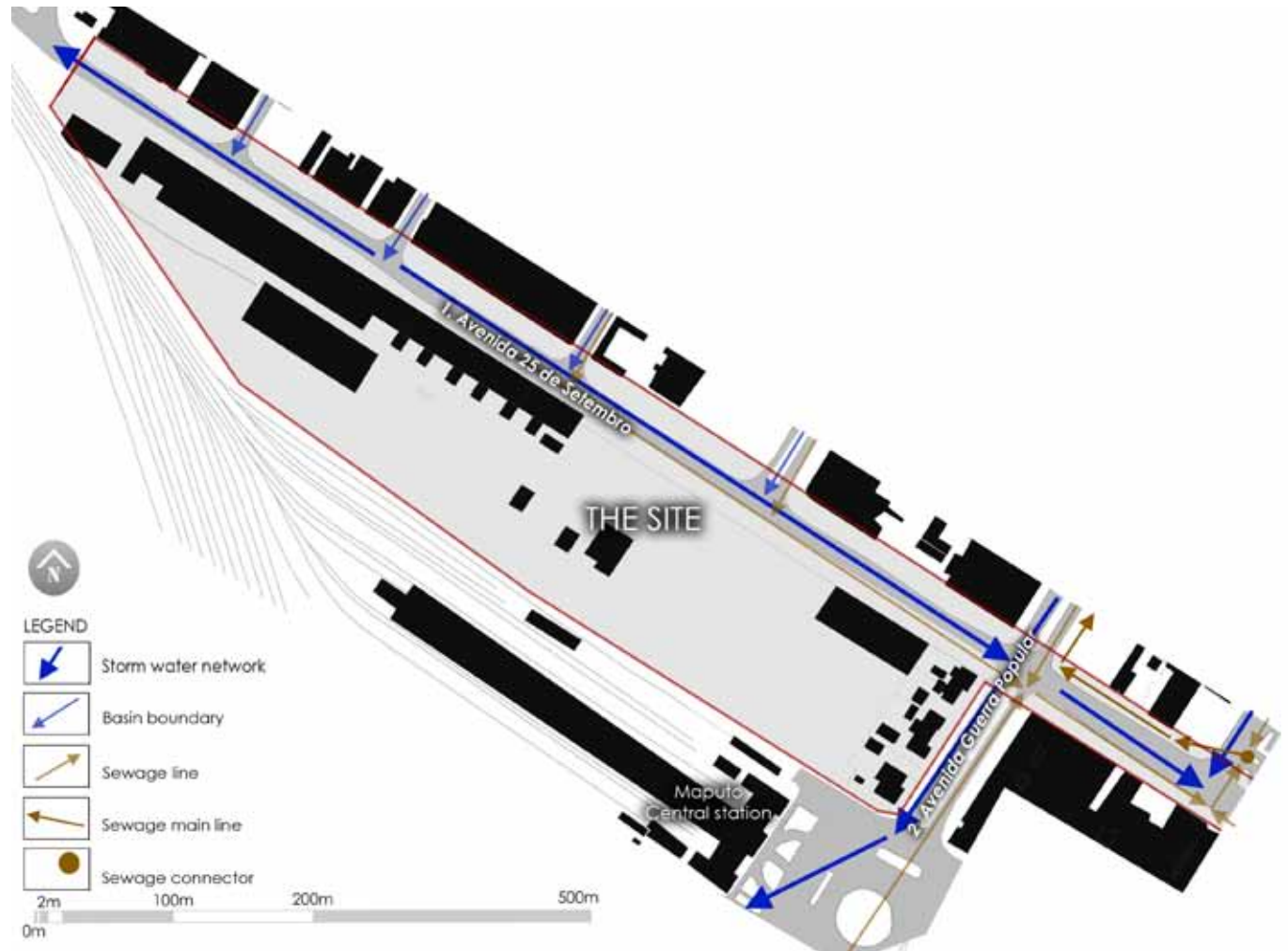


FIGURE 7.8: SITE SERVICES AND RESTRICTIONS ON PROPOSED SITE (AUTHOR, 2011)



FIGURE 7.9: BAIXA CITY SCALE SEWAGE & STORM-WATER MAP (CASSIMO, 2011)



FIGURE 7.10: BAIXA SEWAGE MANAGEMENT MAP (CASSIMO, 2011)



FIGURE 7.11: BAIXA STORM-WATER MANAGEMENT MAP (CASSIMO, 2011)



## 7.4 SITE EXPLORATION

Figure 7.12 (imagery) shows a collection of images and photographs of textures and colours in the study area. It illustrates the relevant experience, characteristics and impressions of the site and its environment. It is felt to express a layer of its rich colonial history and brings forth the rich cultural elements of the time.

Additionally, it adds to the character and unique identity of the *Baixa*, and seems to have joined well with the current social environment. All these layers joined, creates a strong contrast in perspective of what there was, and what there is now. All additions add to the current vibrant, *Baixa* identity.



FIGURE 7.12: SITE EXPLORATION (THE FRAMEWORK)





## 7.5 SLOPE ANALYSIS

In general, the proposed site is extremely flat (Figure 7.15). According to the historical layer, the reason for the flatness is due to the fillings done in the early nineteenth century. The soil type is alluvial deposit (Vicente et. al, 2006).

According to analysis done, it is calculated that the entire site has a slope ranging from 0% to 0.3%. In a study on the contour map, as measured by the author and the other students, it becomes clear that the street has its lowest points at intersections along Avenida 25 de Setembro.

To conclude, the situation causes a “water-bowl effect”, in which water will accumulate at these points. Water will collect at these points, before “spilling” to surrounding areas (see Chapter 4).

Some of the contours in the study area (especially

towards the west), are estimated due to a lack of accessibility. Estimation was done via a continuation of the relative known contour height and then adjusted accordingly. The 4,000 mm contour (i.e. > 4 m above sea level) in Figure 7.14 was measured to be the absolute lowest point in the *Baixa* and for that reason it is an important role player in site selection.

From the site, the site slopes:

- Gradually upward towards the west.
- Steep upward toward the north.
- No slope to the east (Avenida 25 de Setembro).
- Gradual upward to the west (Avenida 25 de Setembro).

FIGURE 7.13: CORNER OF AVENIDA GUERRA POPULAR (α) AND CORNER OF AVENIDA 25 DE SETEMBRO - THE SITE (ZONDERLAND, 2011) (α) ON FIGURE 7.15

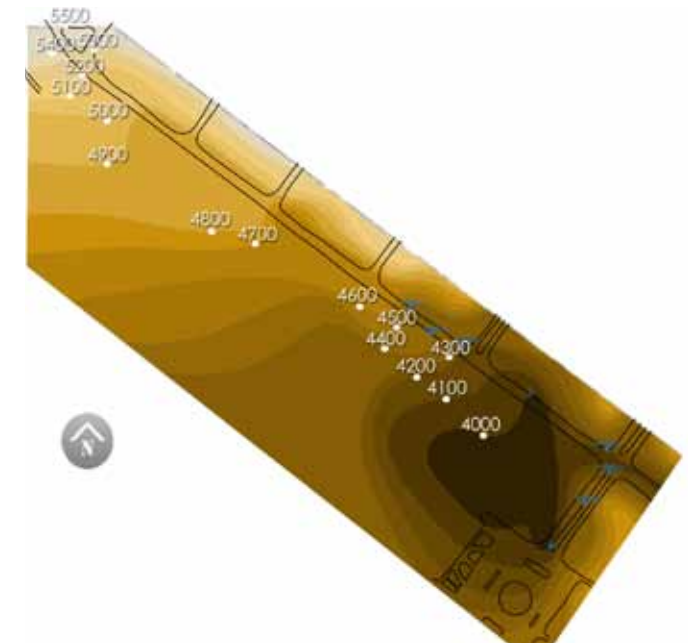


FIGURE 7.14: CONTOURS AND HEIGHTS IN COLOUR (AUTHOR, 2011)



FIGURE 7.15: CONTOURS AND SLOPE GRADIENT ON THE SITE (AUTHOR, 2011)



FIGURE 7.16: INTERSECTION OF AVENIDA 25 DE SETEMBRO AND AVENIDA GUERRA POPULAR (b) (AUTHOR, 2011) (b) ON FIGURE 7.17

## 7.6 VEGETATION ON SITE

The streetscape is general hard urban-surfaced area and consists of paved sidewalks, tarred streets and high-rise buildings. Patches of tree planting occur along the street (Figure 7.17). The original tree selection, being exotic species, was probably done in colonial times.

Generally the streets have the largest percentage of trees, in relation to other parts in the *Baixa*. Some private stores and services introduced neatly kept planter boxes, or planting around existing trees. Trees allow valuable shade for pedestrians and informal traders along the street.

In the framework analysis it was evident that *Avenida 25 de Setembro* is the street with the most pedestrian and vehicular movement. For this reason, the formal and informal sidewalks are more neatly kept.

The negative is that there is a minimum of new trees being planted and the existing trees are maintained

and trimmed incorrectly. The project would thus allow for further introduction of trees along the street, as well as an introduction of a management plan.

It is interesting to note that in the vicinity there are no tree grids installed around tree bases. This might be introduced, if managed, but will lead to litter accumulation. It is felt that grids (in whichever case), should be used to the minimum. As another option, a layer of gravel can be introduced to allow for sufficient water and air filtration. The project site, on the contrary, is completely covered and consists mainly of wild grass with a scattering of fig trees. It is decided that this site allows for the introduction of new trees in the projected scheme.

The private *CFM* offices (to the east of the site, facing *Avenida Guerra Popular*) consist of neatly kept gardens. This is due to the fact that it is fenced off and under private care.

In general terms, it seems that exotic plants (with bright flowers and coloured leaves), thrive well in the subtropical climate of Maputo and add to the unique city character.

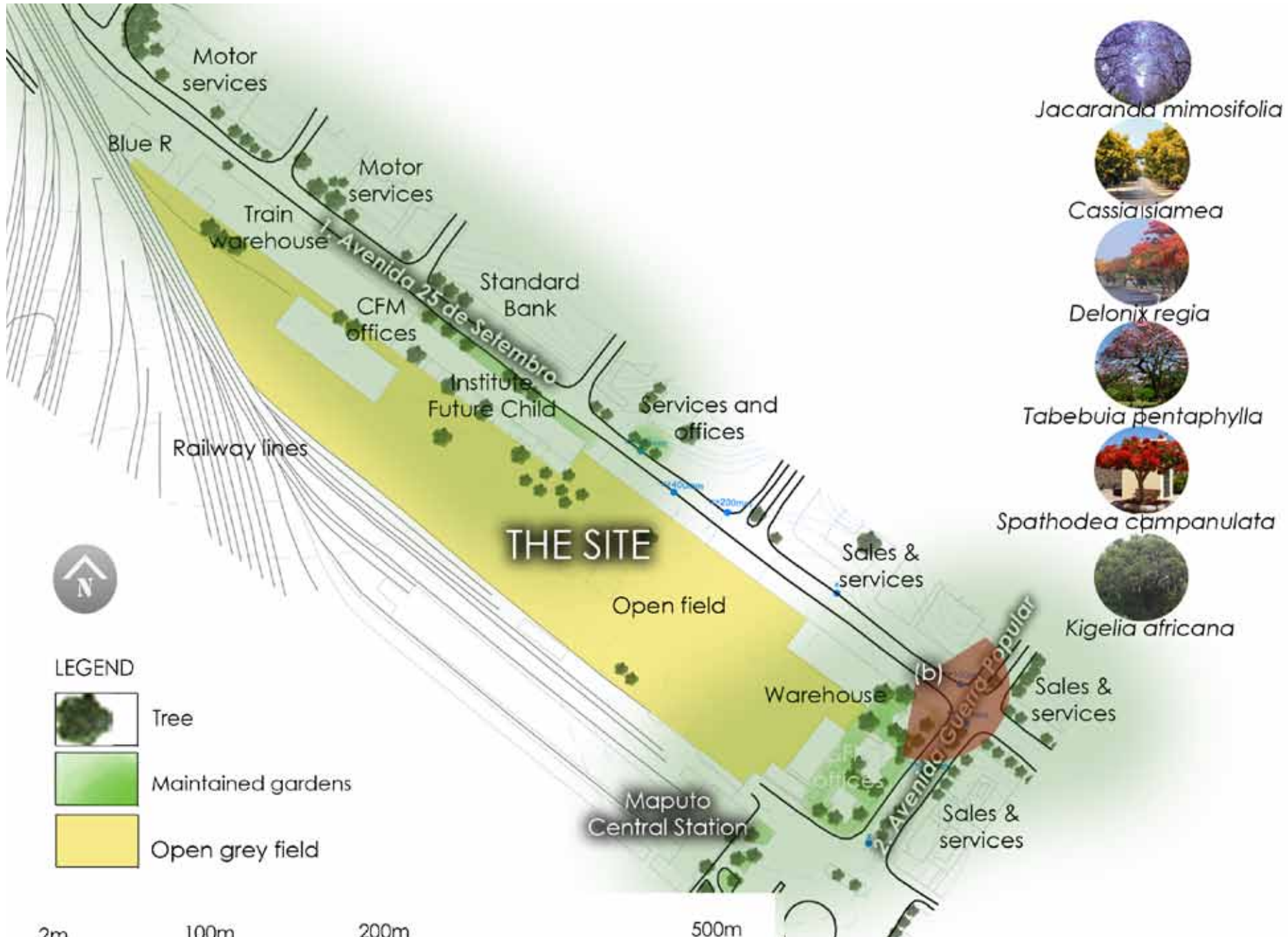


FIGURE 7.17: CURRENT TREES AND GREEN SPACES ON SITE (AUTHOR, 2011)



FIGURE 7.18: VIEW OF THE SITE FROM AVENIDA 25 DE SETEMBRO(c) (AUTHOR, 2011) (c) ON FIGURE 7.20

## 7.7 USE AND SURFACES

As mentioned previously, there is a strong contrast between the two zones within the site in terms of use and surface cover (*Heading 7.6: Vegetation on site*).

*Avenida 25 de Setembro* is in general a continuation of the *Baixa's* hard urban surface and impermeable land cover (Figure 7.20). This results in a high run-off coefficient, which causes a larger amount of water to flow faster upon surfaces within the catchment. The street is characterised by the functionality of buildings with mixed use. The project site, which is allocated to form the largest part of the design, is characterised by an open grass field with scattered ruins within. This area, which is under private use by CFM, is inaccessible to the public.

It is important to develop these sites to encourage green space development and enhance ecological, social and economic aspects within the *Baixa*. It could immediately become a possible area of retreat, relieving the visitor of the hustle and bustle of the hard, historic, fine fabric of the *Baixa*.

Given the context of Maputo and the analysis, it becomes clear to the author that the allocation of a

specific function or programme within the site would not always be accepted or be successful within the public realm. Especially proposing a new kind of intervention in a city like Maputo, could possibly be rejected by the community or intended users.

Failing to attend to this important issue, the project could fall in the same state of decay, similar to that of the city's Botanical Garden. The gardens, although appealing to the author, doesn't seem to receive the same amount of respect from local city users and become another "white-elephant" (Townshend, 2011), as the city's character changed. The social hierarchy in Maputo allows different social classes and different areas to adapt accordingly and this landscape should rather allow for interaction and cultural interchange.

By taking this approach, valuable insight and understanding could possibly become clear, as future landscape interventions are planned. This should serve as criteria for future designs and keep the city's unique, vibrant character and usage patterns.

Open sites and sidewalks are important pedestrian linkages and valuable to everyday functioning. Existing trees and shrubs are not only used for shade, but also used to display items such as sell-

ing and cleaning of material. In the *Baixa*, sidewalks are not only used for pedestrian movement, but also for vehicle washing and parking. Expensive trading stores, together with informal vendors, contribute to the mixed use identity of the area.

Finally, the opportunity should be used to enhance the city life of the daily *Baixa* users. It should not only serve as an urban regeneration and local upgrading agent, but also as a social, economic and environmental mediator. The site should not aim to change or introduce a new way of living in the *Baixa*, but to enhance and find alternative ways of dealing with the issues and to keep the "vibe" intact.



FIGURE 7.19: SAND AND DEBRIS IN AVENIDA 25 DE SETEMBRO (AUTHOR, 2011)

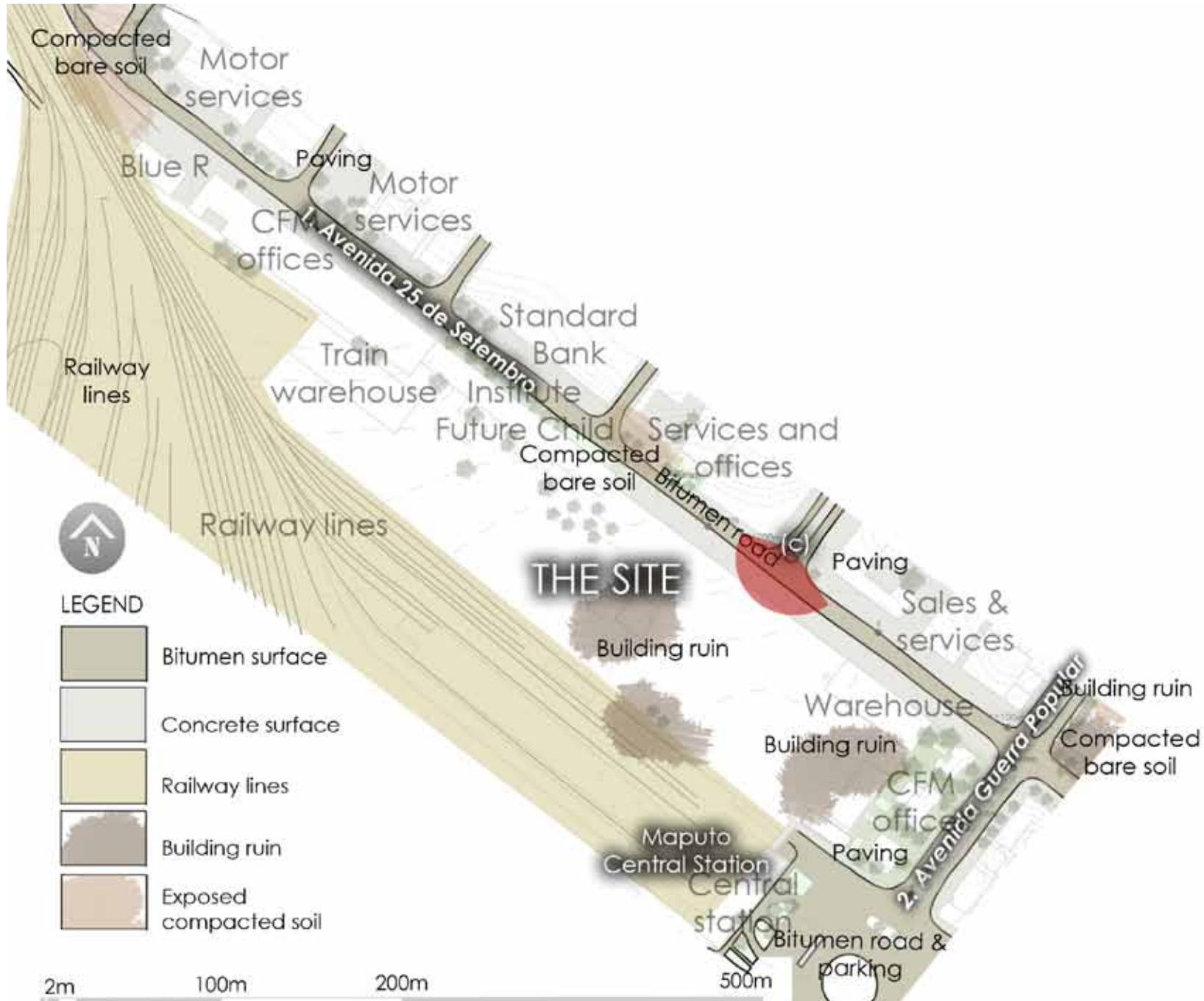


FIGURE 7.20: CURRENT USES AND SURFACES ON THE SITE WITH MAIN MATERIAL COMPOSITION (AUTHOR, 2011)





FIGURE 7.21: AERIAL PHOTOGRAPH OF AVENIDA 25 DE SETEMBRO LEADING TO THE WEST (DEVENISH, 2011)

## 7.8 NOISE, LIMITATIONS AND DANGERS

Identified uses (Noise, limitations and dangers) are illustrated in Figure 7.22.

## 7.9 SUMMARY

The city of Maputo, like many other African cities, has a lack of sufficient green spaces. The city of Libreville, Gabon, is an example of a city experiencing uncontrolled urban development as a result of a shortage of serviced plots, an absence of planning tools and instruments, and a lack of urban space

control. The demand for housing in Libreville stands at approximately 6,000 units per year (with a population of 500,000), and available land for development is minimal (there are 14 hectares of "green spaces" per 10,000 hectares) (UNCHS , 2001).

One of the most important environmental impacts of uncontrolled urbanisation in Central Africa is its spread into fragile ecosystems, including delicate or highly erodible slopes, natural drainage waterways or valleys, and areas that are subject to flooding. Due to the intense competition for space in urban areas, green spaces are rapidly disappearing and areas usually deemed unsuitable for housing are the only refuges available for the urban poor, who are then vulnerable to flooding, landslides, and outbreaks of pests and diseases.

Although planning regulations are in place, they are poorly monitored and enforced. Development in, and modification of, green areas results in changes in biodiversity, risks of pollution of soil and water, changes to soil fertility and stability and, especially in wetland areas or areas where there is standing water due to lack of sanitation, high risk of disease transmission. Dense, unstable, and poorly sited settlements are also vulnerable to the impacts of floods, landslides, and fires (UNEP , 2011).

The proposed system, of which the designed park forms part of, should not only attend to the flooding situation, but also introduce more green spaces and green networks. It is thus ideal to use the system of flood management and in-

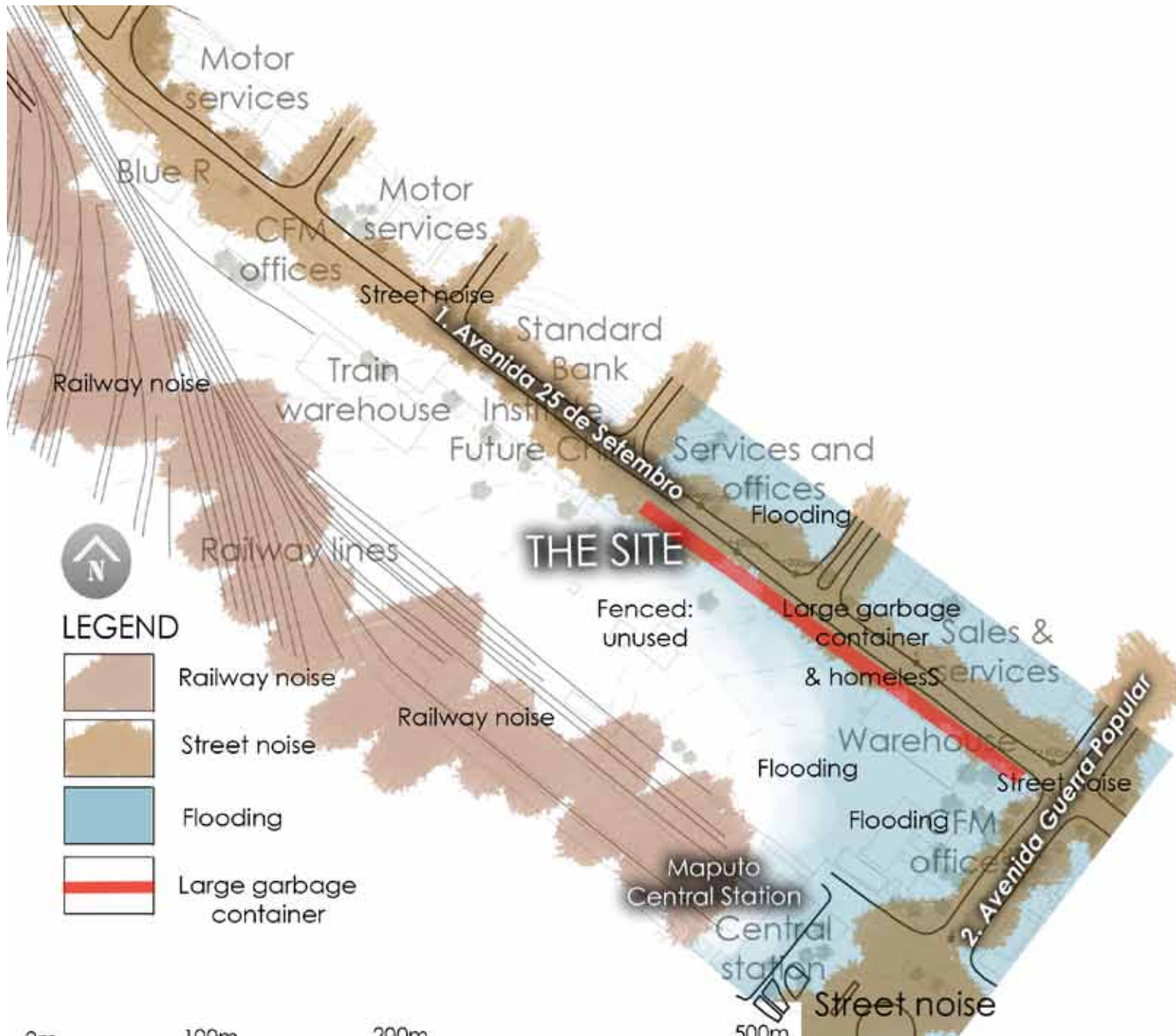


FIGURE 7.22: CURRENT NOISES AND LIMITATIONS ON AND AROUND THE SITE (AUTHOR, 2011)

corporate it with a system of parks in which water can be harvested, and then at the same time be used as a human retreat within the city.

More green spaces can be used to solve these issues and the same time introduce people to the systems of natural function. Through the project, people can be made aware of the ecological, social and economic aspects affecting their city and that sufficient planning need to be implemented by future generations.

Currently, the projected site is not used at all. The initial plan is to expose the important elements acting on the site and make the site an important node

within the city. These elements include movement patterns, making use of existing historical buildings, keeping endemic planting and use of materials. The project could possibly become a place of orientation or a landmark within the city. At the same time the visitor should subsequently be made aware of his or her surroundings on both macro and micro scale. These include the smells from the harbour and bay to the sounds of drums and hooting traffic.

The main focus of *Avenida 25 de Setembro* will be to channel water and act as a threshold to the site. The street would be introduced as a green spine, flowing throughout the *Baixa*. Within this framework, new greens spaces

and development would be able to “plug” in.

## 7.10 CONCLUSION

The proposed system, which the designed park forms part of, should not only address to the flooding situation, but should also introduce more green spaces. It is thus ideal to use the system of flood management and incorporate it with a system of parks in which water can be harvested, and then at the same time be used for human retreat within the city.

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FIGURE 8.1: PRACA 25 DE JUNHO (25 JUNE SQUARE) (DEVENISH, 2011)

# CHAPTER 8\_

## THEORY APPLICATION: DESIGN DEVELOPMENT

## 8.1 INTRODUCTION TO SITE SELECTION

In context of the design procedure, a whole range of options and alternatives was tested and analysed during the design process.

### 8.1.1 CITY SCALE STRATEGY: A

As first option, the site at the waterfront illustrated as "Area a" in Figure 8.3 was investigated.

The site, currently the existing harbour storage area, consists mainly of warehouses, offices and a large open, hard surface.

The original idea was to create an urban park for the *Baixa* which would act as the "Central Park" of Maputo (similar to Central Park in New York, United States of America by designer, *Olmstead*). It was planned that the site would make use of the proposed *Rambla's* system to catch storm and flood water. Water would then be cleaned and discharged into the Ma-



FIGURE 8.2: VIEW OF MAPUTO FROM THE BAY (AUTHOR, 2011)

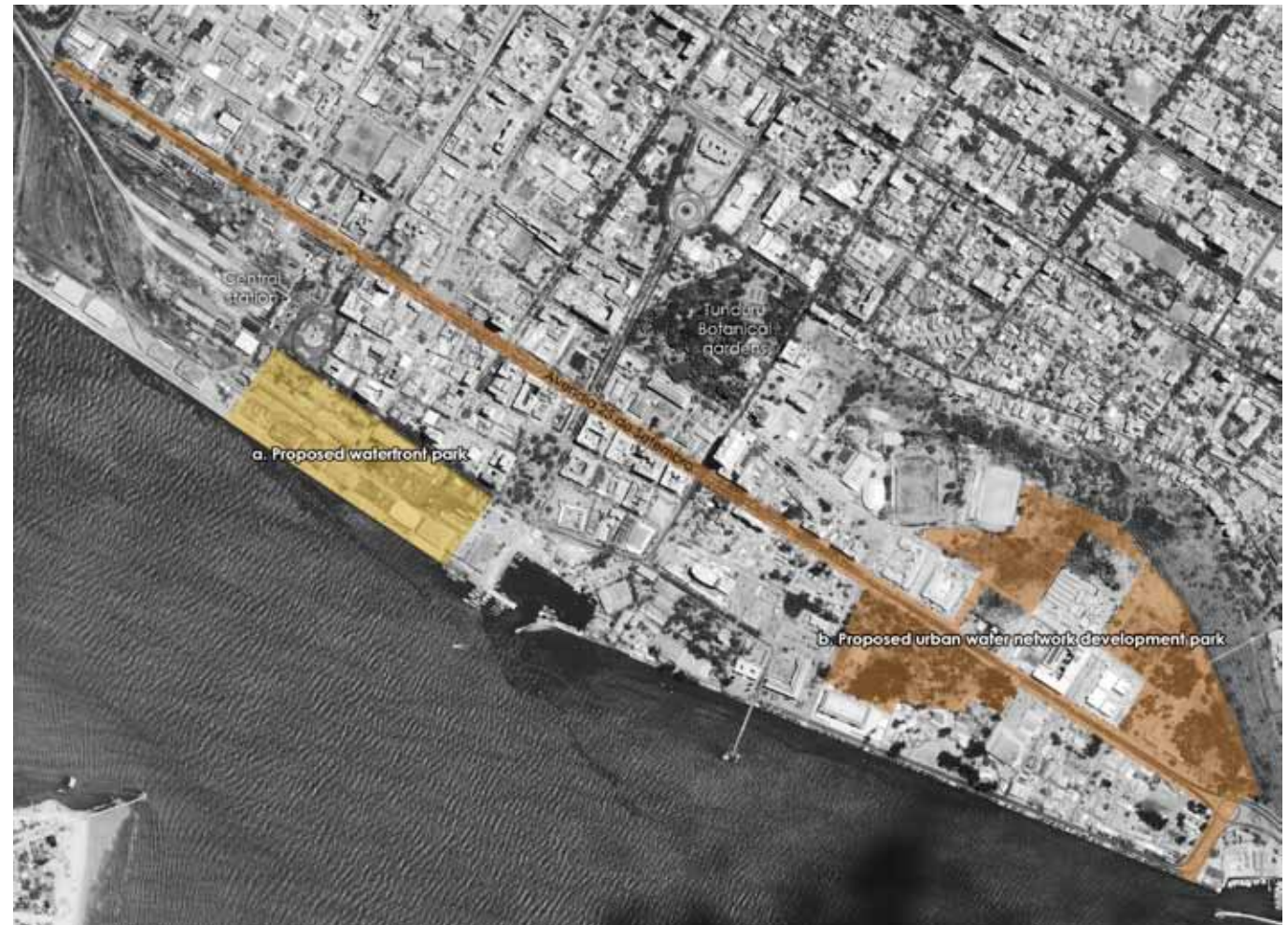


FIGURE 8.3: PREVIOUS SITES CONSIDERED (AUTHOR, 2011)

puto Bay area and simultaneously serve as a recreational and aesthetic element within the inner city. It was later decided to add an ecological layer (Figure 8.5) by creating an intertidal zone and wetland. A layer to introduce a ecological biodiversity into the park and mimic natural processes. The project was reconsidered. Important aspects learned and carried over from this specific intervention were:

- Project should deal with flooding and storm water and utilise it (Figures 8.4 and 8.6).
- Determined that flooding is caused by blocked and insufficient infrastructure.
- The introduction of an ecological layer by making use of elements such as wetlands.
- Keeping the historic layer.
- Addressing the issue of mosquitos by encouraging water movement.
- Adaptive use such as seasonal change and specific programme requirements (Figures 8.7, 8.9 and 8.10).
- Options available in addressing the relative high mean sea-water level (Figure 8.8) which is proposed through pumping water and making use of solar energy.

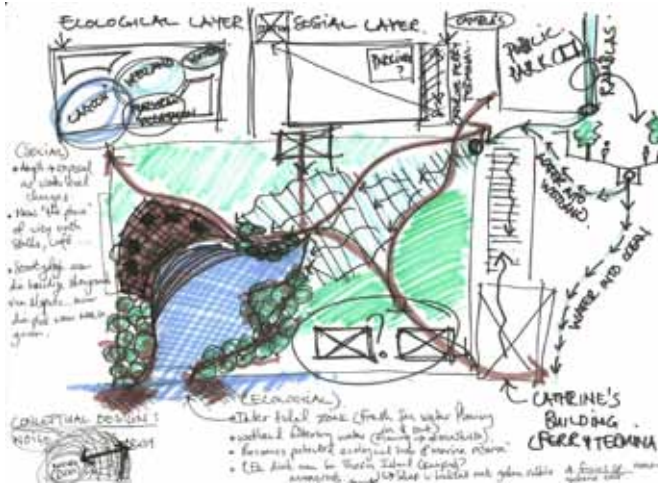


FIGURE 8.5: LAYER DEVELOPMENT AT HARBOUR (AUTHOR, 2011)

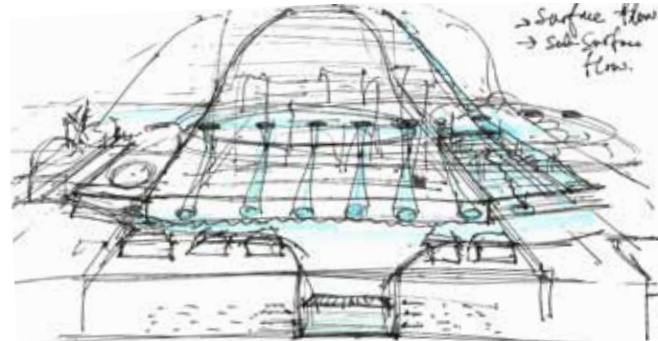


FIGURE 8.6: STORM-WATER MANAGEMENT CONCEPT (AUTHOR, 2011)



FIGURE 8.7: CONCEPTUAL SECTION OF WATER-HOLDING PARK (AUTHOR, 2011)

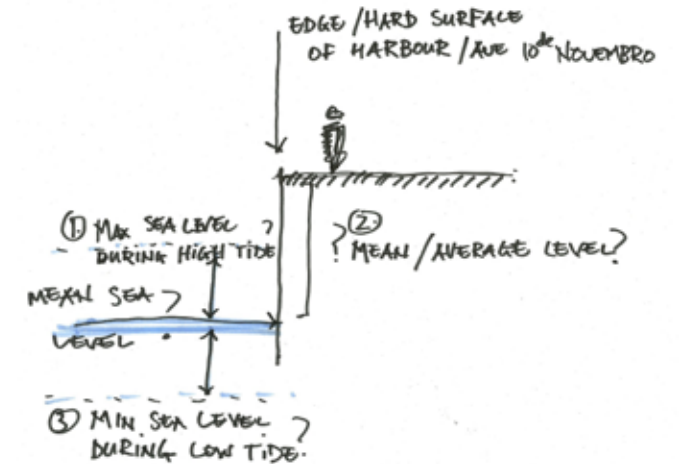


FIGURE 8.8: MEAN SEA WATER LEVEL (AUTHOR, 2011)

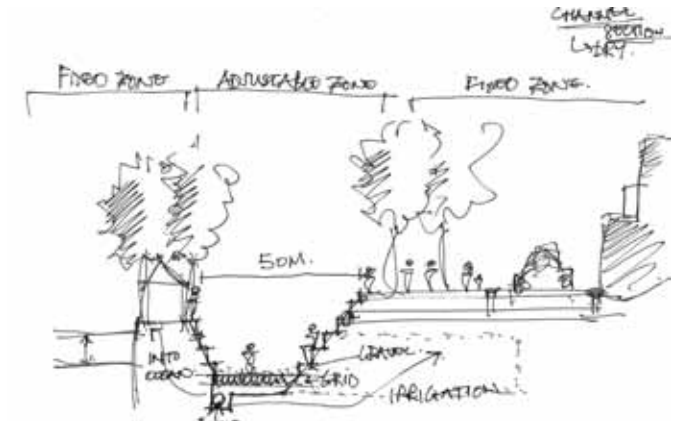


FIGURE 8.9: DRY SEASON PARK USE (AUTHOR, 2011)

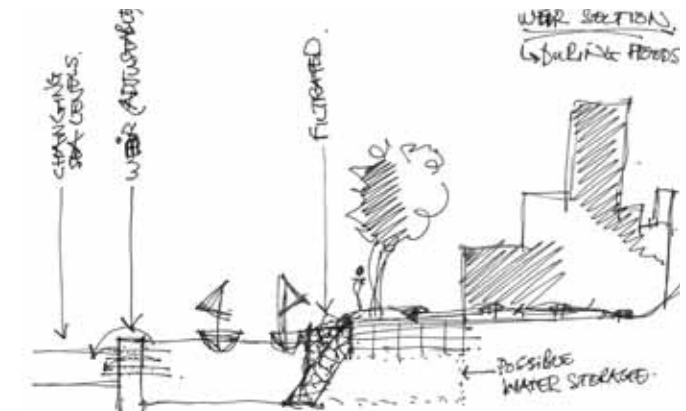


FIGURE 8.10: WET SEASON PARK USE (AUTHOR, 2011)

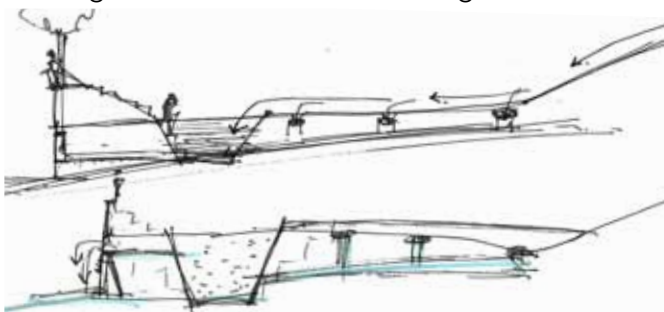


FIGURE 8.4: INITIAL CONCEPTUAL SECTION OF PIPING SYSTEM (AUTHOR, 2011)

Figures 8.11 and 8.12 (see following pages) show the related presentation done on this scheme, earlier in 2011. Although presented earlier in the year, it was a valuable process generator and final design contributor.



# maputo Project regeneration through sustainable landscape

## sustainable sites initiative

### 1. site selection

- urban location & planning history & social change system
- urban morphology
- economic development & planning & infrastructure
- urban growth rate & projection of development
- urban form & building envelope
- urban form & building envelope & use of urban form

### 2. pre-design assessment and planning

- urban & landscape site assessment & urban morphology for the settlement

### 3. water

- urban growth area for the settlement & use of the settlement for the present and future (water, energy & services) & urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form

### 4. soil and vegetation

- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form

### 5. material selection

- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form

### 6. human health & well-being

- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form
- urban form & building envelope & use of urban form

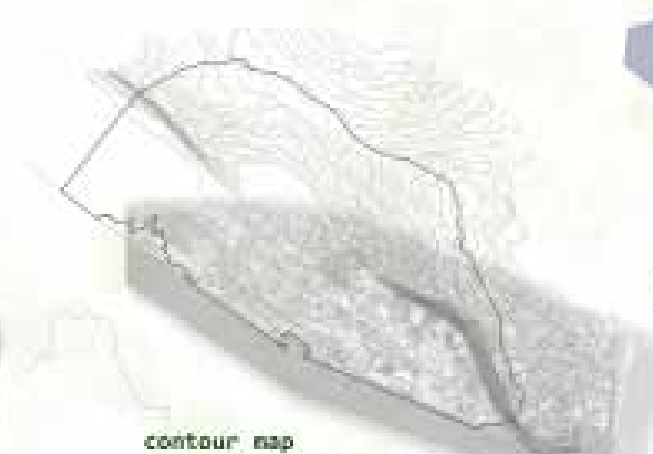
### 7. construction

### 8. operations & maintenance

### 9. monitoring & innovation



The map shows the soil conditions (soil type, depth, etc.) and the topography of the site. It is used to identify areas that are suitable for different types of vegetation and to plan the layout of the site.



The map shows the contours of the site, which are used to determine the slope and to plan the layout of the site.



- water channels & water-holding sites
- water channels & water-holding sites
- water channels & water-holding sites
- water channels & water-holding sites
- water channels & water-holding sites



**current issues**

- lack of green space & urban infrastructure
- poor water & energy services
- air pollution
- poor housing & services
- unemployment

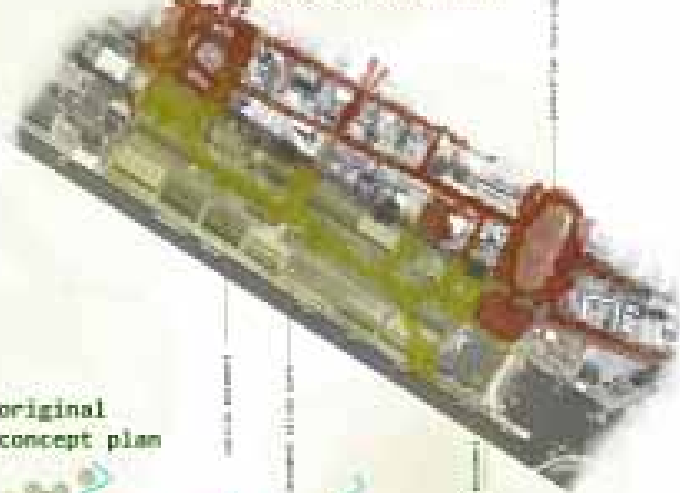


FIGURE 8.11: DESIGN PRESENTATION 1, MILESTONE 2 (AUTHOR, 2011)



# maputo Project regeneration through sustainable landscape

vehicle & pedestrian map



original  
concept plan



client

in 1999, a company was founded in Mozambique to provide infrastructure and urban planning services to the government and private sector.

The company's mission is to provide high-quality infrastructure and urban planning services to the government and private sector. The company's vision is to be a leading provider of infrastructure and urban planning services in Mozambique and the region.



theory



design with nature -  
Ian McHarg

The design process involves a close relationship between the natural and human factors. It is a process of understanding the natural world and its processes, and then using that knowledge to inform the design of the built environment. The goal is to create a landscape that is both functional and beautiful, and that respects the natural world.

an ecological approach -  
Alan Ruff

In order to be successful, the design process must be based on a deep understanding of the natural world and its processes. The following are the key elements of an ecological approach:

1. Understanding the natural world
2. Identifying the natural resources
3. The relationship between the natural world and the built environment
4. The role of the built environment in the natural world
5. The role of the built environment in the natural world



africa

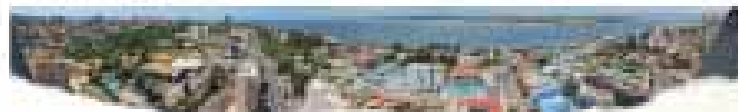
mozambique



maputo blaxo



maputo city



case studies



How does the design process work? It is a process of understanding the natural world and its processes, and then using that knowledge to inform the design of the built environment. The goal is to create a landscape that is both functional and beautiful, and that respects the natural world.

urban and critical to the development of the city. The design process involves a close relationship between the natural and human factors. It is a process of understanding the natural world and its processes, and then using that knowledge to inform the design of the built environment. The goal is to create a landscape that is both functional and beautiful, and that respects the natural world.

precedents

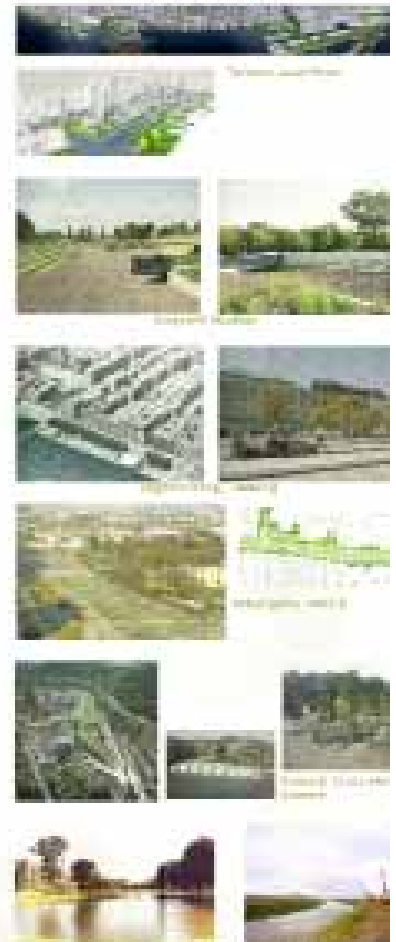
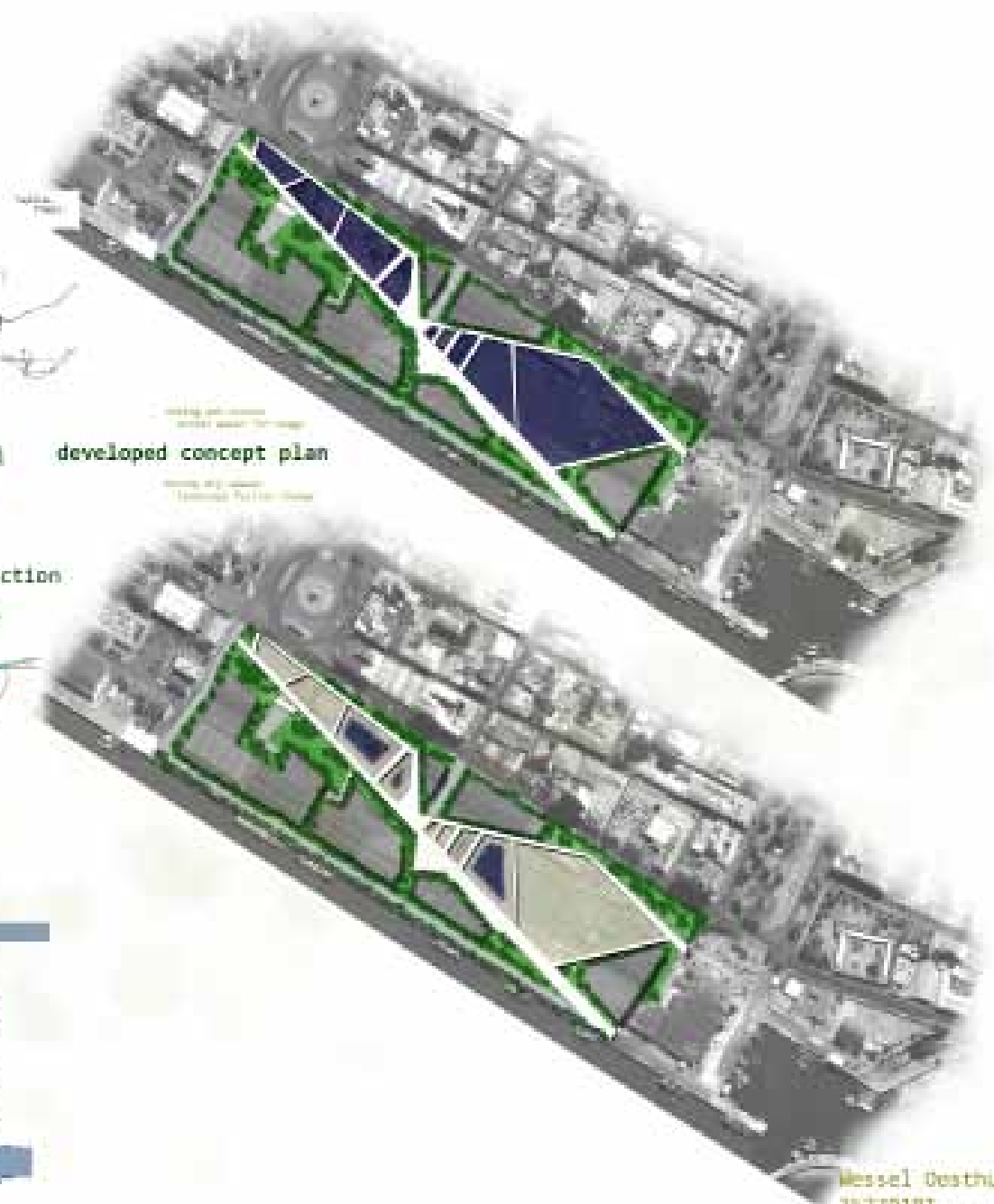
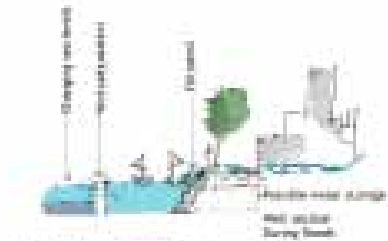


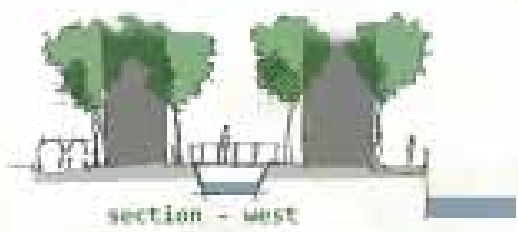
FIGURE 8.12: DESIGN PRESENTATION 2, MILESTONE 2 (AUTHOR, 2011)



developed concept plan

Water to be accepted to fill the water storage tank and...  
 at least 10m wall...  
 at least 10m wall...  
 at least 10m wall...

enough capacity for water section



Messel Oosthuysen  
25279191

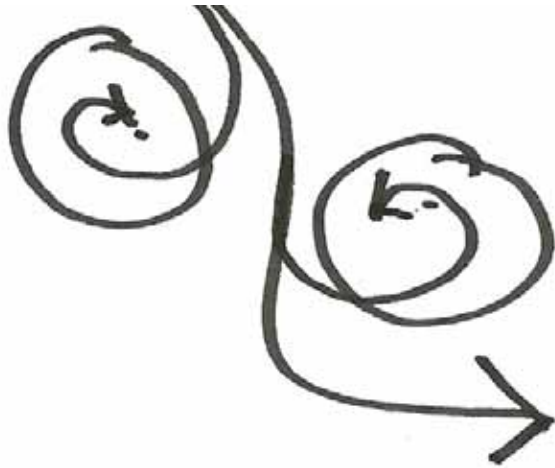


FIGURE 8.13: INITIAL CONCEPT OF REVISION 2 (AUTHOR, 2011)

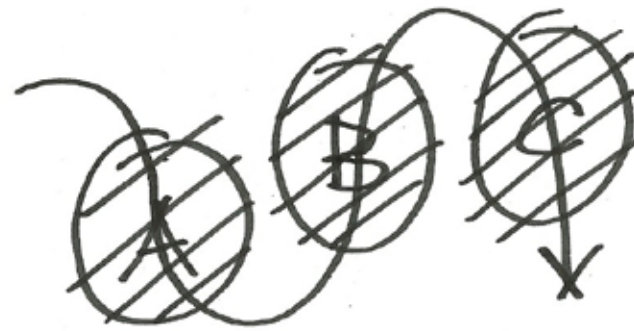


FIGURE 8.14: SECOND INITIAL CONCEPT OF REVISION 2 (AUTHOR, 2011)

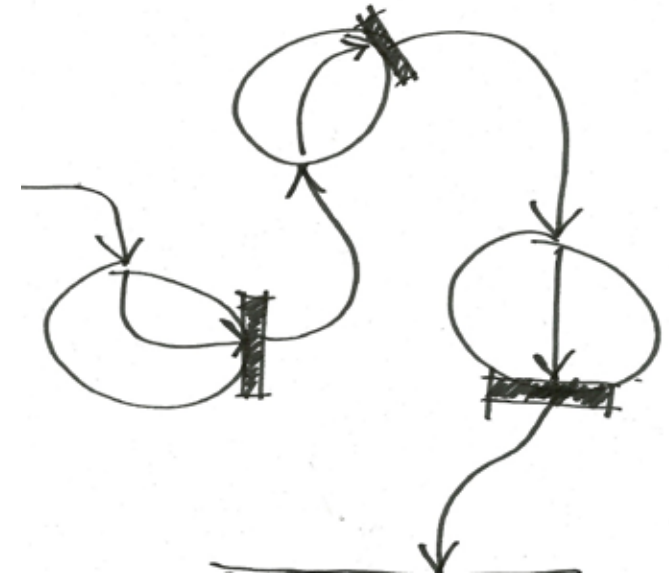


FIGURE 8.15: FINAL CONCEPT OF REVISION 2 (AUTHOR, 2011)

## 8.1.2 CITY SCALE STRATEGY: B

After further investigation it was decided that a better solution to the flooding should be found. The possibility of introducing a larger scaled solution was considered (Figure 8.23).

This proposal derived the possibility of a larger scaled water-retention system and allowed for the originally planned green network to infiltrate. In this intervention proposal, it is planned that water will flow into *Avenida 25 de Setembro* and then be diverted towards the east. Water is proposed to flow through a series of channels, wetlands and retention ponds and the then finally, discharged (Figures 8.13 to 8.15 & 8.22).

The main issue of this approach was height. Height, or the lack thereof, posed the biggest threat to a landscape intervention of this scale. The irregular height difference of the street, the long distance water had to travel and the high water table, served as the biggest issues.

It was estimated that the *Baixa* only had a depth of 3 to 4 meters to work with, given the mean sea level. In addition, the author had the following issues

to deal with: ground water pressure, filtration, the area's flatness, soil fertility and structurally sound soil.

The end result of this revision resulted in the decision to make use of the larger system, but to dissipate the whole into smaller satellite interventions. The concept was kept.

Important aspects that was learned and carried over, was:

- Working on a larger scale to address or lower the flooding problem in the *Baixa*.
- Systematic approach rather than a single intervention.
- Water channels (from streets) should enter sites at a reasonable height below surface. Inlet levels, entering too deep, will make sufficient park and water use difficult.
- Water needs to be cleaned (Figure 8.19 & 8.20).
- The use of an open, fast flowing, water channel that could easily be cleaned and maintained. Minimum use of grids or pipes should be encouraged (Figure 8.18 & 8.21).
- The system should be able to accommodate large water amounts. For

that reason, it was decided to rather make use of the city scale (Figure 8.16 & 8.17).

- A larger scaled water system would introduce the ideal opportunity to encourage green infiltration and allow for new developments to take place around it.

Figure 8.23 (on the following page) shows the presentations done on this relevant proposal.

## 8.1.3 CITY SCALE STRATEGY: C

Figure 8.24 illustrates the next strategy's presentation that was considered. It shows the utilisation of the open site, that later became the final site of intervention.

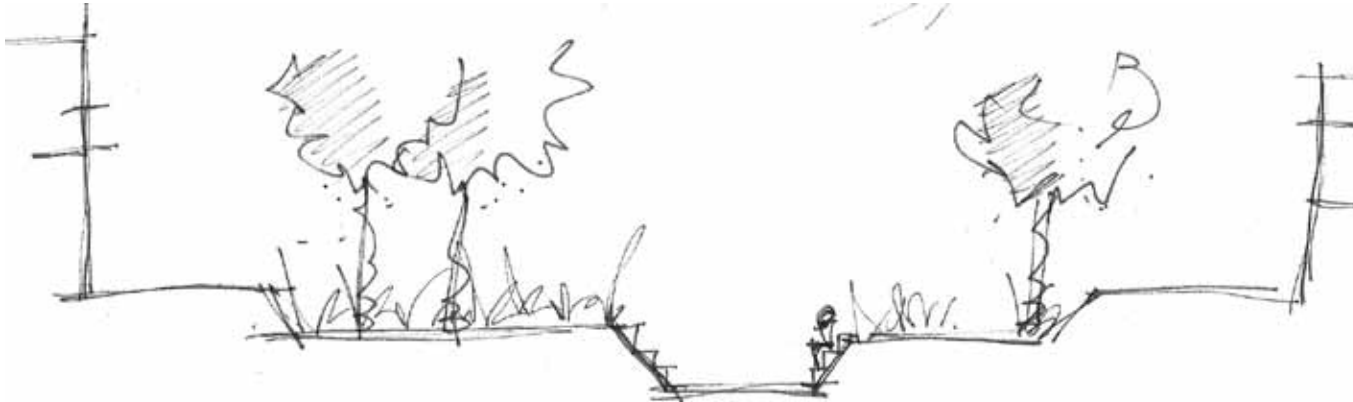


FIGURE 8.16: REVISED WATER PARK SECTION (AUTHOR, 2011)

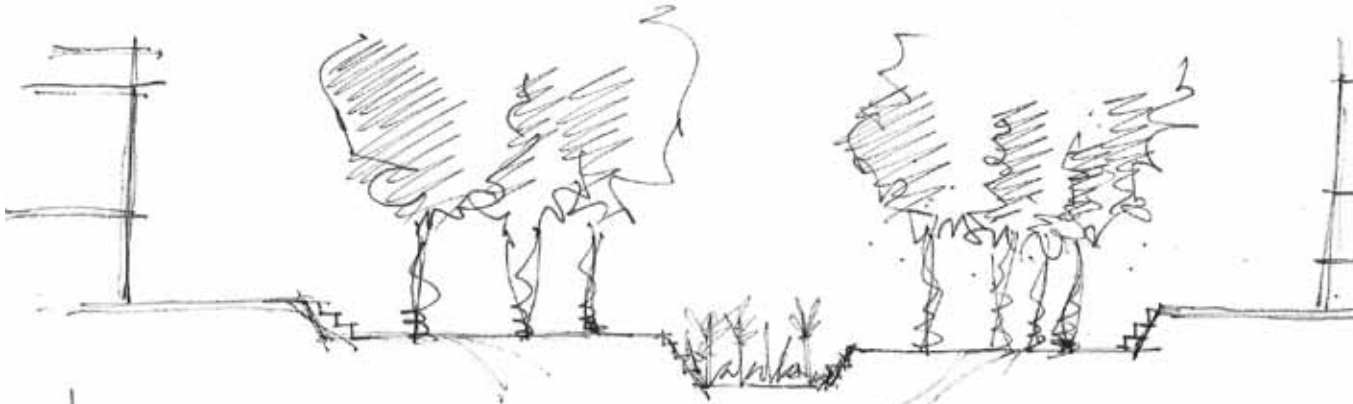


FIGURE 8.17: SECTION OF REVISED WATER PARK - WETLAND (AUTHOR, 2011)

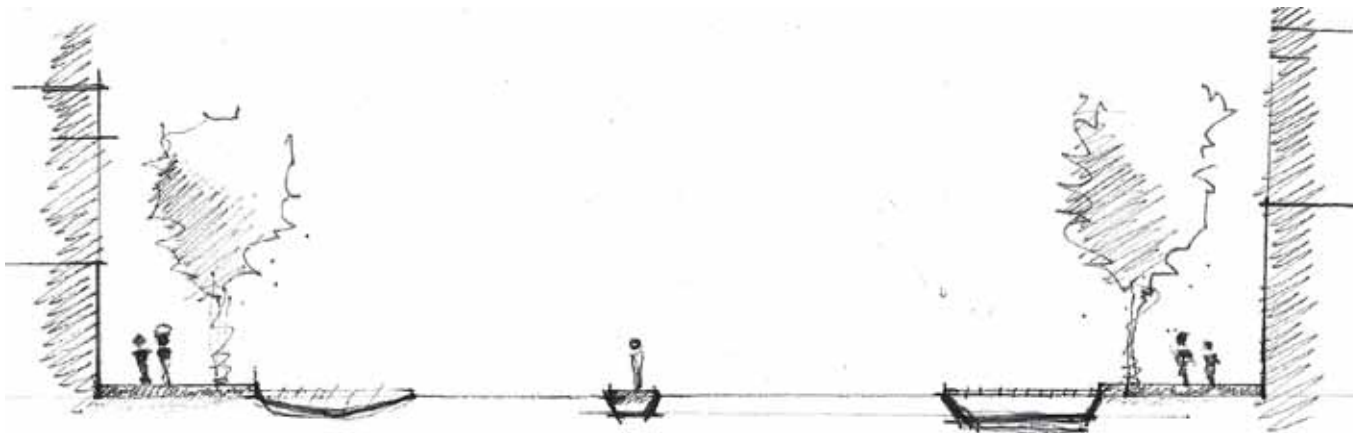


FIGURE 8.18: PROPOSED STREET SECTION OF AVENIDA 25 DE SETEMBRO (AUTHOR, 2011)

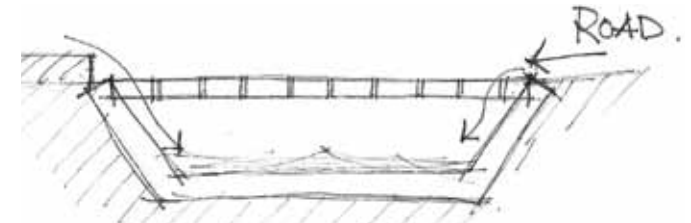


FIGURE 8.19: GRID SYSTEM CURRENTLY IN THE STREET (AUTHOR, 2011)

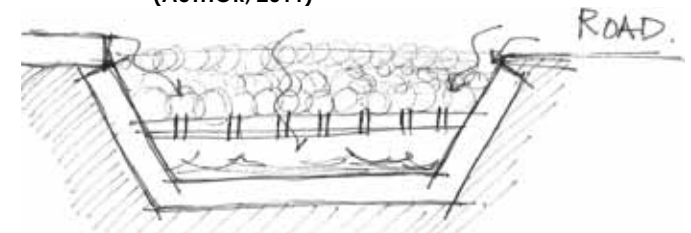


FIGURE 8.20: POSSIBLE CLEANING GRID SYSTEM IN THE STREET (AUTHOR, 2011)



FIGURE 8.21: PROPOSED WATER CHANNEL IN THE STREET (AUTHOR, 2011)

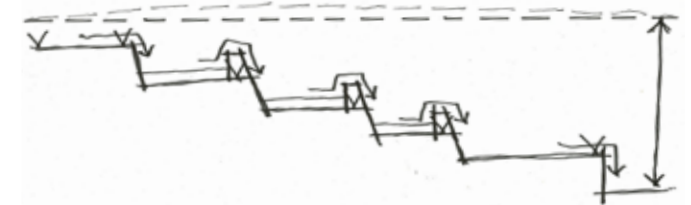


FIGURE 8.22: INITIAL CONCEPTUAL WATER SYSTEM (AUTHOR, 2011)

# introducing the *Baixa*

## Historic overview of the Baixa

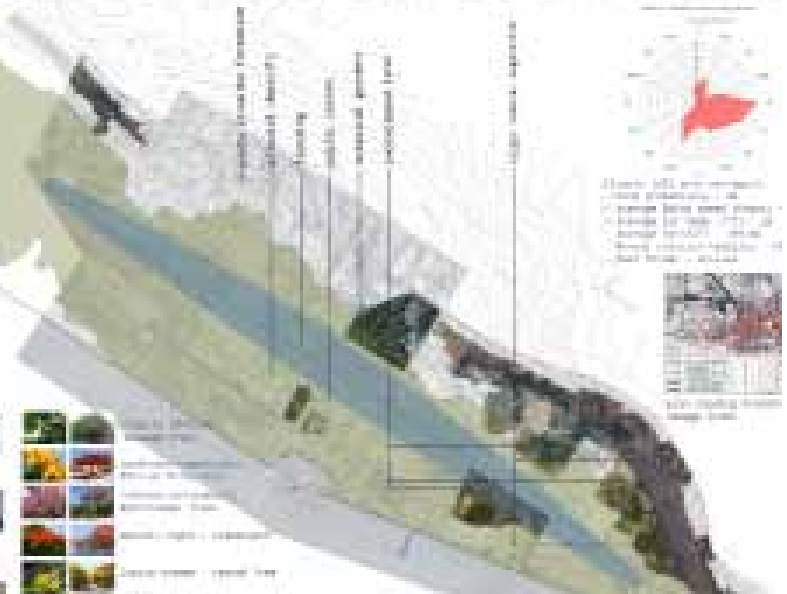


## baixa today

### ecological services

- 1. Green infrastructure: parks, green roofs, urban forests
- 2. Water management: rainwater harvesting, permeable pavements, green roofs
- 3. Air quality: urban forests, green roofs, permeable pavements
- 4. Noise reduction: urban forests, green roofs, permeable pavements

The urban form of the Baixa is a result of a long history of urban development. The area is characterized by its dense, multi-story buildings and narrow streets. The Baixa is a key part of the city's identity and is a major center of commerce and culture. The project aims to improve the Baixa's ecological services and to create a more sustainable and livable urban environment.



*baixa* project  
redefining *maputo* downtown  
through sustainable landscape



FIGURE 8.23: DESIGN PRESENTATION 1, MILESTONE 3 (AUTHOR, 2011)

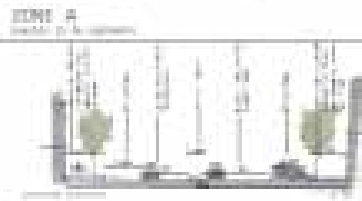
study area



parti drawing



concept



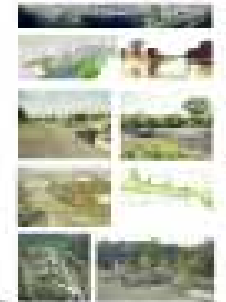
ZONE B-D

Urban Regeneration and Development



urban infrastructure

- 1. flooding
- 2. urban regeneration/development



1. Flooded infrastructure and urban regeneration and development of infrastructure of urban area

2. Urban regeneration and development of urban area

3. Urban regeneration and development of urban area

4. Urban regeneration and development of urban area

5. Urban regeneration and development of urban area

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15. Urban regeneration and development of urban area

16. Urban regeneration and development of urban area

17. Urban regeneration and development of urban area

18. Urban regeneration and development of urban area

19. Urban regeneration and development of urban area

20. Urban regeneration and development of urban area





Introducing the **Baixa**  
redefining Maputo downtown



Baixa during floods



FIGURE 8.24: DESIGN PRESENTATION 1, MILESTONE 4 (AUTHOR, 2011)  
106



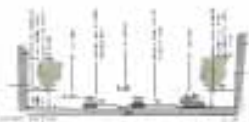
urban infrastructure

1. Flooding
2. urban regeneration/development

AVENIDA 25 DE SETEMBRO



TYPICAL CONSTRUCTION - 100m



1. address current issues:
  - Rain
  - Grid

2. Hierarchy / importance of elements:
  - Pedestrians & Traffic efficiency
  - water control
  - Parking

3. Reducing the cost:
  - Better tree placement
  - Low wall cost
  - REAR foundation cutbacks
  - Street section groups for treatment
  - Space to attract to responsible premises
  - Street sweeping
  - Commercial & industrial packaging
  - Water sold will be option
  - Create jobs through rubber collector
  - Area mapping

urban sketch plan  
1 : 1 500

## 8.2 CITY-WIDE SCALE PROCESS

The area of catchment and quantities of water, made it compulsory to add more water-holding sites to the system (Figure 8.25). Due to time and technical constraints a single, proposed site was chosen. This site would then act as a precedent to the other sites identified.

## 8.3 CITY-WIDE SCALE DESIGN GENERATORS

The following elements shaped the design:

- The storage of water and the systematic approach flooded street water and the treatment of it.
- Its location on the *Baixa* edge, centrally located between the central train station and the developing West.
- Contemporary, innovative and regenerative qualities adding to the upliftment of the region.
- Versatility and adaptive properties.

Now that a more defined problem was identified and design-specific solution was in progress, a city scale intervention could be weighed and tested.

## 8.4 CITY-WIDE SCALE PARTI DIAGRAM

The original *parti* diagram illustrated in Figure 8.26 conceptually shows the original intention of a green spine that originates at the ridge to the east and flows and dissipates into the *Baixa*.

The revised and final *parti* diagram, as illustrated in Figure 8.27 shows the developed thinking into the current situation and what possibly could be achieved. It illustrates the current situation that was identified and how the city separated the natural elements, which include greenery and public spaces. It is proposed that nature should rather interchange with the urban elements, than be divided.

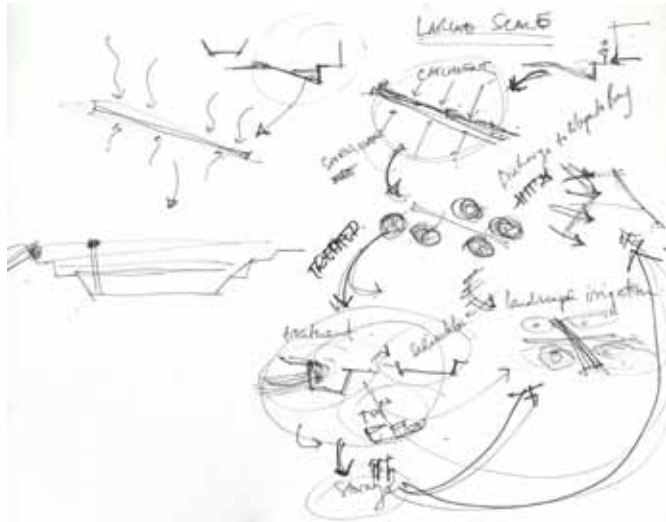


FIGURE 8.25: CITY SCALE INITIAL PARTI DIAGRAM (AUTHOR, 2011)

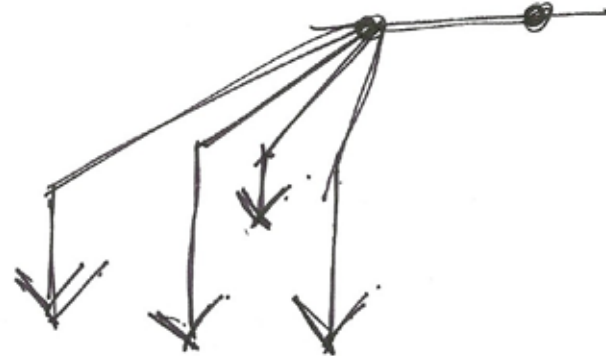


FIGURE 8.26: CITY SCALE INITIAL PARTI DIAGRAM (2), (AUTHOR, 2011)

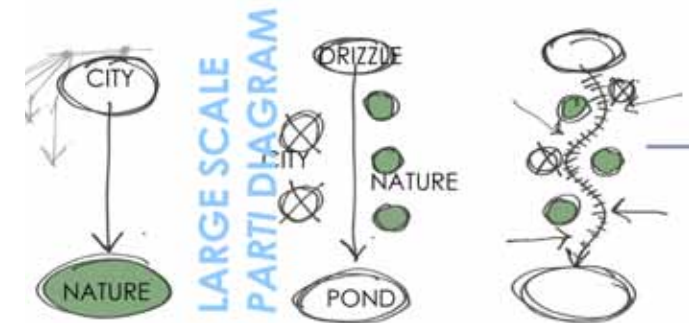


FIGURE 8.27: CITY SCALE FINAL PARTI DIAGRAM (AUTHOR, 2011)

## 8.5 FINAL CITY-WIDE SCALE PLAN

Figure 8.28 illustrates the finalised water strategy plan.

Problems solved:

- Large amounts of water to be allocated to different locations.
- Water not travelling unrealistic, long distances. Shorter travelling distances between the different water-holding sites,

will allow for more accurate water accumulation and a lower gradient water channel.

- Larger system to introduce a green network.
- Interventions can be interlinked to allow for overflow of water into other sites. Excess will be discharged into the ocean after use.
- Different sites will have different individual identities and characteristics, according to their surrounding

environment. The proposed site will consist of a wetland, while other interventions might not require one as sediment could be used for agricultural purposes.

In summary, the images presented in Figures 8.29, 8.30 and 8.31 show the city scale, design process that lead to the final city scale strategy.

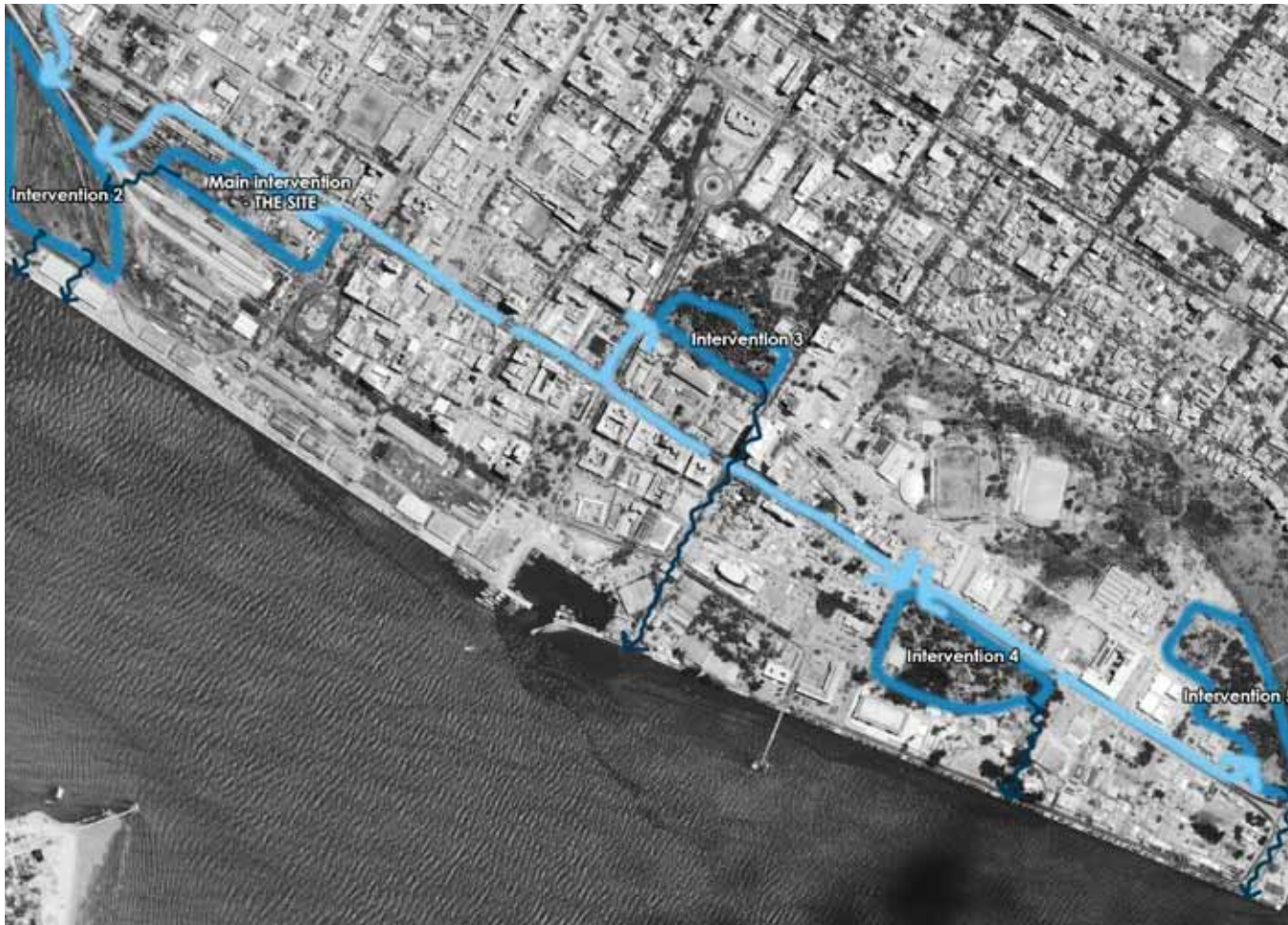


FIGURE 8.28: CITY SCALE FINAL REVISION (not to scale) (AUTHOR, 2011)

### 8.5.1 CITY-WIDE SCALE REVISION 1

Figure 8.29 depicts Revision 1. The proposed *Rambla* project along *Avenida Samora Machel* could be revised to transport water via a surfaced or sub-surfaced system. Water would then enter the proposed intervention at the harbour, be cleaned, utilised and discharged.

The problems that were encountered:

- Not addressing the water problem.
- Inadequate location for water harvesting.
- Insufficient subsurface (section of site is built on poles).

### 8.5.2 CITY-WIDE SCALE REVISION 2

A systematic approach was taken to reach Revision 2 (depicted in Figure 8.30). Water along *Avenida 25 de Setembro* will be channelled along the street.



FIGURE 8.29: CITY SCALE REVISION 1 (AUTHOR, 2011)

The parking along the street area would be alternated to become water channels, but will also keep its function as parking bays. The sidewalks and streets will be kept as is currently, but a sloped channel will allow water to flow through a series of dams. Water would be cleaned, harvested and discharged.

Problems that were encountered:

- The steep slope along the north-eastern boundary of Intervention 2 will cause the channel to enter the site at a too deep level.
- Water has to travel too long a distance still using a flat gradient, water will enter the sites at a level too deep. It was calculated that water will enter the site at the main intervention at 3 meters below surface.
- One channel would be insufficient for the water volumes.



FIGURE 8.30: CITY SCALE REVISION 2 (AUTHOR, 2011)

### 8.5.3 CITY-WIDE SCALE REVISION 3

The change in site selection came from the June 2011 site visit. It was now clear where the lowest points of water allocation was and also where water would flow. Figure 8.31 illustrates that the intervention location, would be ideal for water collection by still making use of the parking-channel system.

Problems that were encountered:

- Too much water for a single, but larger site.
- Water to travel a long distance Slope of 1:500, will enter the site at too deep level.
- One channel would be insufficient to accommodate and transport water.



FIGURE 8.31: CITY SCALE REVISION 3 (AUTHOR, 2011)

## 8.6 SITE SCALE PARTI DIAGRAM

The final *parti* diagram abstraction (Figure 8.34) is derived from the irregular street layout (Figure 8.32 & 8.33) in the *Baixa* core. The reason was to create a relation between the historical core and the new proposed site and act as an intangible, metaphysical and historical layer.

It was decided to keep the *parti* diagram and approach throughout the whole of the design process as is evident in the earlier design proposals.

The *parti* is applied to every level of design in a simplified form. Thus it is aimed to keep certain aspects of history (through physical design), but simultaneously develop the innovative, urban regenerative design concept.



FIGURE 8.32: BAIXA STREET CONCEPTUALISING (AUTHOR, 2011)

## 8.7 SITE SCALE DESIGN GENERATORS

As mentioned, the final site selection was based on the author's contour measurements, completed in June 2011 once the lowest point in the *Baixa* was known.

The chosen site, currently fenced off and unused, acts as an ideal location for one of these urban water parks and longed for unification and use. According to the author, its openness should to be protected, enhanced and celebrated. After these two trial-and-error presentations a final proposal could be synthesised.

The main (on-site) design generators are:

- Need for a water-holding area.
- Need for a wetland and other water-cleansing elements.
- Estimated pedestrian movement patterns.

The main (off-site) design generators are:

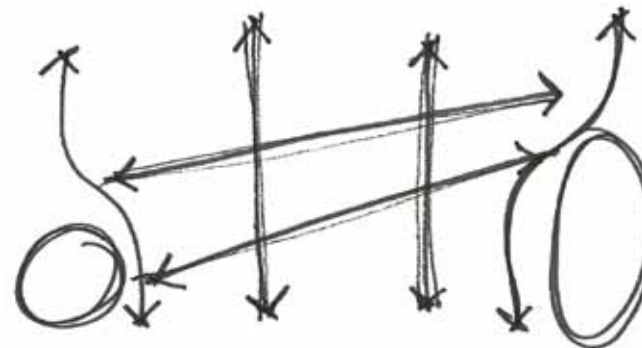


FIGURE 8.33: INITIAL PROJECT PARTI DIAGRAM (AUTHOR, 2011)

- *Baixa* road layout.
- Street water-channel heights and inlet levels.
- External influences from nearby institutions, such as the central train station, the need for public open space and proposed new developments.

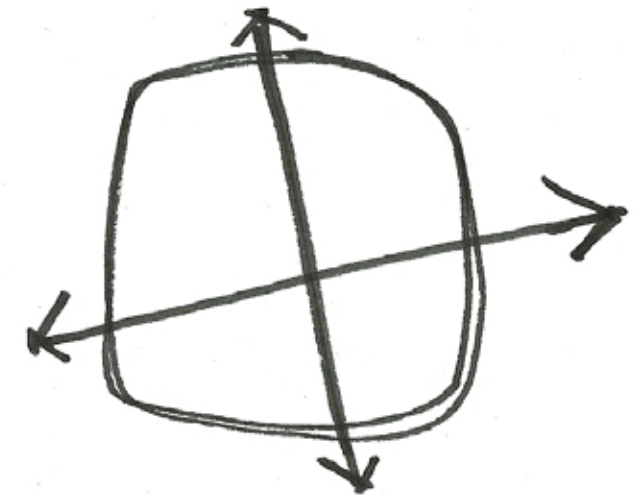


FIGURE 8.34: FINAL PROJECT PARTI DIAGRAM (AUTHOR, 2011)

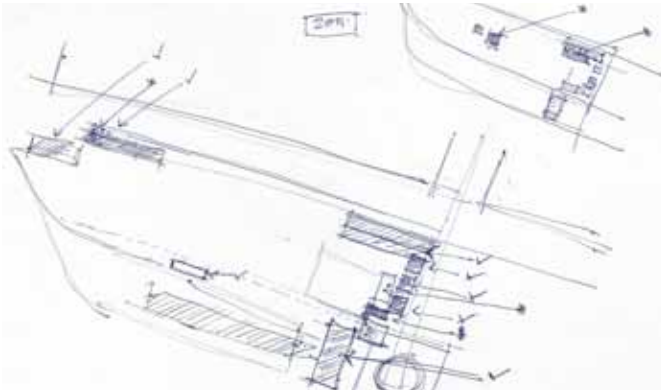


FIGURE 8.35: CURRENT SITE PLAN (AUTHOR, 2011)

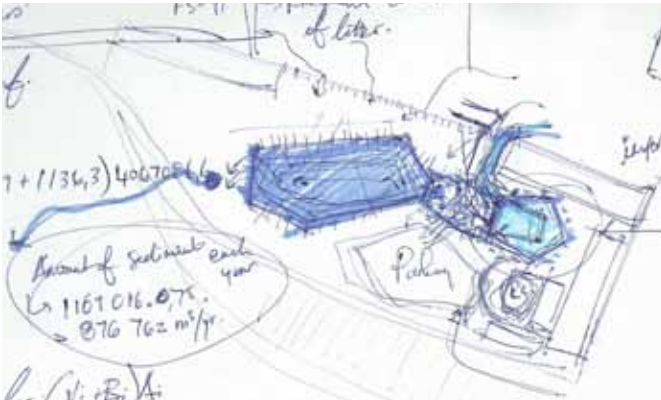


FIGURE 8.36: CONCEPT PLAN (AUTHOR, 2011)

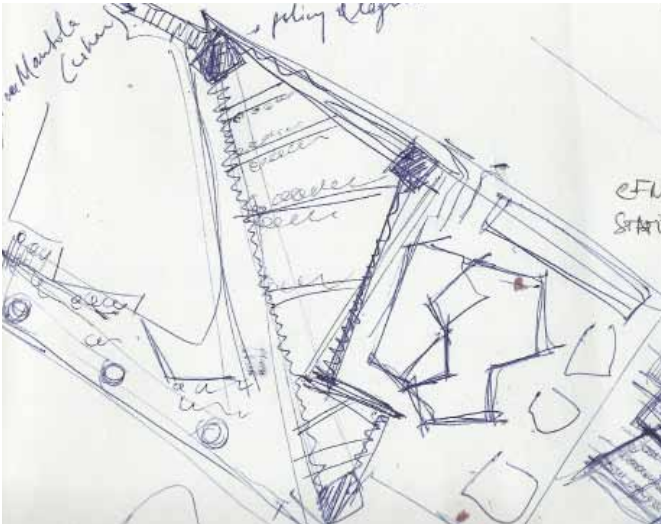


FIGURE 8.37: SITE PLAN REVISION 1 (AUTHOR, 2011)



FIGURE 8.38: SITE PLAN REVISION 2 (AUTHOR, 2011)

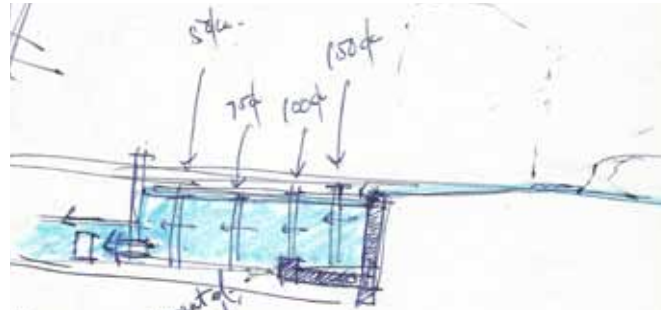


FIGURE 8.39: INITIAL LITTER TRAP SYSTEM (AUTHOR, 2011)

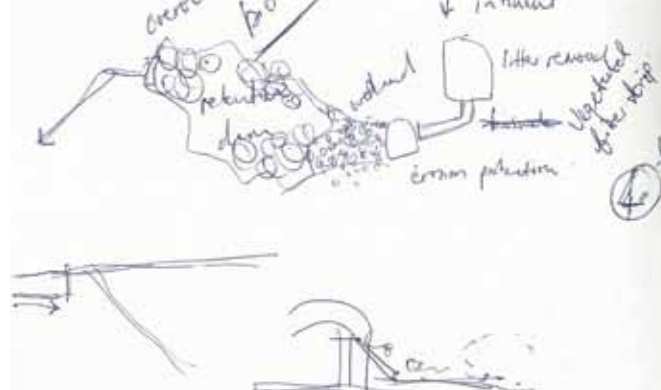


FIGURE 8.40: DIAGRAM ILLUSTRATING THE CLEANSING OF WATER (AUTHOR, 2011)

## 8.8 SITE PLAN (SITE SCALE) PROCESS

The current site plan (Figure 8.35) shows a hand-drawn sketch of the site and how the space was identified. The specific figure shows notes made by the author, as to which buildings were to be kept and which buildings were to be demolished.

Figure 8.36, the original concept plan, shows the water body and wetland as initially placed by the author. A parking area was proposed to the south-east of the site and the existing CFM offices unchanged.

Figure 8.37 is a revised plan on the previous. It shows a defined pathway as derived from the *parti* diagram. It was decided that a preliminary sediment pond or wetland should strategically be placed in front of the CFM offices to the right of the site. It was also designed that the pathways should end in nodes to better define the area.

Figure 8.38 refines the plan from the previous version. The design was made "stronger" by articulating lines by repeating and widening paths. Structure was given to all elements to blend. A proposed parking area was moved to the north-west of the site, together with a proposed new building complex at the back of it.

In Figure 8.39 & 8.40 the author calculated the amount of litter that will be accumulate in the litter traps. It was initially believed that a single litter trap would be efficient for all street residue removal. After further analysis and investigation it became clear that the system should include a sediment, litter and grease trap (and wetland, depending on aesthetic requirements and use of water).

Figure 8.41 introduced a natural element of curvilinear lines into the project, as "relief" from the straight lines, used throughout. The water channel entering the site posed to be the ideal opportunity.

Figure 8.42 and 8.43 shows the investigation

and implementing of a “vertical wetland”, innovated by the author. The wetland would have water entering it from the channel and then in circular formation, flowing downward. Clean water would flow into the water-holding area.

The developed design thus far was presented (Figure 8.44) for Milestone 3 (From Figure 8.24). It shows a clearer design and structure, set out by the author in terms of pathways, parking, on-site programming and surrounding buildings.

A recycling centre is proposed to encourage recycling of trapped litter. The building (empty

warehouse to the north-east of the site), would allow for sustainable reuse and encourage public square usage. The building surrounding the square has now been proposed as small restaurants.

There exists no strong link with the station from which most pedestrians would enter the site.

In Figures 8.45 and 8.46 the vertical wetland has been discarded. This is due to height limitations (high mean ground water level) and too high water volumes entering the site. Parking was also moved further back towards the west, to allow new office buildings to reside directly on the “waterfront” area.

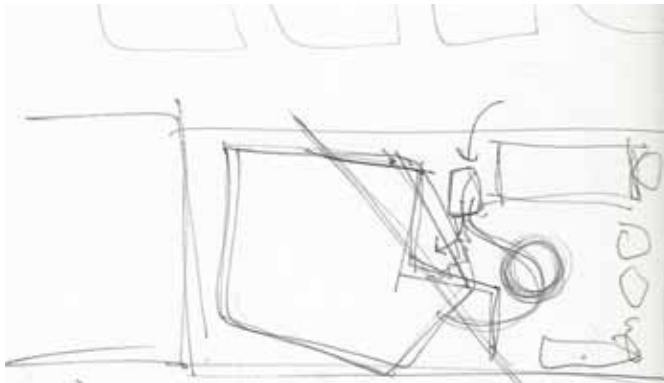


FIGURE 8.41: SITE PLAN REVISION 3 (AUTHOR, 2011)



FIGURE 8.42: VERTICAL WETLAND (AUTHOR, 2011)

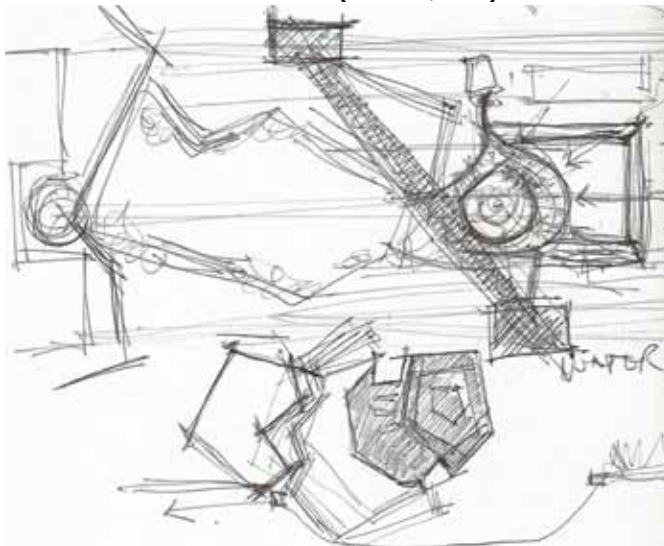


FIGURE 8.43: SITE PLAN REVISION 4 (AUTHOR, 2011)



FIGURE 8.44: SITE PLAN REVISION 5, MILESTONE 4 (AUTHOR, 2011)



The final revision as depicted in Figure 8.47 illustrates the near final design for the site-specific designed intervention. The author now had a better understanding of the designated layout in terms of heights, water retention, lighting, materials and planting strategies to follow.

The recycling centre was discarded and a more height- and cleaning-efficient wetland was introduced. The public square, still undeveloped, now had a proposed information centre, allowing visitors from the station to fully utilise the area before entering the *Baixa*.

Elements that changed (to be illustrated in Chapter 9), was:

- The raised stage area in the square was changed to a wetland, viewing and eating area.
- Restaurants living outwards onto public square.
- Restaurant delivery area.
- Establishment of a better connection with the station and the site.
- The water channel (wetland) was widened to allow for more water to flow in.
- A revised water system to allow for more

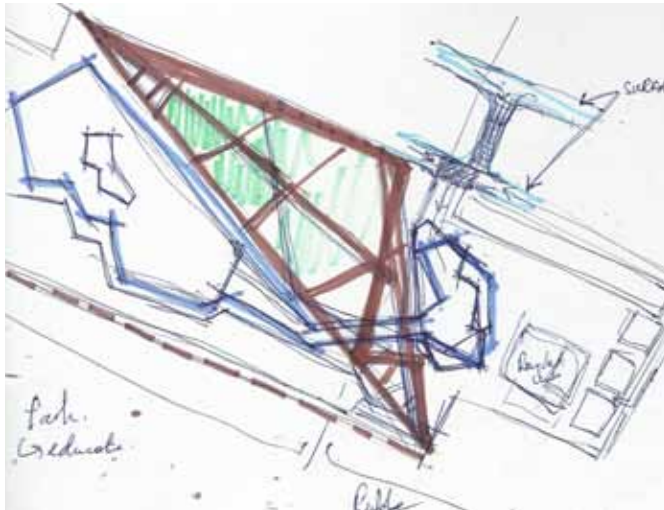


FIGURE 8.45: SITE PLAN REVISION 6 (AUTHOR, 2011)

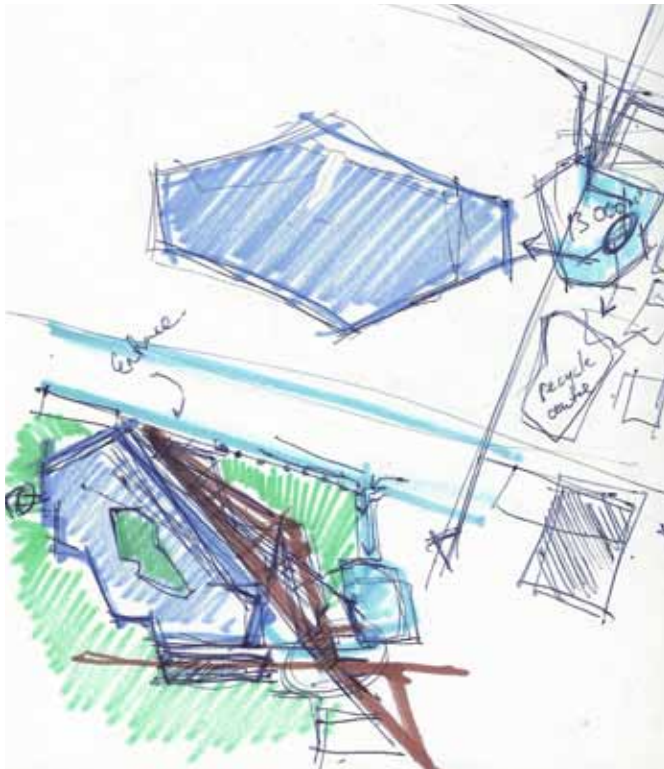


FIGURE 8.46: SITE PLAN REVISION 7 (AUTHOR, 2011)



FIGURE 8.47: SITE PLAN REVISION 8, MILESTONE 5 (AUTHOR, 2011)

- sufficient water management.
- Waterfront to the west (lowered to allow user/ water connection).
- New office building parking area was changed to grass parking.



FIGURE 9.1: BUILDING OPPOSITE THE STATION FROM PRACA DE TRABALHADORES (DEVENISH, 2011)

# CHAPTER 9\_

## THEORY APPLICATION: DESIGN RESOLUTION



## 9.1 FOUNDING

The final step in the *four tracing concepts* is *founding*. This is probably the most durable and significant. Girot states that it comes at the moment when the preceding three acts are synthesised into a new and transformed construction of the site. It may either be constructive (referring to past events) or innovative (importing something new) always a reaction to something that was already there. It can also be understood as bringing something new to a place, something that may change and redirect a particular site. It inevitably happens each time something new occurs, staking out the ground for future events. A well-founded project will thus remain clear in its approach and resolution, extending the legacy of a place toward a productive future (Girot, 1990).

## 9.2 CITY-WIDE SCALE OBJECTIVE

On city scale, the main objective is to create a number of water-holding sites to which where water can be diverted. As mentioned in Chapter 4, the catchment of the site has a large influence on the water system regarding everything from water channelling, capacity and discharging.

For this reason, a thorough catchment management plan needs to be implemented. The catchment management plan includes the following to be proposed and implemented:

- The entire catchment is divided into smaller catchments. These would allow water to be intercepted and encourage water flow into different, strategically placed,

### WATER CYCLE

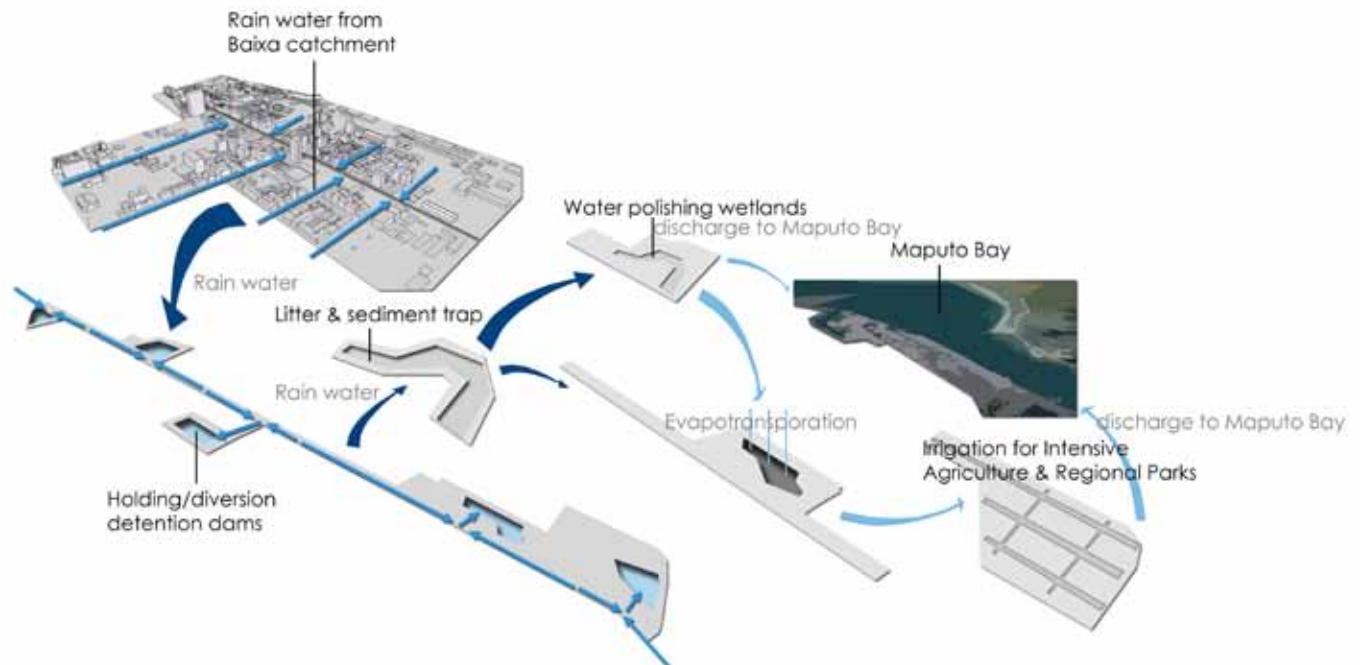


FIGURE 9.2: WATER FOUNTAIN ON EASTERN ESCARPMENT (AUTHOR, 2011)

FIGURE 9.3: CITY SCALE WATER MANAGEMENT DIAGRAM (AUTHOR, 2011)

water-holding sites.

- This is done through manipulating *Avenida 25 de Setembro*. As soon as water reaches the street, it will be directed to a specific allocated site. Different areas (inner catchments), will have different destinations allocated to them.

- Quantities will be calculated to allow for efficient storage volume. This means effective volume control and management of water as it enters the sites. Excess water will overflow to either other sites, or be discharged into the bay.
- The author will be able to address and propose different requirements for each site, as the needs may differ according to location and immediate surroundings. An example of this, is the decision to implement sedimentation traps, litter traps, grease/oil traps, wetlands, irrigation, water needs and so forth.
- The plan will also allow for sufficient planning to exactly determine the height at which water channels would enter the different water-holding sites. A general slope of 1:500 was determined and used throughout the channel system in *Avenida 25 de Setembro*.
- All water in the catchment will go through the water system and will thus be cleaned before being discharged into the bay. This will in effect create a sustainable water environment, enhancing the water quality. Figure 9.3 diagrammatically illustrates the water process that is planned and has to be implemented.

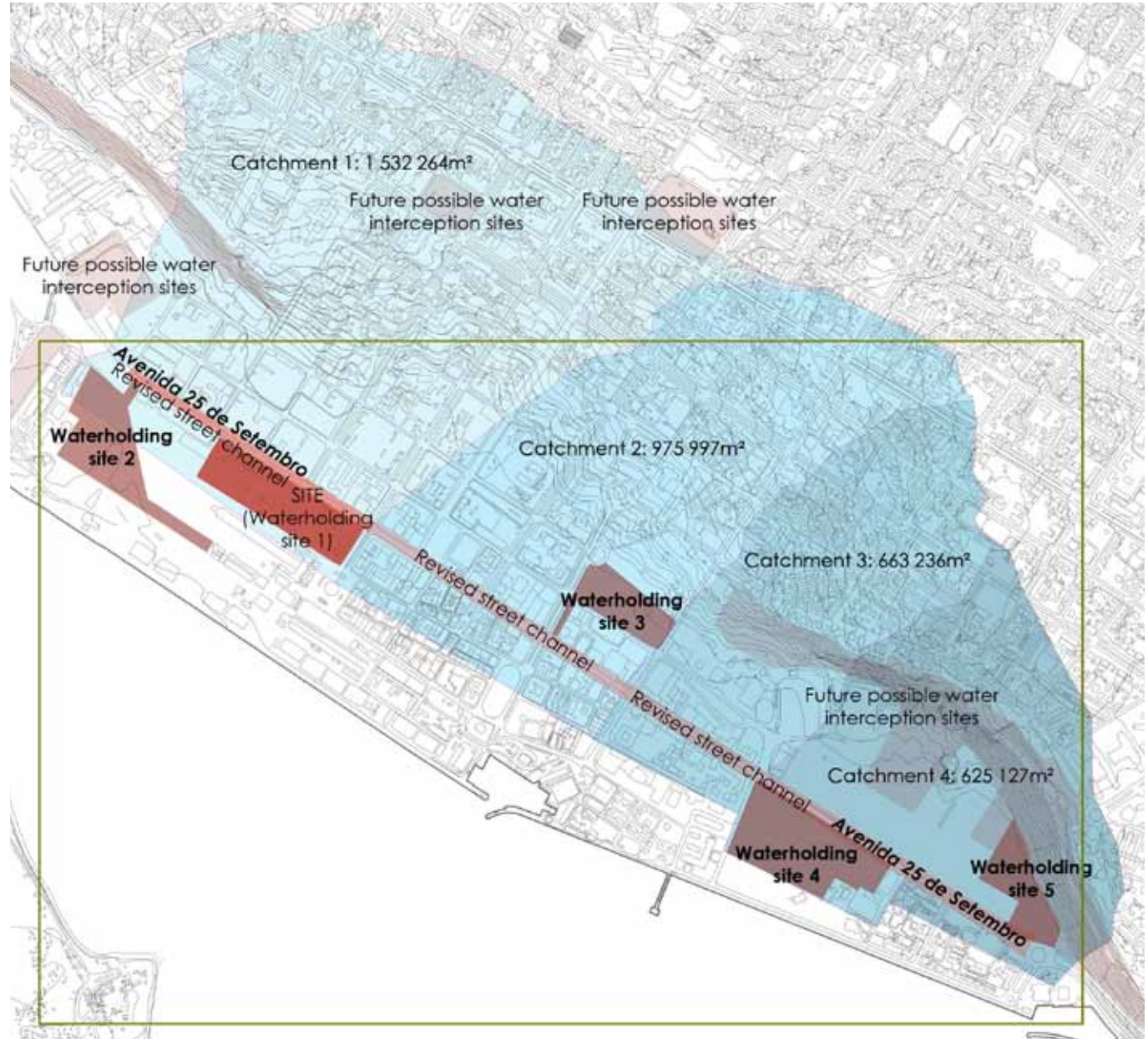


FIGURE 9.4: CATCHMENTS, WATER-HOLDING SITES AND OTHER POSSIBLE SECONDARY SITES (not to scale) (AUTHOR, 2011)

Figure 9.4 illustrates the different catchments and places the site in context. It also illustrates the other four water-holding sites of which the discussed project forms part of.

As extra option, the figure also shows other possible future sites where water can be intercepted, channelled or stored (apart from the five named interventions along the street).

These “possible future sites” will have the main function of lowering pressure and quantities on the lower gradient-located, major five retention dams (due to the large area and run-off coefficient). The reason why this is currently not analysed to further extend, is that it would require huge infrastructural alterations. Required changes larger than those done in Avenida 25 de Setembro.

To conclude: It becomes clear that the relevant site cannot be seen as a separate entity, but part of a larger water-management system. The proposed project will also serve as possible *Baixa* regeneration and will offer an additional designed, green, landscape space.

Figure 9.5 identifies the final proposed city scale intervention. It consists of a collection of projects along the Avenida 25 de Setembro that is proposed to be implemented by the author. It consists of a water-channel system and the water-holding sites on current open plots. These water-holding sites are listed and compared in the table (Figure 9.6). In-flow and out-flow level will differ.



FIGURE 9.5: FINAL CITY SCALE PLAN (not to scale) (AUTHOR, 2011)

### 9.3 SKETCH PLAN

Figure 9.7 illustrates the project's sketch plan. The follow-on figures will illustrate how the different layers interact and function as a whole.

Water holding site	Water holding site 1 (the SITE)	Water holding site 2	Water holding site 3	Water holding site 4	Water holding site 5
Traps	Litter trap, Sediment trap, Oil/Grease trap, Wetland, Water body Urban park,	Litter trap, Oil/Grease trap, Water body	Litter trap, Sediment trap, Oil/Grease trap, Water body	Litter trap, Sediment trap, Oil/Grease trap, Wetland, Water body	Litter trap, Sediment trap, Oil/Grease trap, Wetland, Water body Urban park,
Site functions	Public square, Water storage, Irrigation & other uses, New buildings	Urban agriculture, Water storage, Irrigation & other uses	Urban park, Water storage, Irrigation & other uses (Pott's building)	Urban park, Water storage, Irrigation & other uses, Trim park	Public square, Water storage, Irrigation & other uses, New buildings

FIGURE 9.6: WATER-HOLDING SITES COMPARED (AUTHOR, 2011)



FIGURE 9.7: SKETCH PLAN (not to scale) (AUTHOR, 2011)



## 9.4 MOVEMENT

The movement patterns within the design vary according to the following categories:

- Vehicle movement which include the streets and grass parking space at the business complex.
- Primary pedestrian movement which is illustrated by red arrows. The own the identity of being the main movement patterns where faster pedestrian movement will take place.
- Secondary pedestrian movement, which is illustrated by yellow arrows. It illustrates lingering spaces of slower movement and includes seating under trees and shade.

A number of important nodes are also identified within the design. These are mainly located at entrance points, along the perimeter of the site. Nodes within the design context becomes important places of focus and energy. The occur everywhere on site and act as important threshold to and from the site.

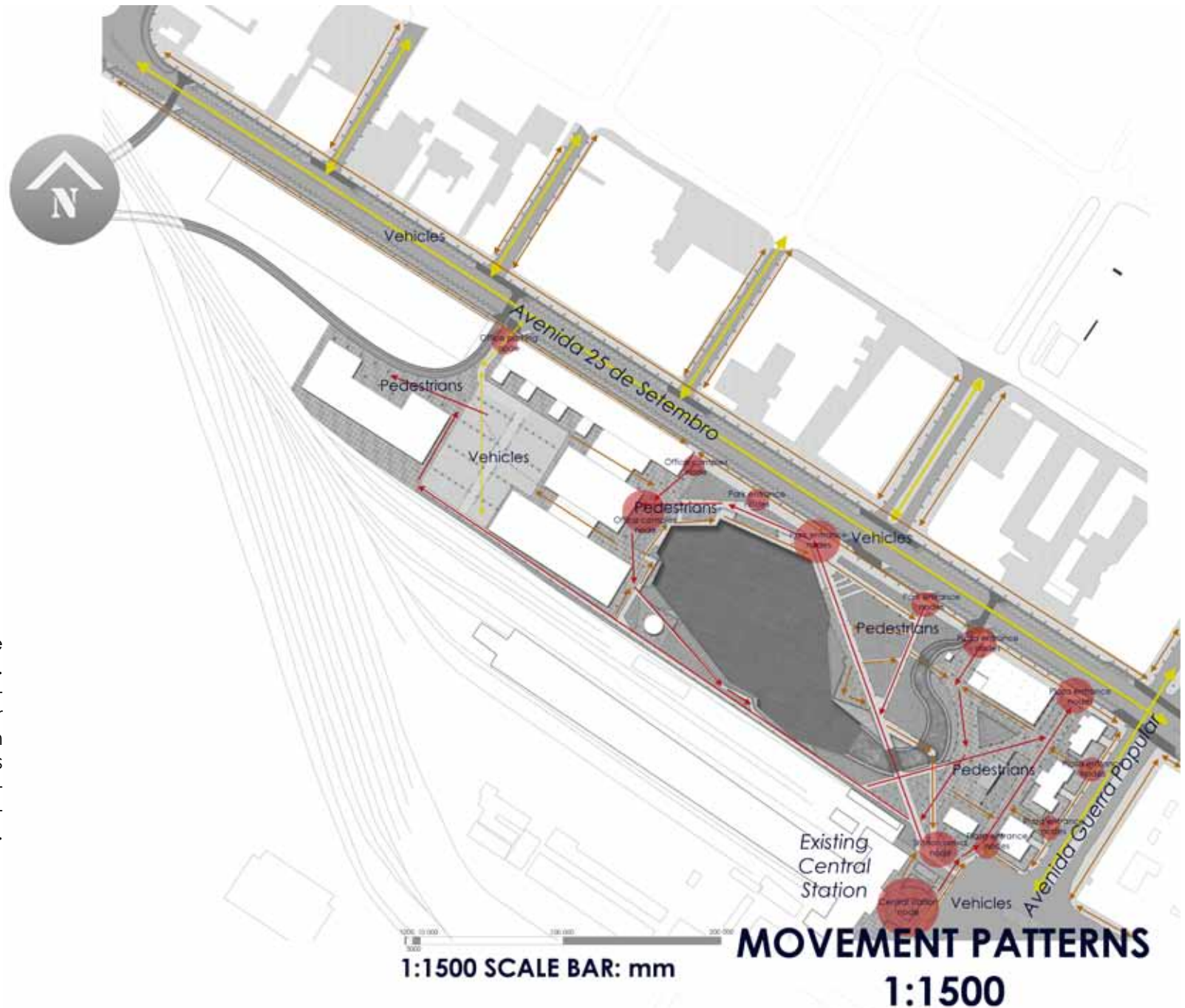


FIGURE 9.8: NODES (not to scale) (AUTHOR, 2011)

## 9.5 ZONES

The park can be divided into three main zones being:

- East: Public square consisting of outdoor restaurant seating, open-plan market area, small grass lawn, graffiti wall, historical wall kept as heritage layer, seating and a zero-depth water feature for children.
- Central: Mainly public park consisting of grass lawns or common green, pathways, a wetland and retention dam and finally a waterfront area.
- West: New high-rise office buildings, waterfront (deepest end of retention dam), cafeteria and concrete grass blocks parking area.

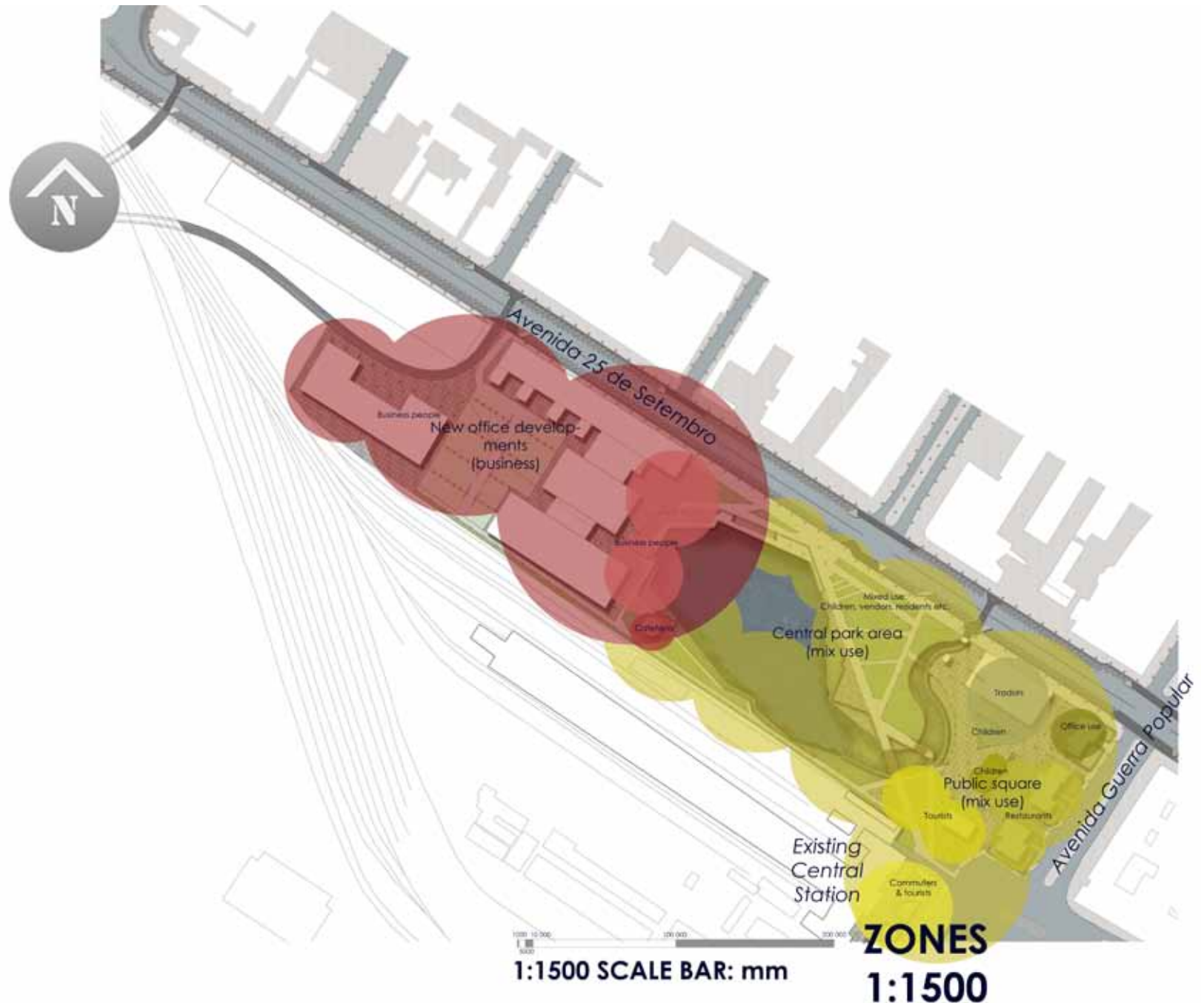


FIGURE 9.9: ZONES (not to scale) (AUTHOR, 2011)

## 9.6 WATER STRATEGY

Water will be circulated by means of submerged water pump. Energy will be provided by solar panels located on the new office building's roof.

Water is circulated in order to keep water moving and clean, and to disallow stagnant water in order to discourage mosquito infestation and to keep wetland plants alive.

Excess water will overflow to Intervention 2 (Water-holding Site 2), which is located to the south-west. Storm water flowing to the site will follow one of the following routes.

It will either:

- Slowly flow to the retention dam via the wetland (the wetland receives water from a manhole in the centre of the site and releases water through a small pipe).
- Flow directly into the retention dam via a sub-surfaced, 300 mm concrete pipe (the pipe is also connected to manhole).
- Surpass this site's water system and exit to the north-east of the site via the street channel (excess water will thus not be used in the site, but will rather flow to water-holding Site 2).

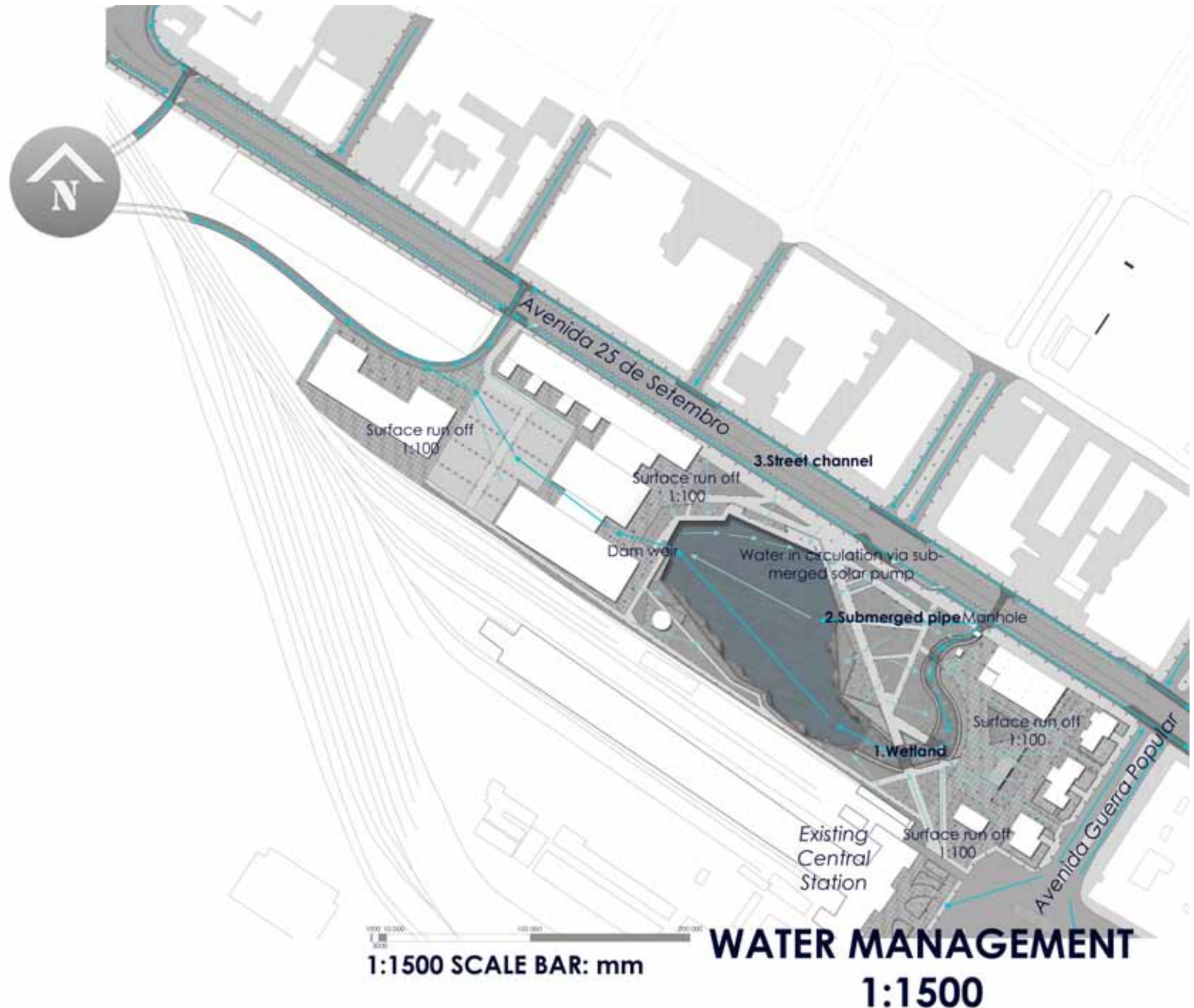


FIGURE 9.10: STORM-WATER MANAGEMENT (not to scale) (AUTHOR, 2011)

## 9.7 PLANTING STRATEGY

The planting strategy consists of four different zones. A collection of plant images are shown by the images bordering Figure 9.35.

- Planting Zone 1: Street planting (exotic trees kept to blend in and keep historical layer).
- Planting Zone 2: Public square (evergreen indigenous trees to create a comfortable micro environment).
- Planting Zone 3: Park area (indigenous evergreen and deciduous trees).
- Planting Zone 4: Wetland and dam perimeter (indigenous water plants).



FIGURE 9.11-9.34: COLLECTION OF PLANTING IMAGES (GOOGLE, 2011)  
FIGURE 9.35: PLANTING STRATEGY (not to scale) (AUTHOR, 2011)

## 9.8 MATERIAL SELECTION

The following materials are used:



FIGURE 9.36: SALIGNA EUCALYPTUS



FIGURE 9.37: EXPOSED AGGREGATE CONCRETE



FIGURE 9.38: CONCRETE GRASS BLOCKS



FIGURE 9.39: COBBLESTONES (WITH PATTERNS)



FIGURE 9.40: SLATE (WITH PATTERNS)



FIGURE 9.41: RENO MATTRESS

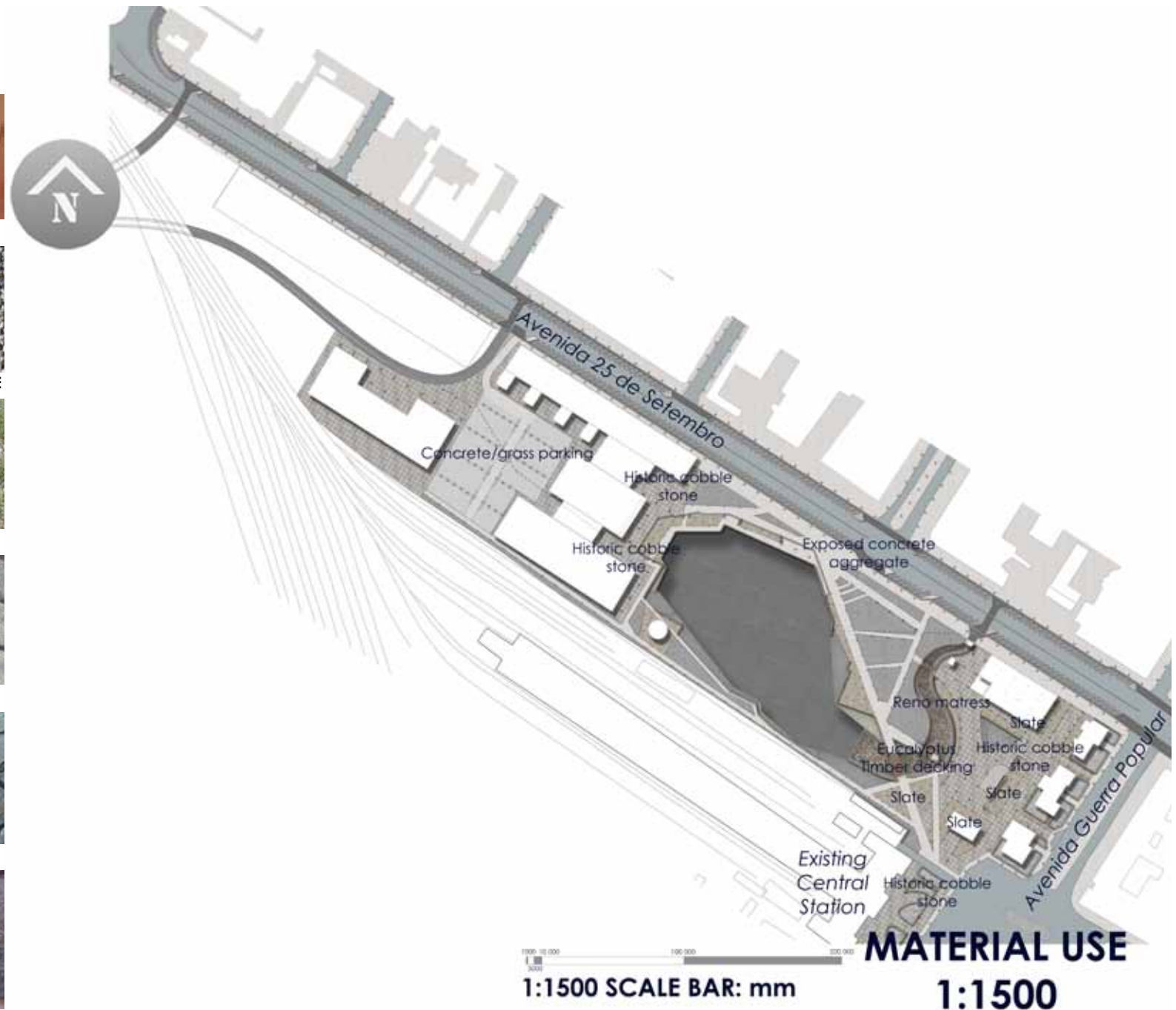


FIGURE 9.42: MATERIAL SELECTION (not to scale) (AUTHOR, 2011)

## 9.9 LIGHTING STRATEGY

The following lighting elements are used:

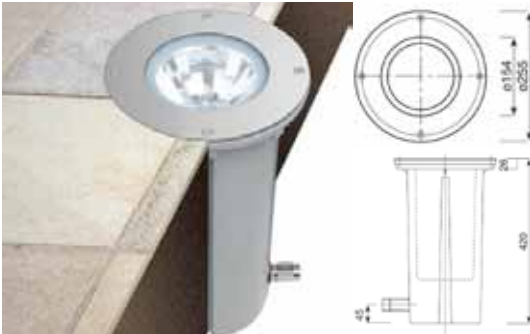


FIGURE 9.43: BEKASPIKE UP-LIGHTER

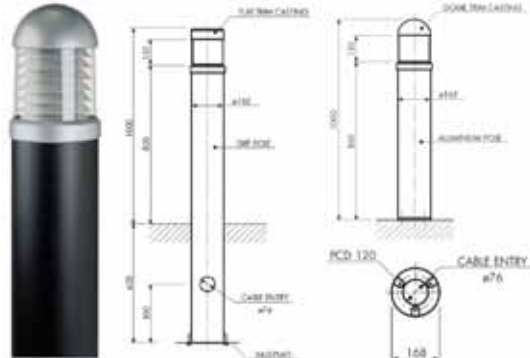


FIGURE 9.44: BEKABRITE BOLLARD LUMINAIRE

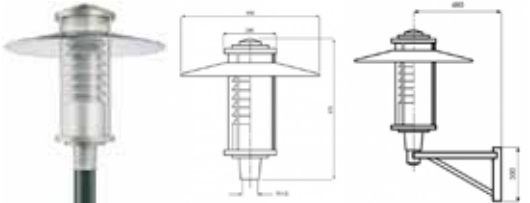


FIGURE 9.45: BEKASHINE POST TOP LUMINAIRE

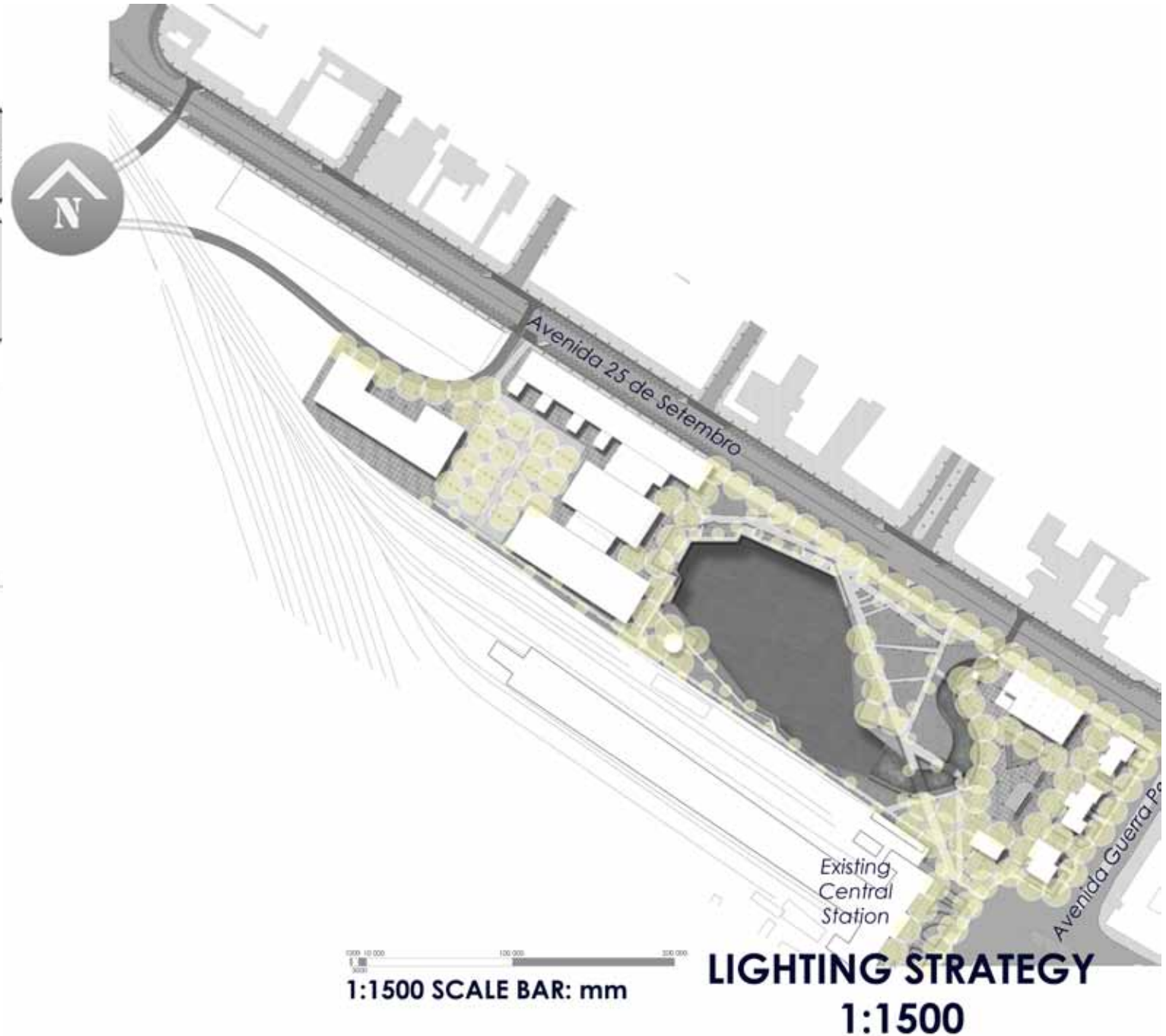


FIGURE 9.46: LIGHTING STRATEGY (not to scale) (AUTHOR, 2011)

## 9.10 CONTOURS & HEIGHTS

The site is generally located on the 4000 contour. Water channel enters the site at 3470. Water then goes through a sediment trap (3000) and overflows into the wetland.

Water enters the top of the wetland at 3300 and exits the wetland weir at 2800. It flows into the water-holding site at 2700 (water level). Water thus overflows at 2700 (top of weir) and flows into the pipe system to Water-holding Site 2.

The dam's base level is at 0 (mean sea level) and 2700 meters at its deepest (to the west). The pedestrian area to the north and west of the dam is lowered to level 3000, to allow a closer link between the site user and water (300 mm). The same concept is used where the wetland flows past the public square. Stairs, forming a seating area, allows the user to sit 500 mm above the wetland level.



FIGURE 9.47: SITE CONTOURS AND HEIGHTS (not to scale) (AUTHOR, 2011)

## 9.11 SITE PLAN



FIGURE 9.48: SITE PLAN (not to scale) (AUTHOR, 2011)



FIGURE 9.49: SITE PLAN ZOOM 1 (not to scale) (AUTHOR, 2011)



FIGURE 9.50: SITE PLAN ZOOM 2 (not to scale) (AUTHOR, 2011)





FIGURE 10.1: PRACA 25 DE JUNHO (P. DEVENISH, 2011)

# CHAPTER 10\_ THEORY APPLICATION: TECHNICAL RESOLUTION



FIGURE 10.2: PLANTER BOX (AUTHOR, 2011)  
132

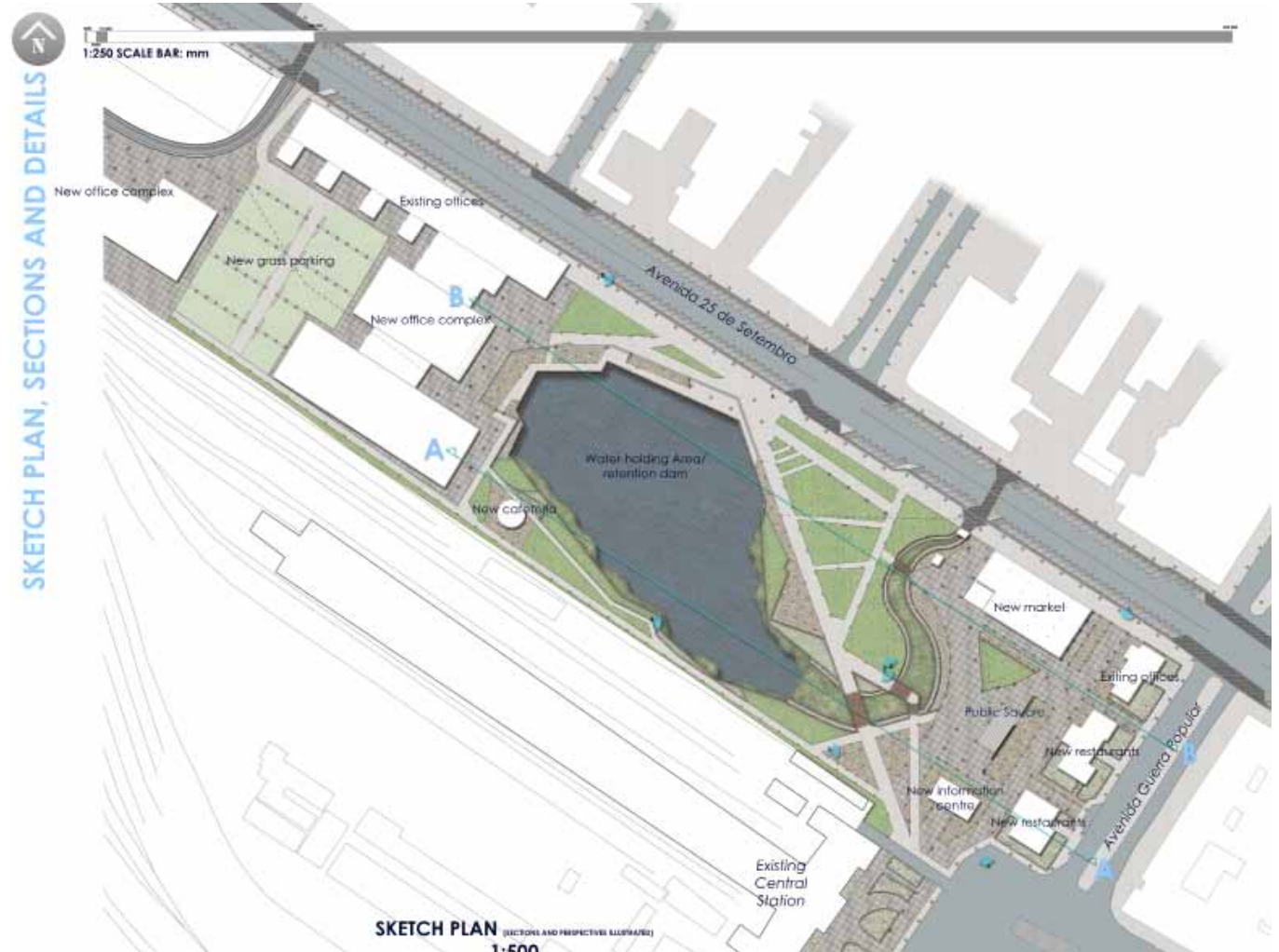


FIGURE 10.3: SKETCH PLAN ILLUSTRATING SECTIONS (AUTHOR, 2011)

## 10.1 INTRODUCTION

Figure 10.3 illustrates the sketch plan and shows the sections (AA and BB), shown on Figures 10.12 and 10.13. It also shows the perspective-images, illustrated by Figures 10.4 to 10.11.

Appendix C includes full technical development and details investigated.

## 10.2 PERSPECTIVES



FIGURE 10.4: PERSPECTIVE FROM SOUTH-EAST ENTRANCE (AUTHOR, 2011)



FIGURE 10.5: PERSPECTIVE OF PUBLIC SQUARE AND WETLAND (AUTHOR, 2011)



FIGURE 10.6: PERSPECTIVE OF ARRIVAL NODE (AUTHOR, 2011)



FIGURE 10.7: PERSPECTIVE OF WATER HOLDING AREA (AUTHOR, 2011)

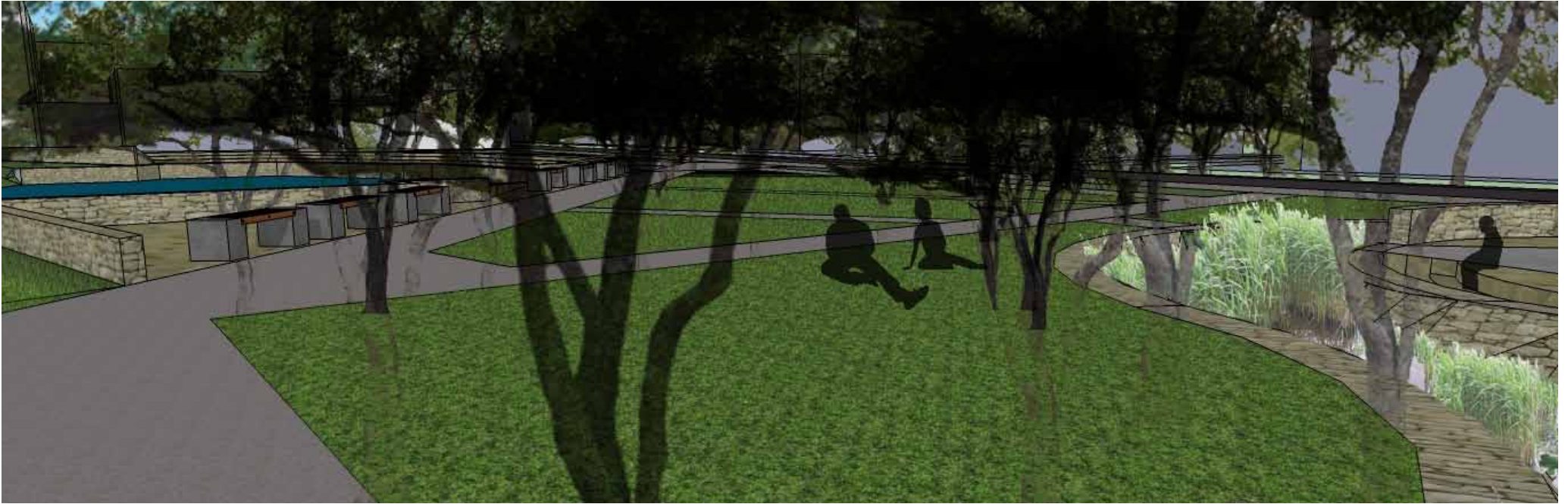


FIGURE 10.8: PERSPECTIVE OF COMMON GREEN AREA (AUTHOR, 2011)



FIGURE 10.9: PERSPECTIVE OF NORTH ENTRANCE (AUTHOR, 2011)



FIGURE 10.10: PERSPECTIVE FROM NORTH-EAST ENTRANCE (AUTHOR, 2011)

### 10.3 SECTIONS



FIGURE 10.12: SECTION AA (not to scale) (AUTHOR, 2011)



FIGURE 10.13: SECTION BB (not to scale) (AUTHOR, 2011)



FIGURE 10.11: PERSPECTIVE OF WATER CHANNEL AVENIDA 25 DE SETEMBRO (AUTHOR, 2011)





## 10.4 DETAILS

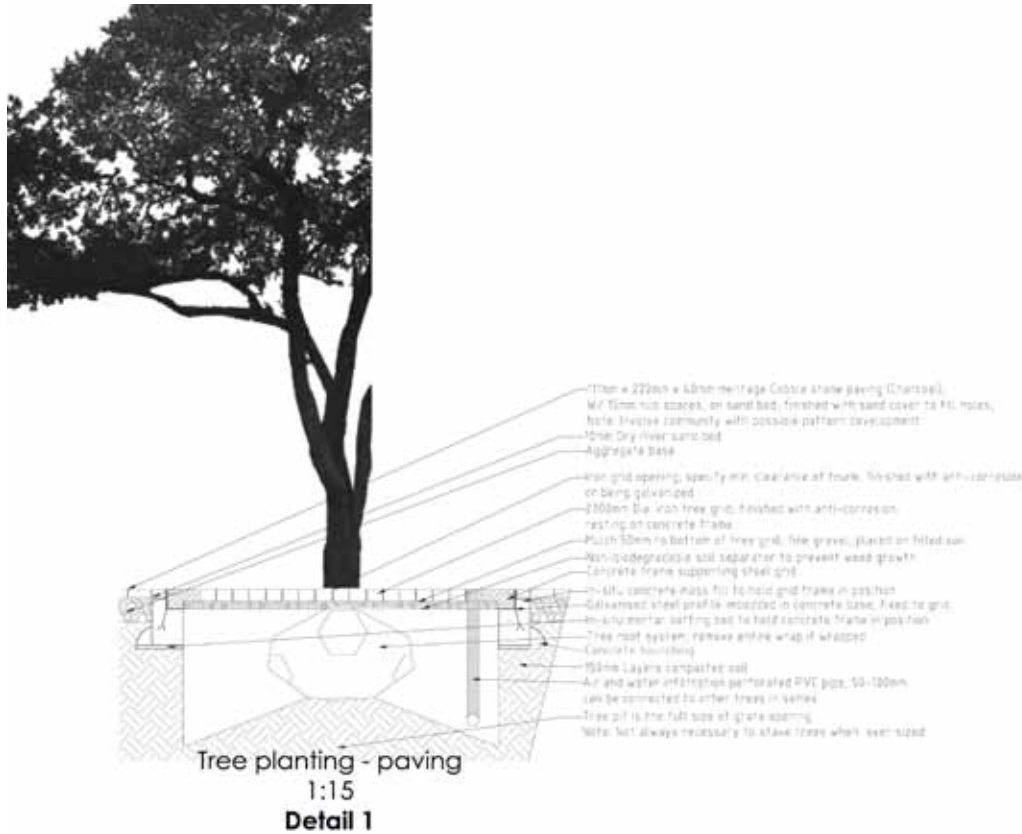


FIGURE 10.14: TREE PLANTING - PAVING (not to scale) (AUTHOR, 2011)

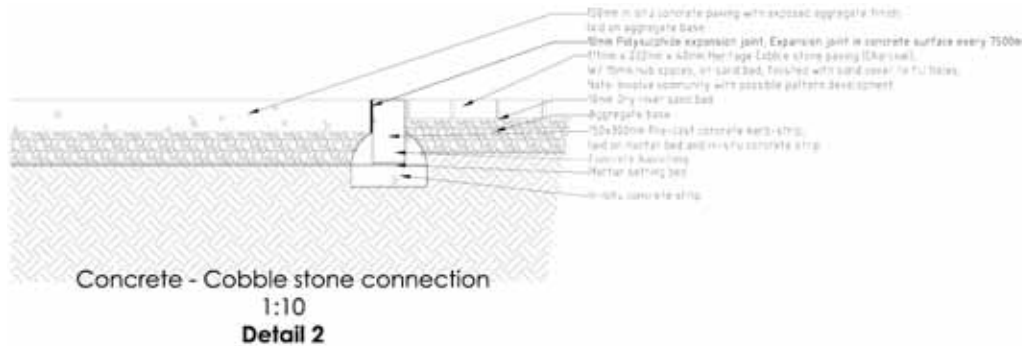


FIGURE 10.15: CONCRETE - COBBLESTONE CONNECTION (not to scale) (AUTHOR, 2011)

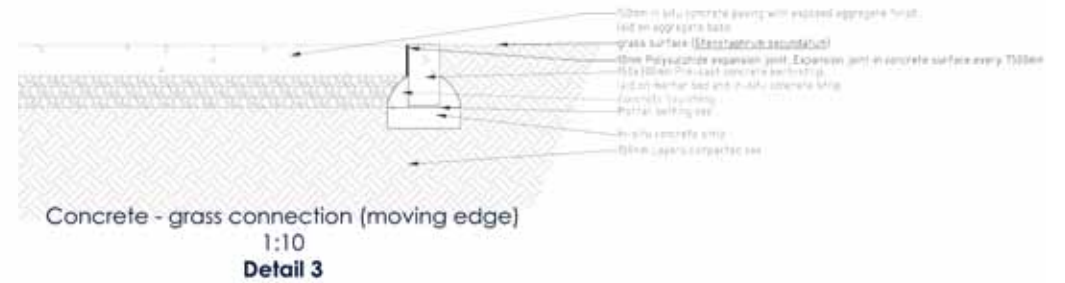


FIGURE 10.16: CONCRETE - GRASS CONNECTION (MOVING EDGE) (not to scale) (AUTHOR, 2011)

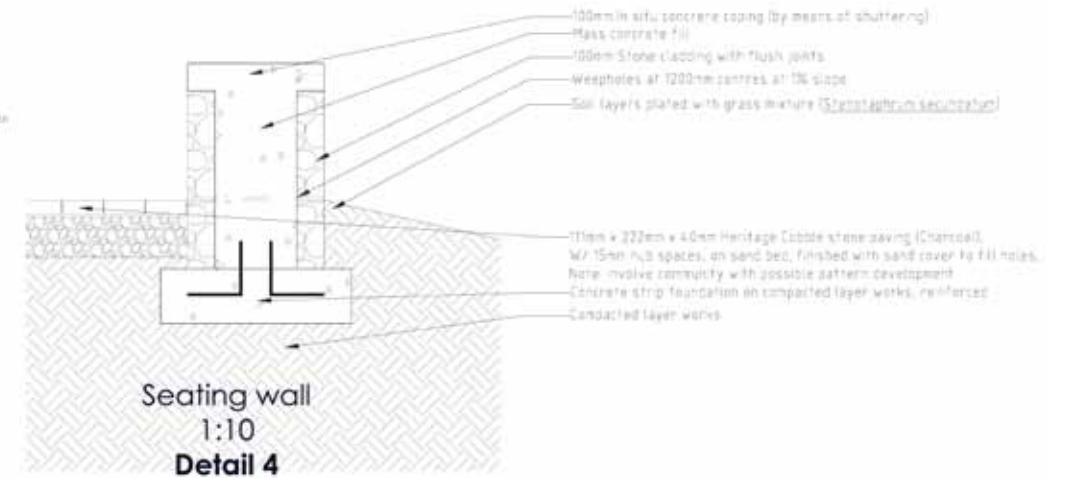


FIGURE 10.17: SEATING WALL (not to scale) (AUTHOR, 2011)

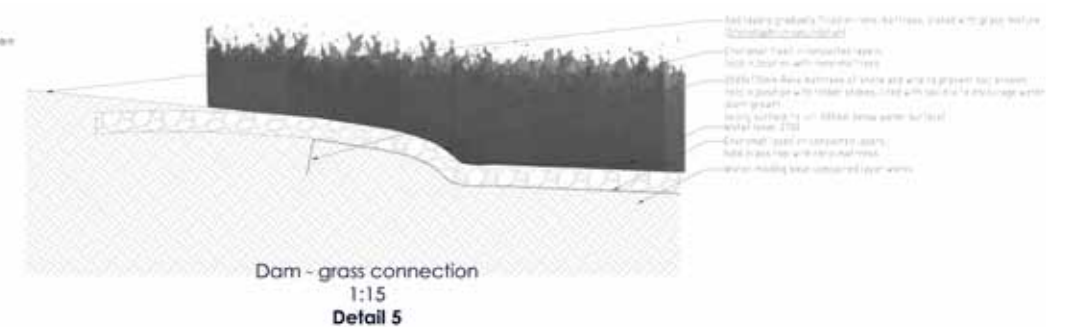


FIGURE 10.18: DAM - GRASS CONNECTION (not to scale) (AUTHOR, 2011)

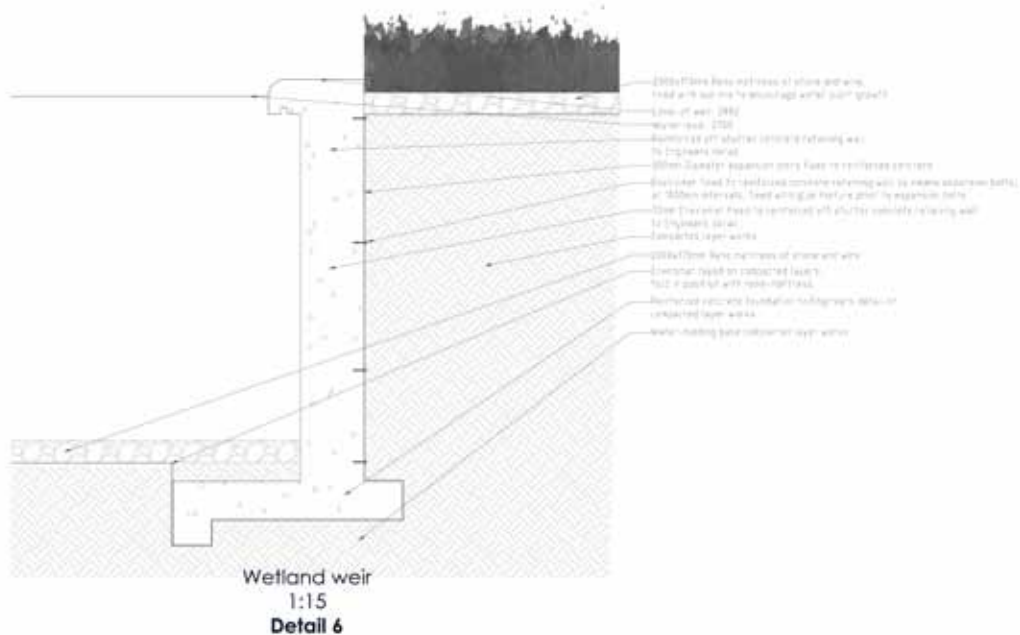


FIGURE 10.19: WETLAND WEIR (not to scale) (AUTHOR, 2011)

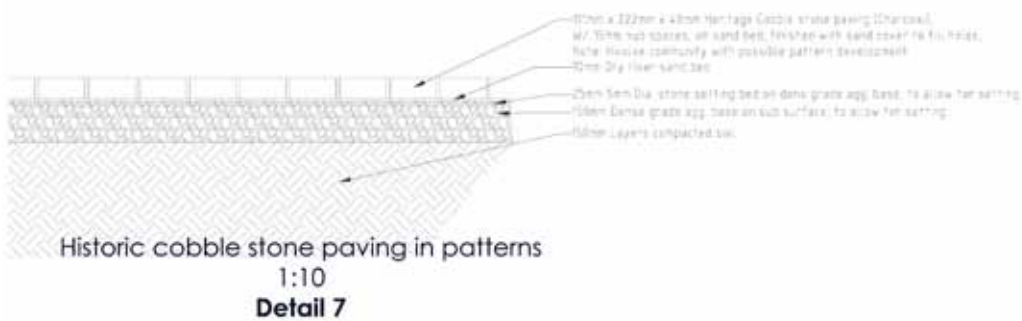


FIGURE 10.20: HISTORIC COBBLESTONE PAVING IN PATTERNS (not to scale) (AUTHOR, 2011)

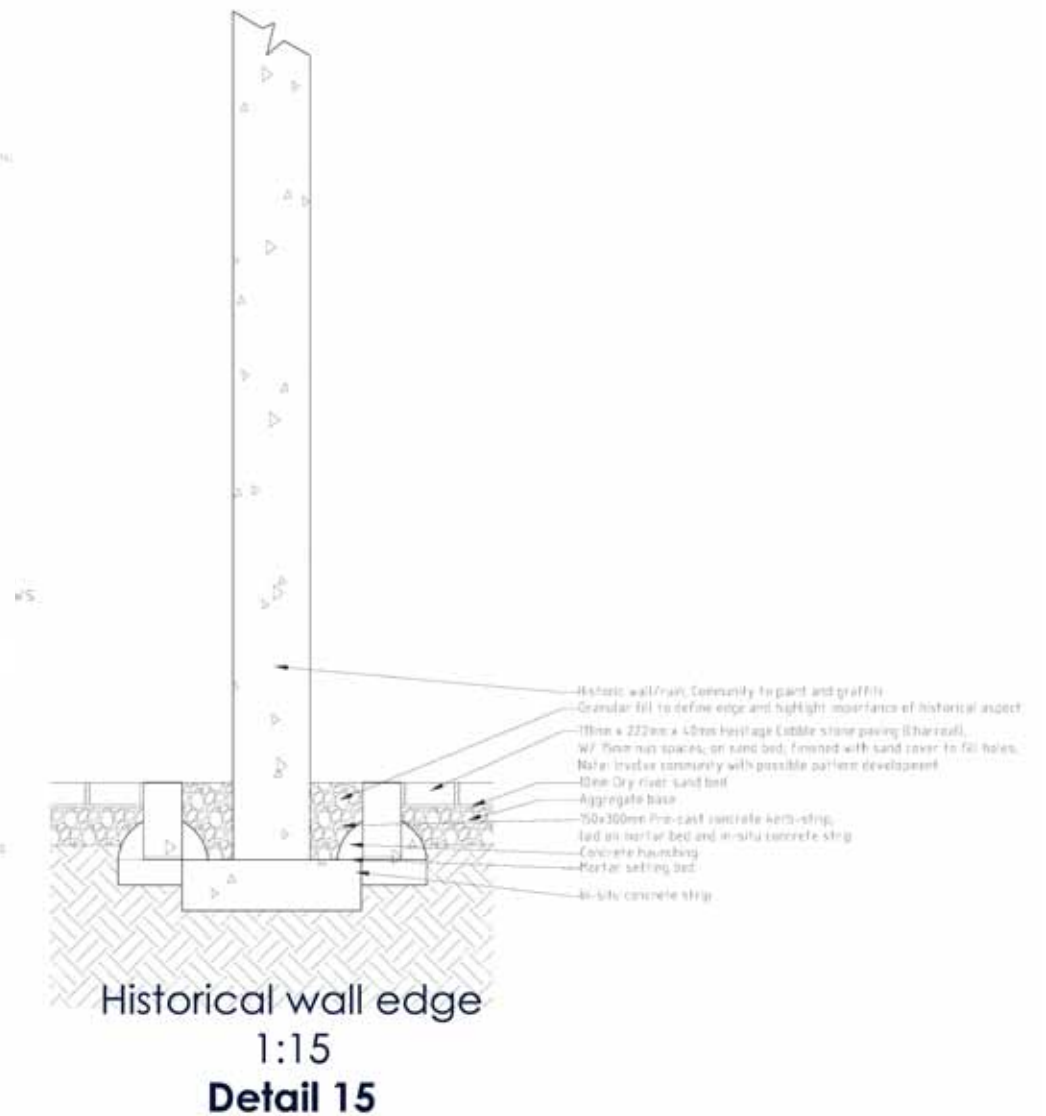


FIGURE 10.21: HISTORICAL WALL EDGE (not to scale) (AUTHOR, 2011)

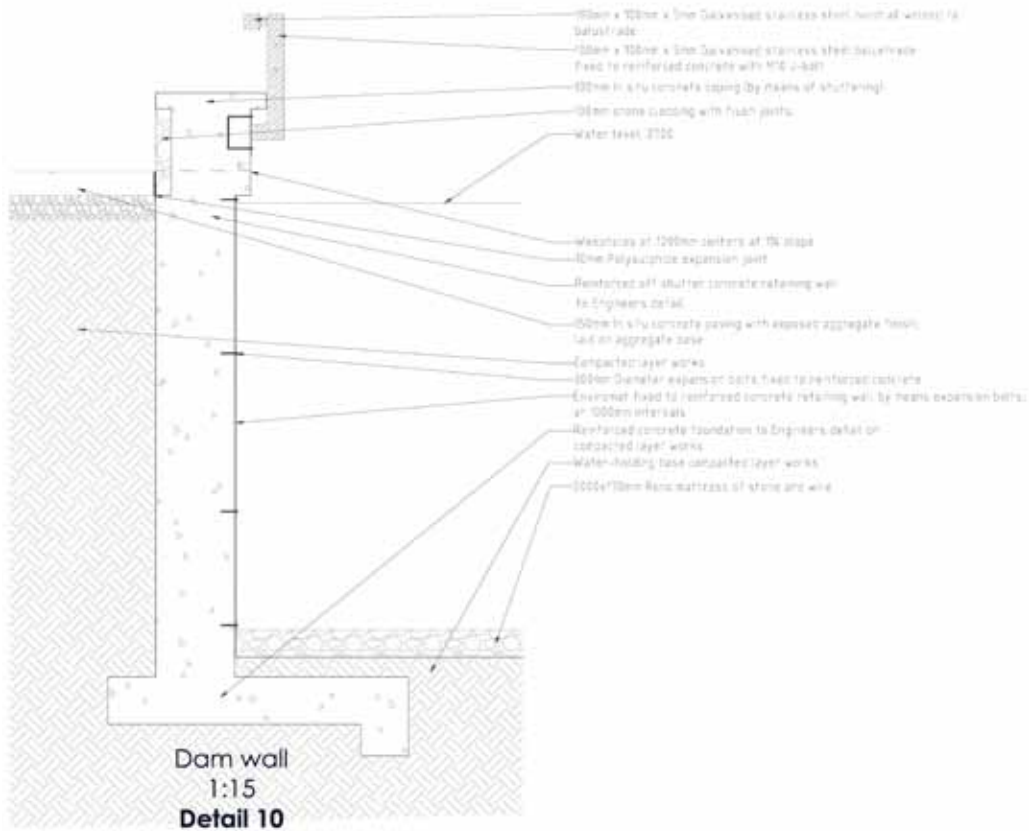


FIGURE 10.22: DAM WALL (not to scale) (AUTHOR, 2011)

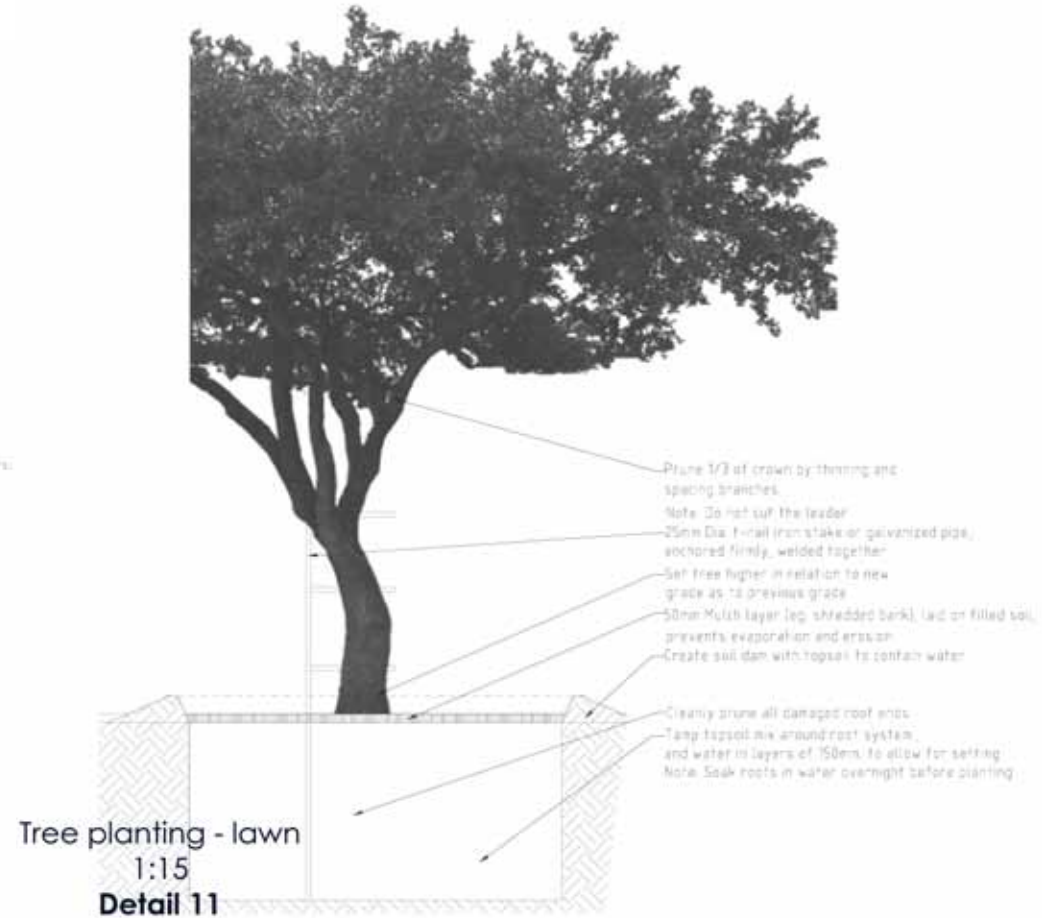


FIGURE 10.23: TREE PLANTING - LAWN (not to scale) (AUTHOR, 2011)

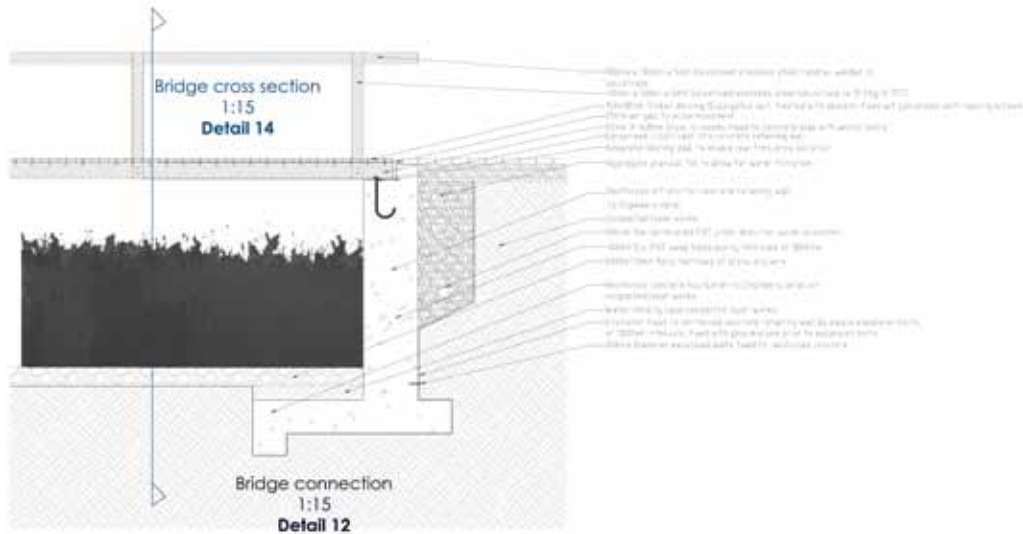


FIGURE 10.24: BRIDGE CONNECTION (not to scale) (AUTHOR, 2011)

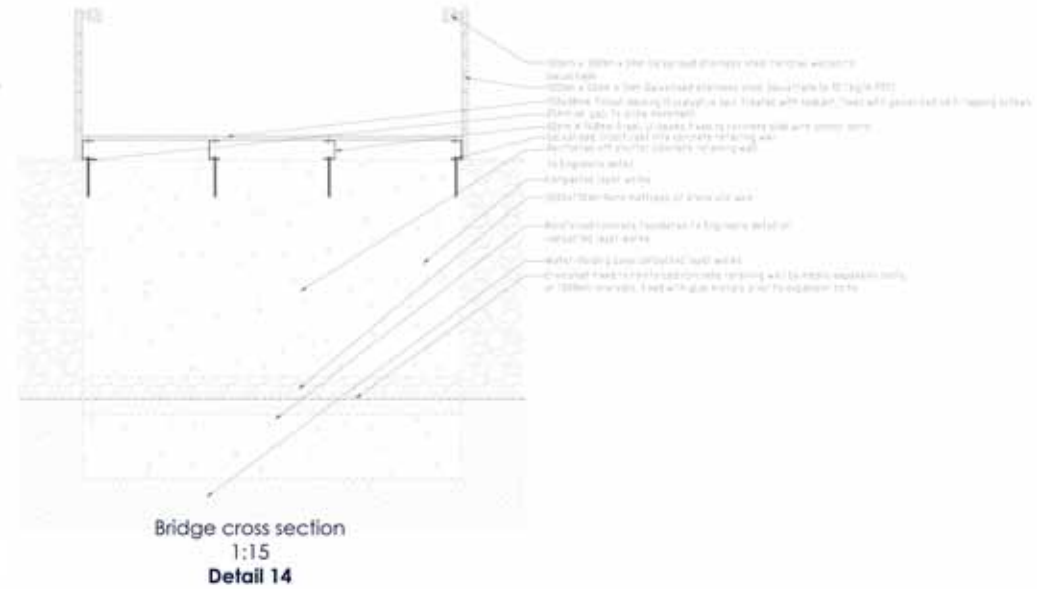


FIGURE 10.26: BRIDGE CROSS SECTION (not to scale) (AUTHOR, 2011)

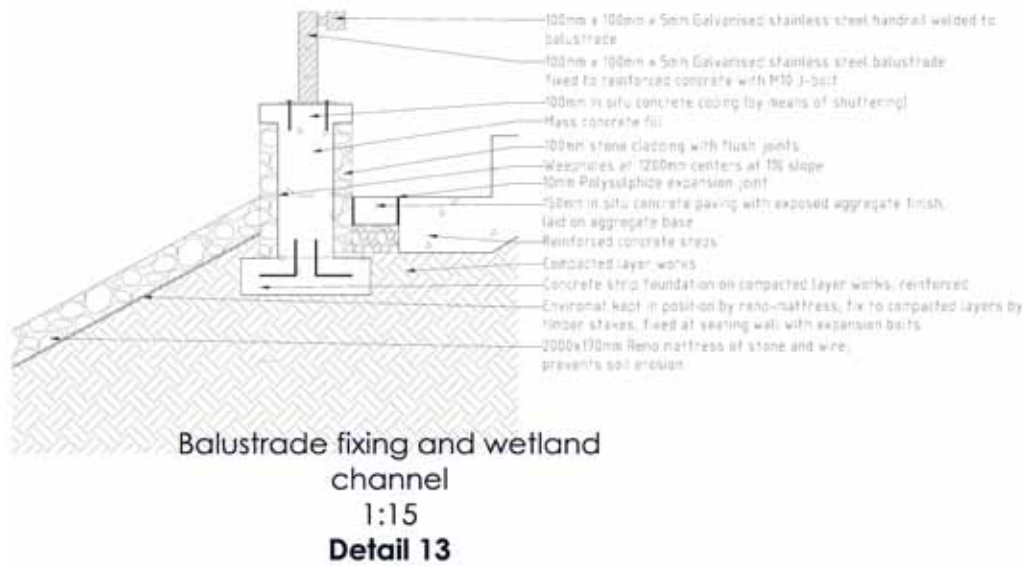


FIGURE 10.25: BALUSTRADE FIXING AND WETLAND CHANNEL (not to scale) (AUTHOR, 2011)

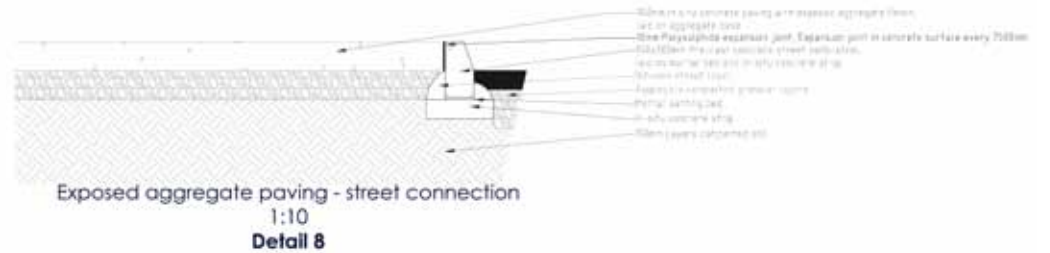


FIGURE 10.27: EXPOSED AGGREGATE PAVING - STREET CONNECTION (not to scale) (AUTHOR, 2011)

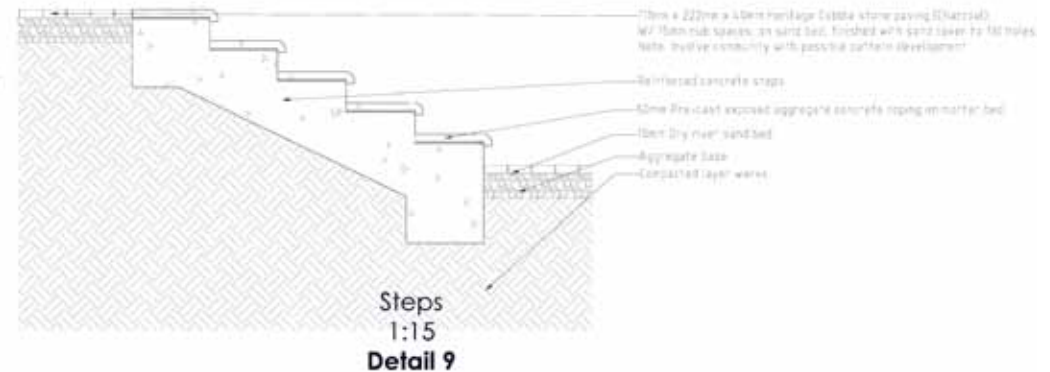


FIGURE 10.28: STEPS DETAIL (not to scale) (AUTHOR, 2011)



# CHAPTER 11\_

## CONCLUSION

## 11.1 SUMMARY AND CONCLUSION

The design goals of the project, will address the following citywide and site specific issues:

Citywide scale:

- Designing the vision of the Maputo *Baixa* student urban design framework (the framework, 2011), of which the author is part of. Achieving this by proposing, the public is provided with urban green spaces along *Avenida 25 de Setembro*. These sites will act as cultural, historic and social nodes within the city.
- Create and introduce a green linkage system. This system will consist of green-urban parks along *Avenida 25 de Setembro* and bisecting the *Baixa* with a green corridor. This will also encourage more efficient pedestrian movement and crossing.
- Analysing the catchment and storm water management of the total area. Factors influencing the amount of water includes the percentage of hard urban surface and total area of catchment. It is due to this extend, that a larger system is designed on city scale level. A system that will allow the entire catchment of

water to be allocated, cleaned, treated, harvested and discharged. A series of water holding/urban parks are identified and implemented.

Site specific:

- One of the main issues in terms of the site specific design, is the amount of water that will flow into the site system. The suggested park's water holding capacity will only be able to accommodate an estimation of 22 123.39 m<sup>3</sup> of water. The amount expected within this one catchment can add up to 196 321.72 m<sup>3</sup> in the rainy month of January. There should thus be efficient structures and systems in place to accommodate for these large amounts of quantities. These include from the inflow of water from the street's channel to the outflow of water to the next site of discharge.
- A second issue is cleaning all the water that enters the site. This is done through a series of traps which account to litter, sediment and oil traps.
- Another issue that should be attended to is the seasonal change of water flow and water amounts. The aims is to keep water in circulation and prevent still standing,

stagnant water. During the dry seasons, water should still be the main aesthetic feature within the park. This means that the "dam" should be full during the most of the time.

- It should be aimed to restore an ecological unit within the park
- Implementing robust furniture and park elements.
- In regard to *Avenida 25 de Setembro*, it should be attempted to create a multi-functioning water channel, that will allow for water channelling during rainy seasons, but parking during dry the season.
- From a design perspective, *Avenida 25 de Setembro*, should be altered in such a way that is does not inhibit movement across or within its perimeter.

## REFERENCES

- ADELEKAN, I.O. 2009. *Vulnerability of Poor Urban Coastal Communities To Climate Change In Lagos, Nigeria*.
- An Inconvenient Truth*. Directed by DAVIS GUGGENHEIM. United States of America: Paramount Classics. 2006.
- ACTIONAID 2006. *Climate change, urban flooding and the rights of the urban poor in Africa*. A report by ActionAid International.
- BREBBIA, C.A., Mander, U. 2006. *Brownfield Sites III*, United States of America, WIT Press.
- BRIGGS, P. 2011. *Mozambique 5th, The Bradt Travel Guide 99*. United States of America: The Globe Pequot Press Inc.
- BROOKER, C. 2011. Verbal Communication with the Author in August and October. South Africa, Johannesburg.
- BRUSCHI, S. 2005. *O Desenho Das Cidades: Breve História Do Urbanismo Moçambicano*. Mozambique: Maputo. Académica, Lda. p.9
- CITY OF CAPE TOWN FACILITIES MANAGEMENT. 2011. *Sustainable Landscapes, Practices and Guidelines*. South Africa: Cape Town.
- COMMISSION FOR AFRICA. 2005. *Action for a strong and prosperous Africa*. United Kingdom, London: The Commission.
- DARAMOLA, A., IBEM. E.O. 2010. Urban Environmental Problems In Nigeria: Implications For Sustainable Development. *Journal of Sustainable Development in Africa*. Volume 12(1).
- DEVENISH, P. 2011. Verbal Communication with the Author in 2011. South Africa: Pretoria
- FLOOD, J. 2011. Verbal Communication with the Author in February 2011. Mozambique: Maputo.
- FORJAZ, J. 2011. Verbal Communication with the Author in June. Mozambique: Maputo.
- GARNER, G. 2011. *Urban Green File. Urban regeneration: Gandhi square*. South Africa: Brooke Patrick.
- GIROT, C. 1990. Four Trace Concepts in Landscape Architecture. In: J. CORNER, (ed). *Recovering Landscape: Essays in Contemporary Landscape Architecture*. United States of America, New York: Architectural press, p.59.



GOOGLE DICTIONARY. 2011. *Intuitive Research*. Available from: <http://www.google.com/dictionary> [Accessed 12 April 2011].

GREEN BUILDING COUNCIL OF SOUTH AFRICA. 2011. Green Star Rating South Africa. Available from: <http://www.gbcsa.org.za/home.php>. [Accessed 24 July 2011].

HOTTEN, R., DIPROSE, P. 2009. *Sustainable Architecture Primer*. Available from: <http://www.aloha.net/~laumana/index.html>. [Accessed 2 September 2011].

INTERNATIONAL MONETARY FUND. 2006. *Finance and Development*. United States of America, Washington DC: BPA International.

IPCC WORKING GROUP II. 2001. *Impacts, Adaptation and Vulnerability*. United Kingdom, Cambridge: Cambridge University Press.

JOST, D. 2009. *Landscape Architecture Magazine. A redesigned entry plaza at the National Aquarium in Baltimore spices up the city's Inner Harbor and brings the aquarium's mission out into the site*. United States of America, Washington DC: American society of Landscape Architects. Volume 99(8).

LAGE, L. 2005. *O Desenho Das Cidades: Maputo Historia De Uma Cidade E Da Sua Arquitectura*. Mozambique: Maputo. Académica, Lda. p.82

LLEWELYN-DAVIES, n.d. *Urban Design Compendium*. UK: English Partnerships and The Housing Corporation. Available from: <http://www.urbandesigncompendium.co.uk/public/documents/UDC1FULL.pdf> [Accessed 15 May 2011].

LYNCH, K. 1960. *The image of the city*. United States of America, Massachusetts: Institute of Technology and the President and Fellows of Harvard College.

MAHNE, T. 2009. *Urban water centre: Educate and celebrate*. South Africa: University of Pretoria.

MAOCHA, J.(maochaj@yahoo.com) 2011. Park Precedent. [Email to:] OOSTHUYSEN, W. (wesooos@live.co.za) in February 2011.

MAPUTO CITY COUNCIL. 2011. Verbal communication with the Author in February. Mozambique: Maputo.

MCHARG, I. 1969. Design with nature. In: S. SWAFFIELD, (ed.) *Theory in landscape architecture*. 2002. United States of America, Philadelphia: University of Pennsylvania. p.173

MCNEILL, D. 1999. *Urban Change and the European left*. United Kingdom. Routledge.

MILLIE, A. 2009. *Securing Respect, Behavioural expectations and anti-social behaviour in the UK*. Great Britain. The Policy Press.

MMOCHI, A., FRANCIS, J. n.d. *Land Based Activities and Sources of Pollution to the Marine, Coastal and Associated Fresh Water Ecosystems in the Western Indian Ocean Region*.

NATIONAL INSTITUTE OF BUILDING SCIENCES. 2010. *Whole building green design guide*. Available from: [http://www.wbdg.org/design/dd\\_landscapearch.php](http://www.wbdg.org/design/dd_landscapearch.php). [Accessed 12 March 2011].

NICHOL, P. 2007. Thunduru botanical garden, Maputo, Mozambique: *Global learning for local regeneration*. United Kingdom: Groundwork East Durham & Department for International Development. p.1-8

OOSTHUYSEN, W., CASSON, J., DEVENISH, P., SNOW, B., HART, J., DEACON, C. 2011. *The Framework*. South Africa: University of Pretoria.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. 2001. *Policy brief: Sustainable development: Critical issues*. Available from: <http://www.oecd.org/dataoecd/29/9/1890501.pdf>. [Accessed 1 April 2011].

PAI, H., PAE, H. 2002. *The Portfolio and the Diagram*. Massachusetts Institute of Technology. United States of America: Liberty of Congress Cataloging-in-Publication Data

PETERS, W. 2000. *Global Issues-An Electronic Journal of the U.S Department of State. Green Cities- Urban Environmental Solutions*. March 5(1) p.1-39.

ROBBERTS, D. 2011. *Algebra Lesson Page: Qualitative vs. Quantitative Data*. Available from: <http://regentsprep.org/REgents/math/ALGEBRA/AD1/qualquant.htm> [Accessed 8 May 2011].

RUFF, A. 1982. An ecological approach. In: S. SWAFFIELD, (ed.) *Theory in landscape architecture (2002)*. United States of America, Philadelphia: University of Pennsylvania. p.175

SAMBIRA, J. 2007. *Floods in West Africa Increase with Overcrowding of Cities*. United Nations Radio. Available from: <http://www.unmultimedia.org/radio/english/detail/81527.html> [Accessed 3 Augustus 2011]

SPENS, M. 2007. *Landscape architecture site/non site*. Architectural design. United Kingdom: Wiley-Academy. p.48-51

SUSTAINABLE SITES INITIATIVE. 2009. *Sustainable Sites Initiative: Guidelines and Performance Benchmarks 2009*. Available from: <http://www.sustainable-sites.org/report/>. [Accessed 2 September 2011].

TRANCIK, R. 1986. *Finding lost space: Theories of urban design*. United States of America: John Wiley & Sons Inc.

TOWNSHEND, D. Verbal communication with Author in 2011. South Africa: Pretoria

- UNCHS. 2007. Urbanization: A Turning Point in History. *Global Report on Urbanization*. Available from: <http://www.unhabitat.org>. [Accessed 25 September 2011].
- UNEP. 2011. *Africa Environment Outlook: Past, Present and Future Perspectives*. Available from <http://www.unep.org/dewa/africa/publications/aeo-1/216.htm> . [Accessed 22 August 2011].
- UNFPA. 2007. *State of the World Population 2007, Unleashing the Potential of Urban Growth*. New York: United Nations Population Fund.
- UN-HABITAT. 2003. *The Challenge of Slums, 2003 Global Report on Human Settlements*. Nairobi: United Nations Centre for Human Settlements.
- UNIVERSITY OF EDUARDO MONDLANE. 2011. *Presentation on frameworks attended by Author in February 2011*. Mozambique: Maputo.
- UP STUDENTS. 2011. *Maputo Workshop*. South Africa, Pretoria: University of Pretoria.
- VANDERZADEN, A., COOK, T.W. 200. *Sustainable Landscape Management*, United States of America, New Jersey: John Wiley & sons Inc.
- VOLKER, A. 2011. Verbal communication with Author in August 2011. South Africa, Pretoria.
- VICENTE, E. 2006. Geology and Geomorphologic Settings. *Urban Geology of Maputo*. Volume 338(2).
- WATERFRONT TORONTO. 2011. Available from <http://www.waterfrontoronto.ca/> [Accessed 12 May 2011]
- WILLIAMS, D.A. 2007. *Sustainable design: Ecology, Architecture and planning*. United States of America, New Jersey: John Wiley & sons Inc.
- WORLD BANK. 2000. World Bank Report 1999/2000. *Entering the 21st Century*. United States of America, New York: Oxford University Press.
- WORLD WATER ASSESMENT PROGRAMME. n.d. *Water for people, Water for Life*. United Nations.
- YOUNG, G, et al. 2011 Verbal communication with the Author and Landscape Architects throughout 2011. South Africa: University of Pretoria - Faculty of Architecture.

# ***APPENDIX A\_*** **THE FRAMEWORK, 2011**

# Maputo Studio

Baixa

Revitalising the historic core of the port city

2011

Jacqueline Casson

Catherine Deacon

Paul Devenish

Juliette Hart

Wessel Oosthuysen

Byron Snow

An international design collaboration in which the revitalisation of Maputo's historic Baixa district serves as the active laboratory for learning.



**June 2010 (Maputo workshop):**  
Quick scan analysis of the Baixa

**February 2011 (Maputo workshop):**  
Delft, Pretoria and Maputo students  
First impressions

Analysis and identification of problems

- 1) Flooding
- Cars
- Insensitive building practices
- Poor connection to sea
- Mapping

**July 2011 (Maputo workshop):**  
Pretoria students visit Maputo  
conduct further site specific research

**August 2011 (Pretoria workshop):**  
Delft, Pretoria and Maputo students visit Pretoria  
Presentation of frameworks  
Discuss design proposals



experience

Experiencing the city as a architectural coalition on a pedestrian level allowed for the production of impressions sketches and a dialogue facilitating understanding of the various points of reference and opposing opinions.



analysis

Group discussions as part of a basic framework design involved analysing problem and possible solutions for the Baixa. Separate groups of student proposed varying SWOT analyses as well as mapping of different conditions with the existing fabric.

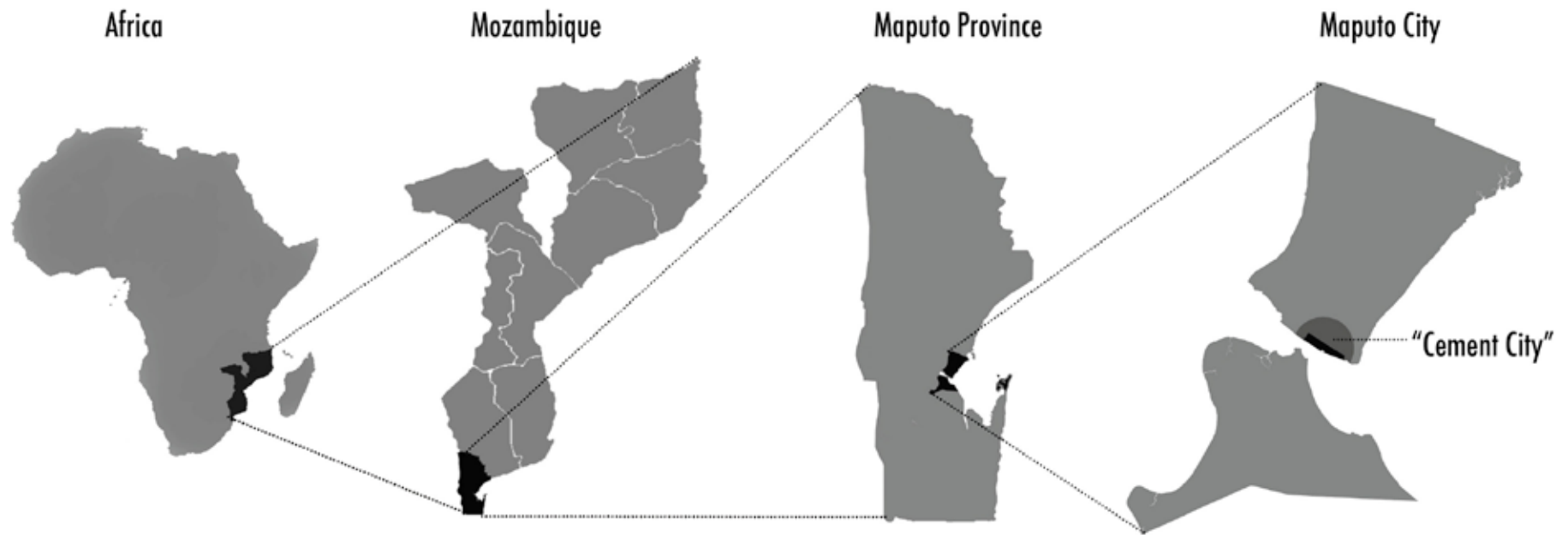


scenario development

Scenarios for the development of the Baixa are determined through analysis and group work consisting of ideas from various and opposing frames of reference. Scenarios were then combined and presented to lecturers from the various schools and criticized.

## Project Background

# MSA 2011



## Locating: Geographical



MSA 2011



Locating: the 'cement city'





**MSA 2011**

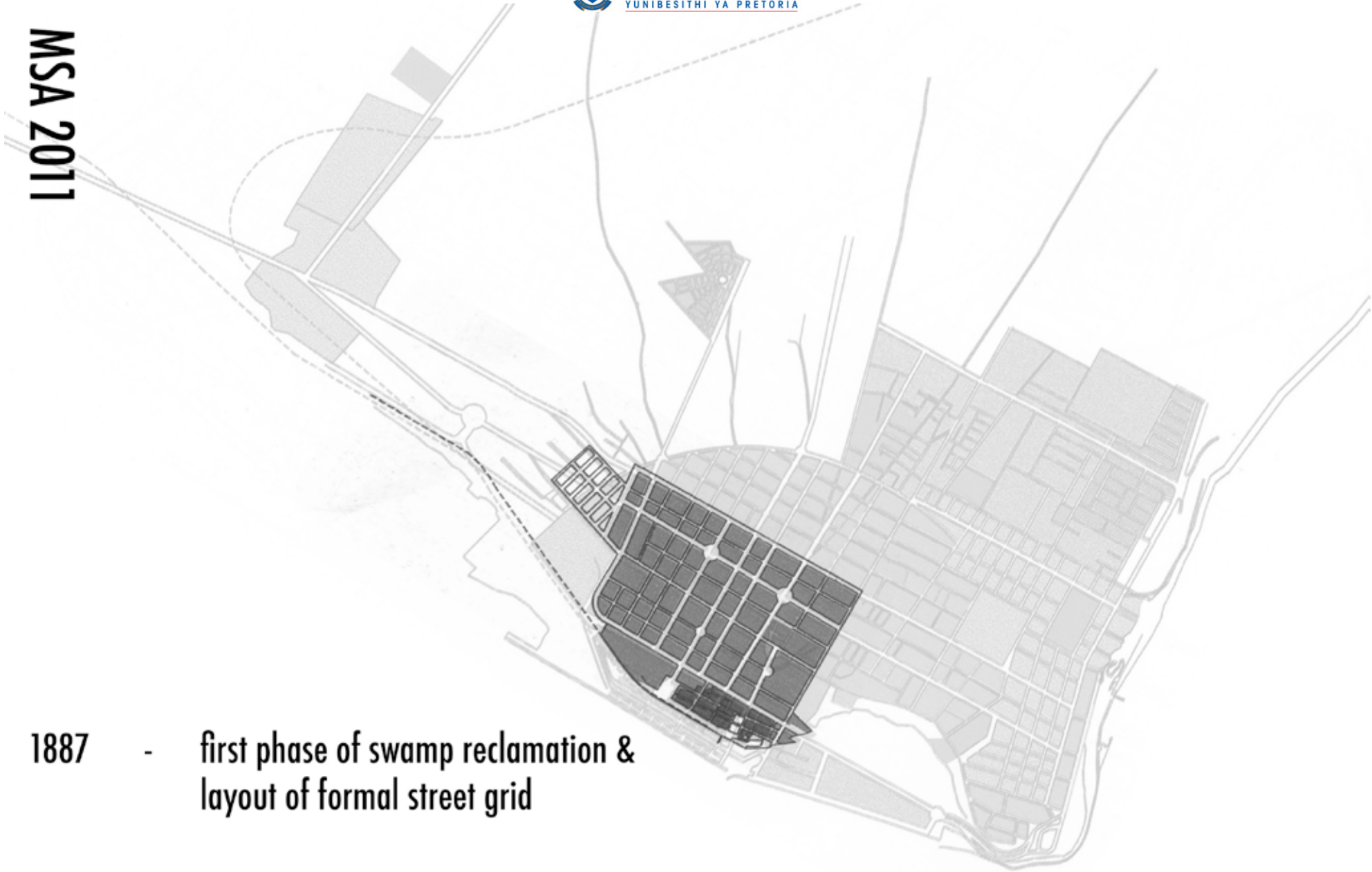


**1876** - the fort & trading settlement on an island swamp

**Historic growth of 'cement city'**



**MSA 2011**

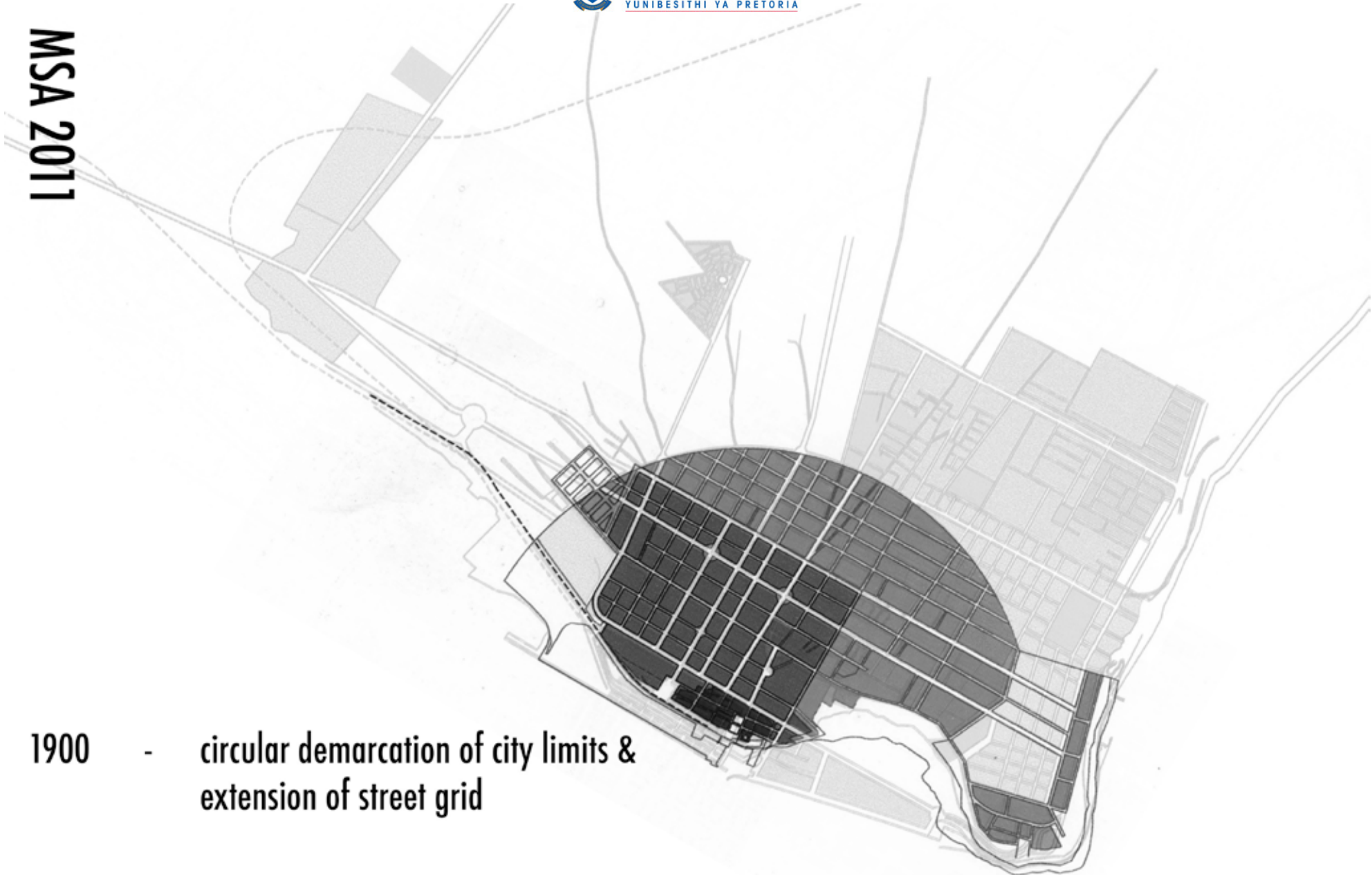


**1887** - first phase of swamp reclamation & layout of formal street grid

**Historic growth of 'cement city'**



**MSA 2011**

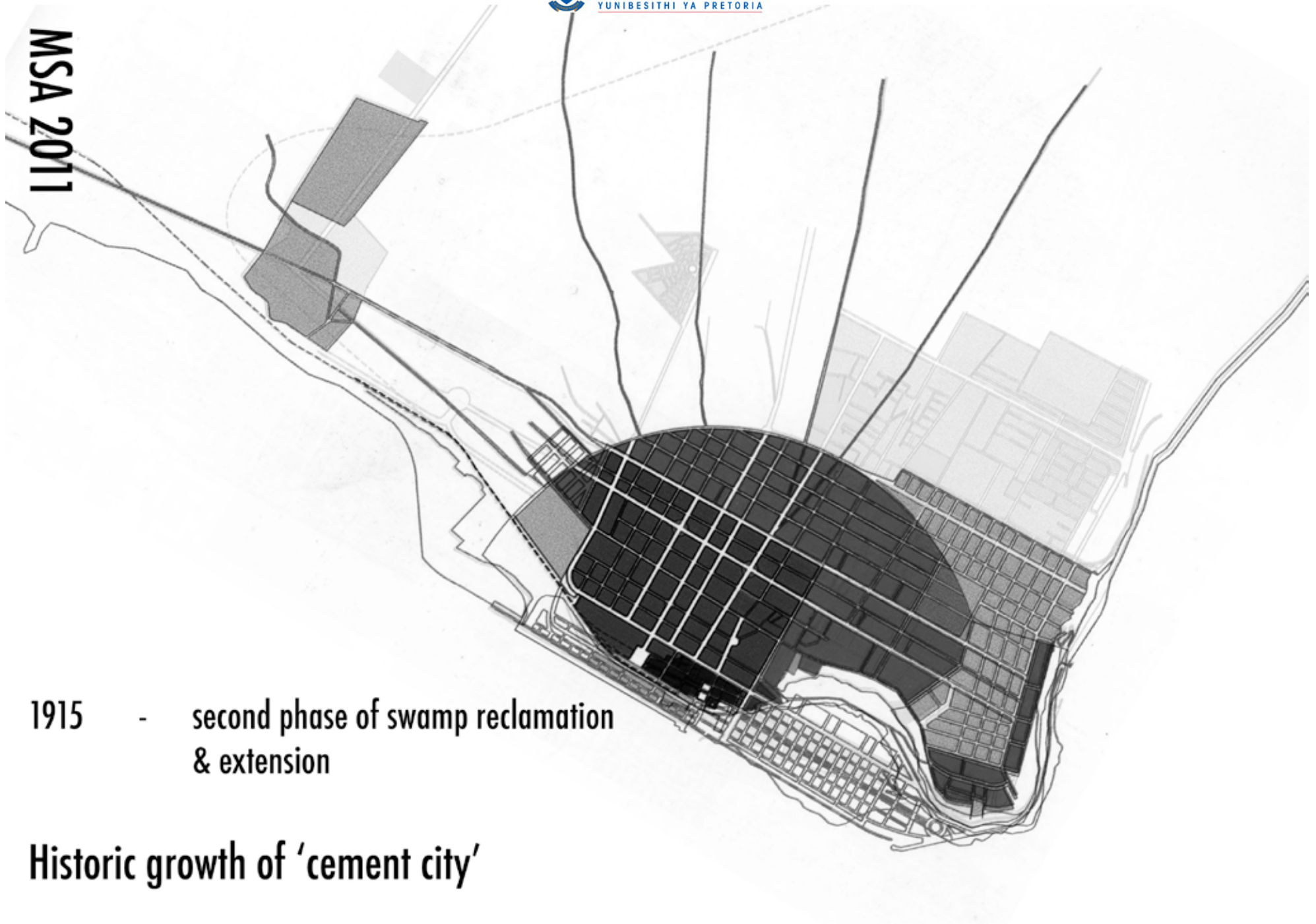


**1900** - circular demarcation of city limits & extension of street grid

**Historic growth of 'cement city'**



MSA 2011

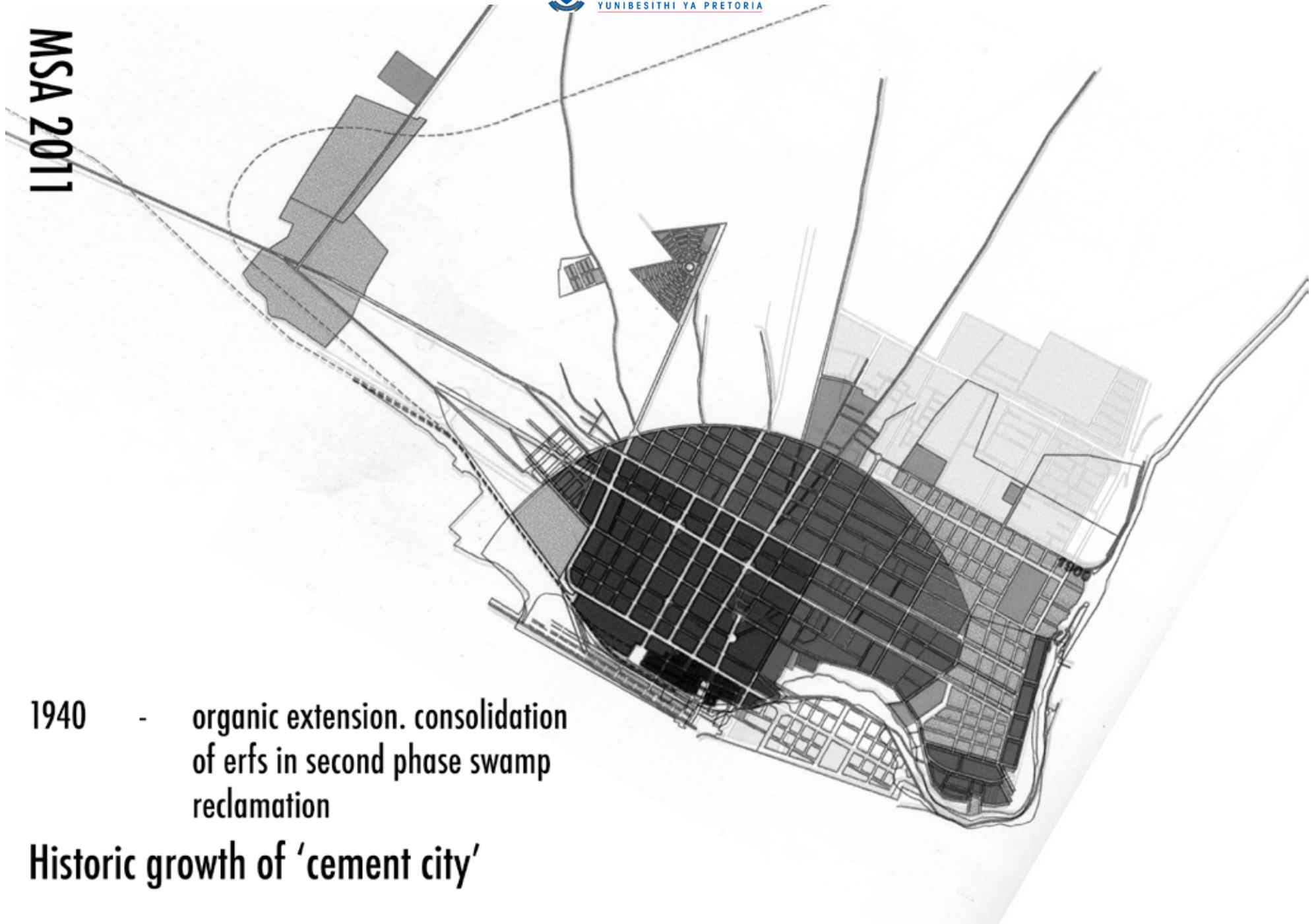


1915 - second phase of swamp reclamation & extension

Historic growth of 'cement city'



MSA 2011

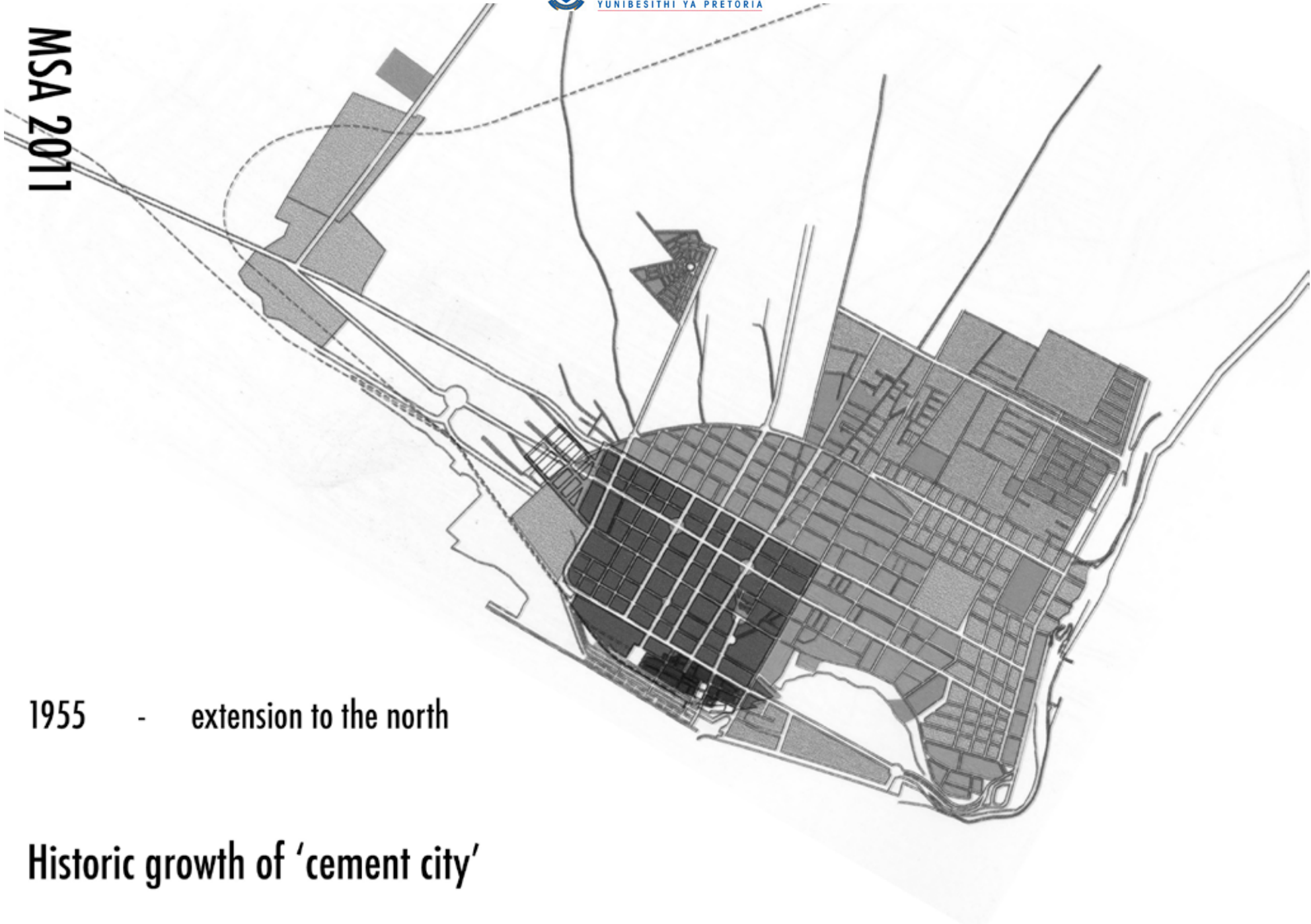


1940 - organic extension. consolidation of erfs in second phase swamp reclamation

Historic growth of 'cement city'



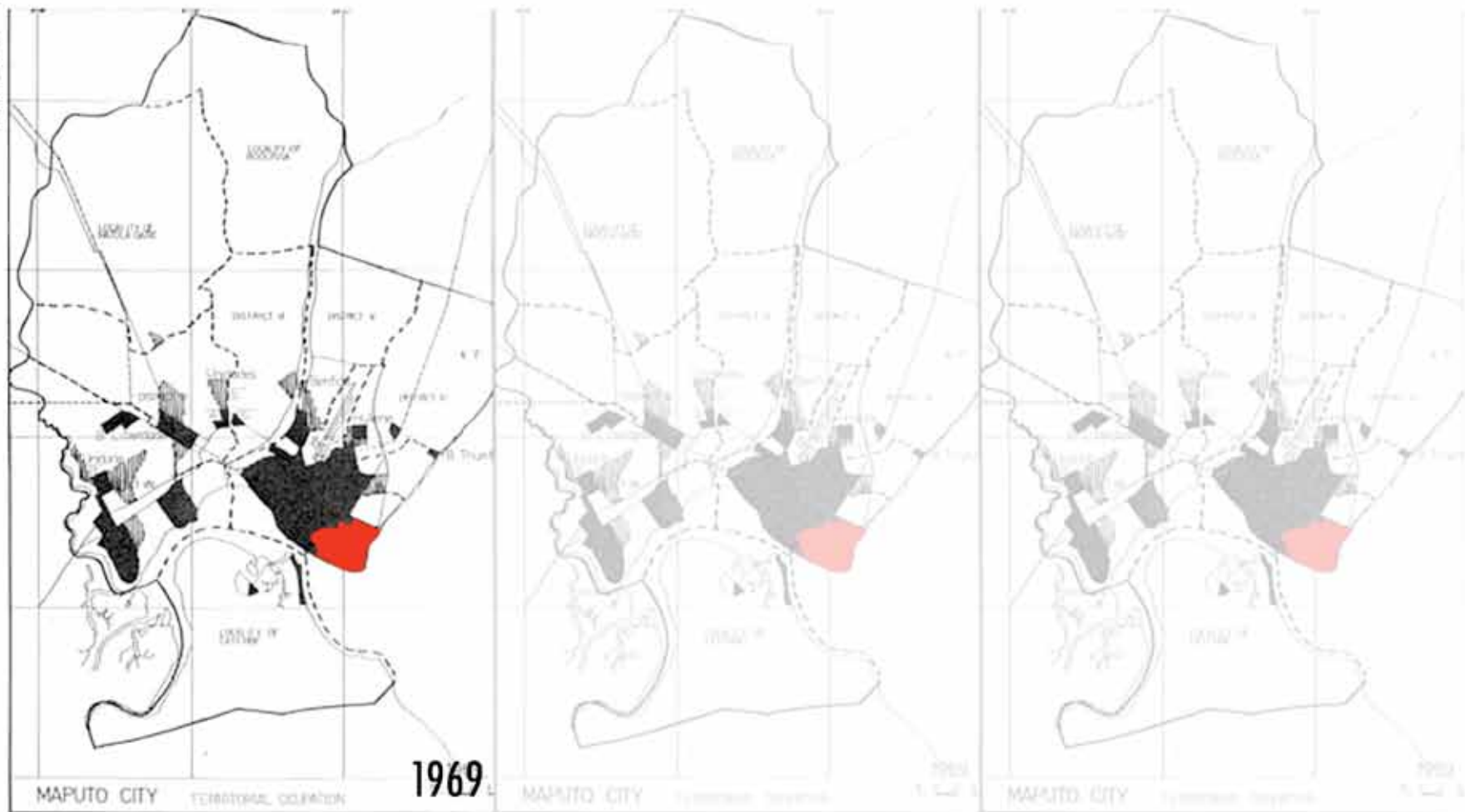
MSA 2011



1955 - extension to the north

Historic growth of 'cement city'

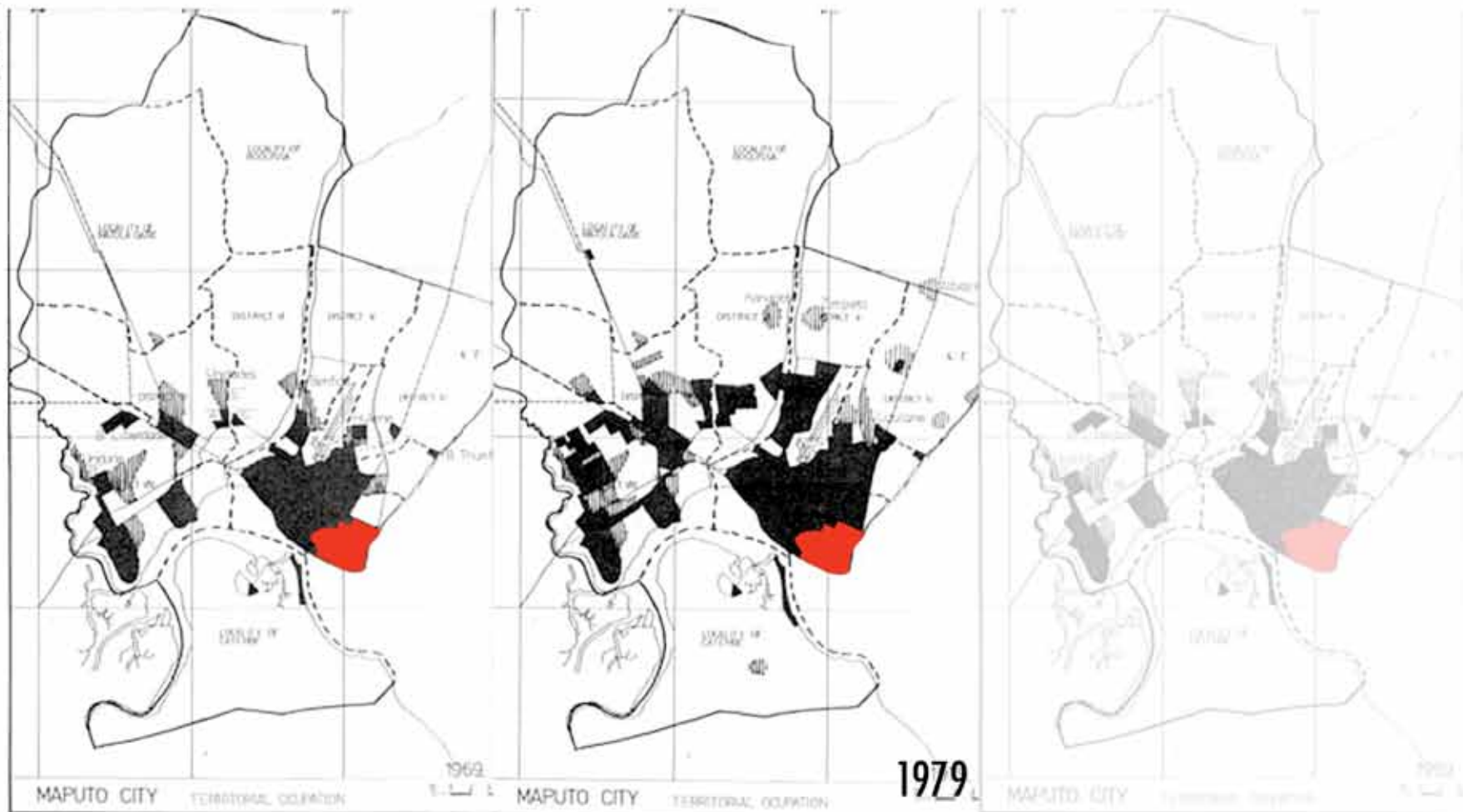
MSA 2011



1969 - 1989 post independence: influx of people from rural areas and resultantly an expansion of informal areas of greater maputo

**Historic growth of the 'reed city' (greater Maputo)**

MSA 2011

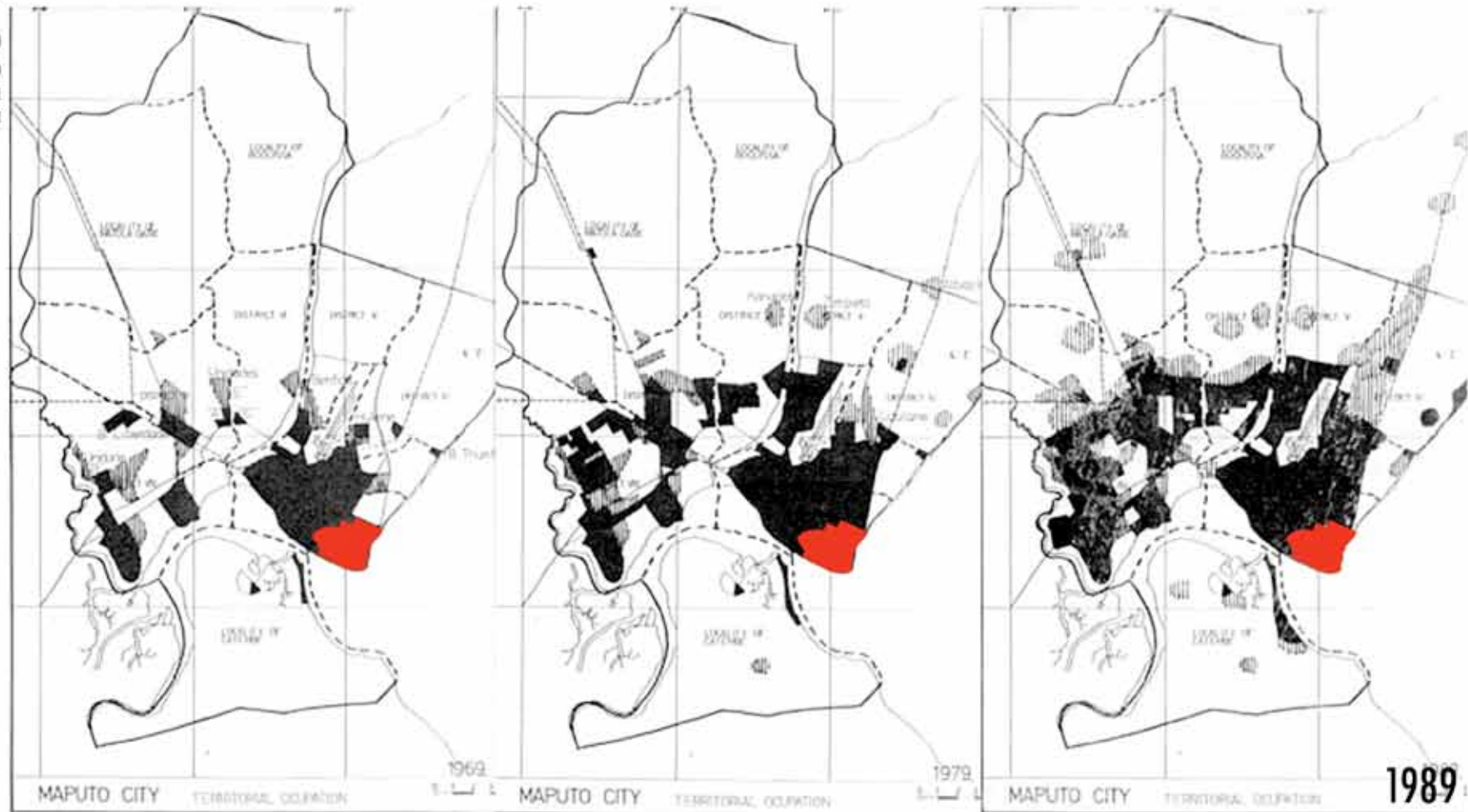


1969 - 1989 post independence: influx of people from rural areas and resultantly an expansion of informal areas of greater maputo

**Historic growth of the 'reed city' (greater Maputo)**



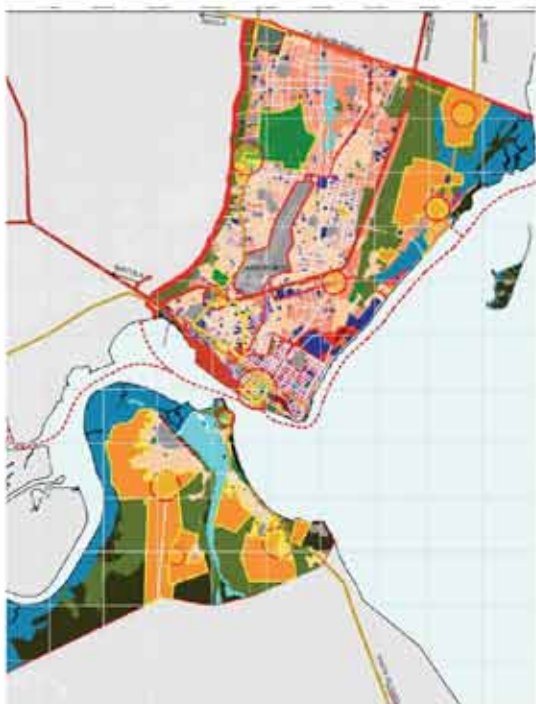
MSA 2011



1969 - 1989 post independence: influx of people from rural areas and resultantly an expansion of informal areas of greater maputo

Historic growth of the 'reed city' (greater Maputo)

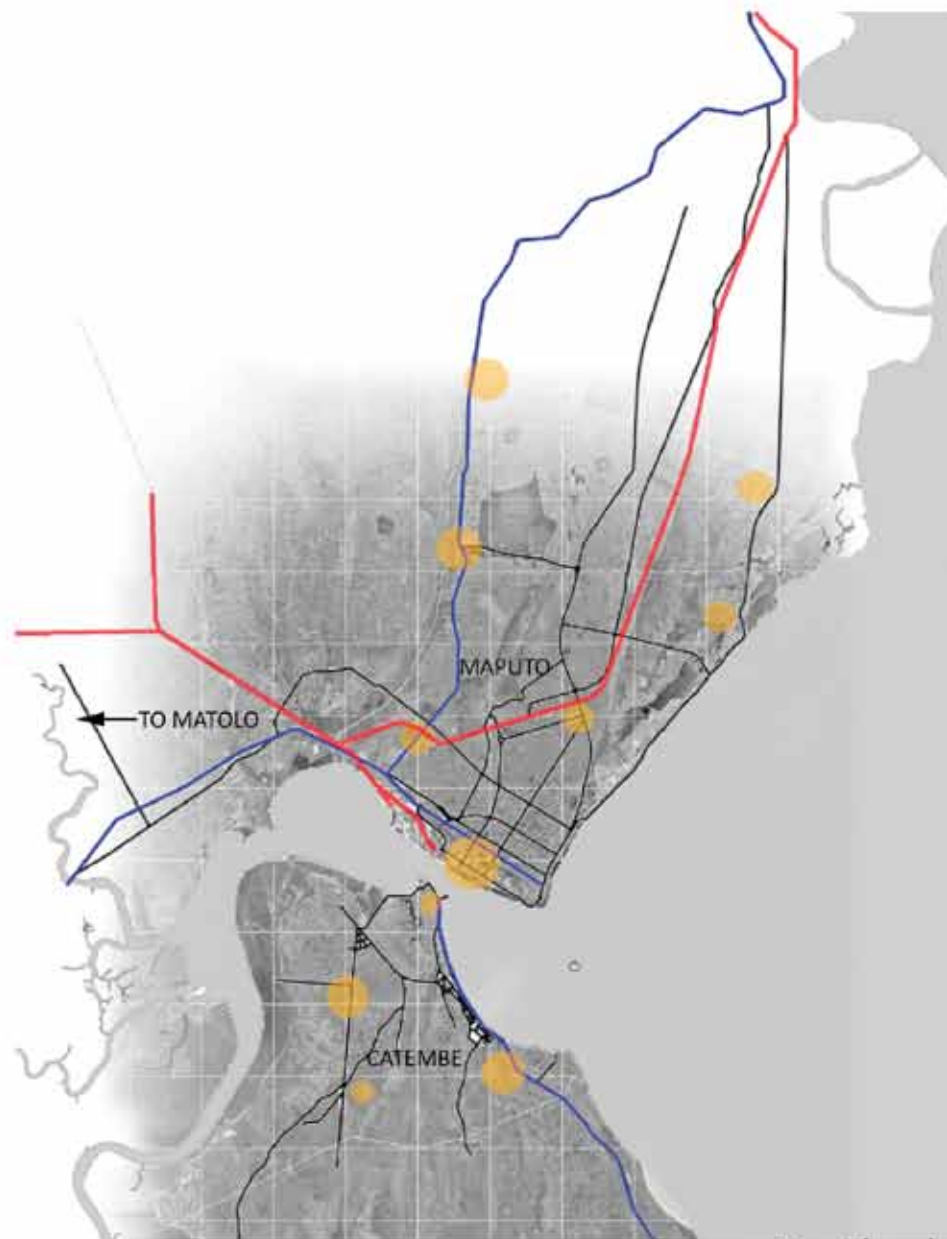
MSA 2011



### 2008 PEUMM greater Maputo framework

- the right to the city
- the right to urbanized land
- the right to decent housing
- the right to sanitation
- the right to safe transit and urban mobility

### Existing City Framework - Poly-central

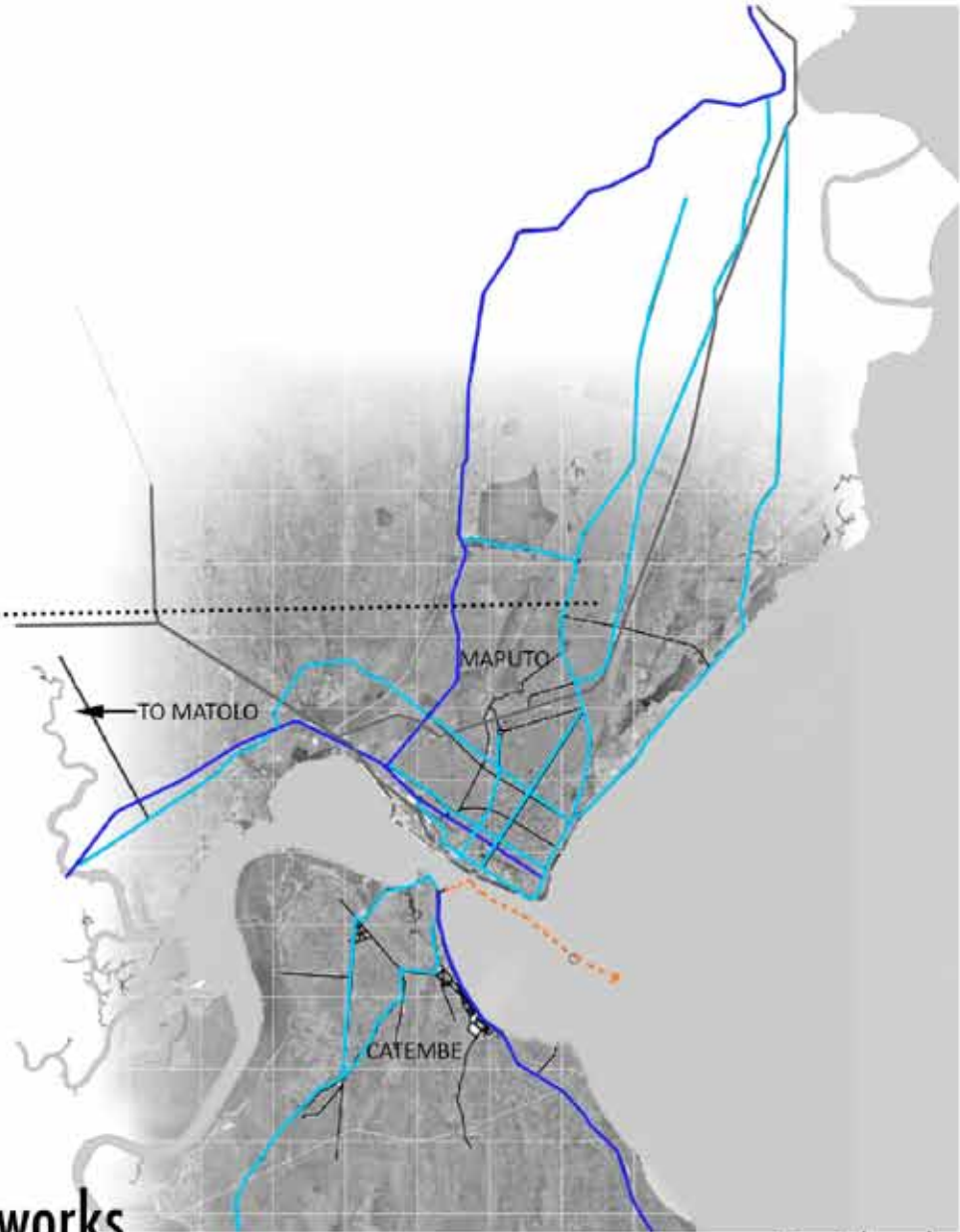


city- wide scale

MSA 2011



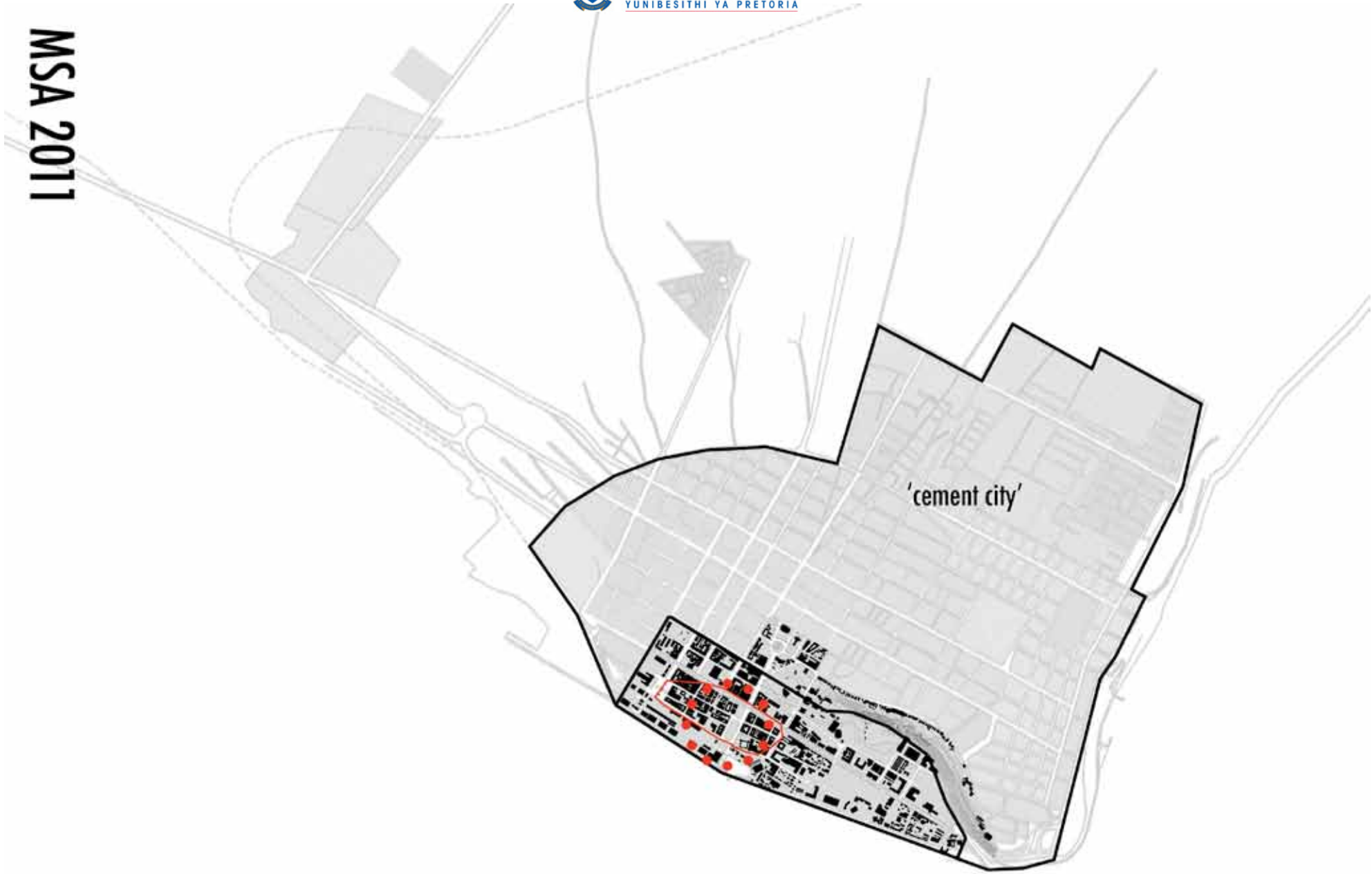
The informal 'reed city'



city-wide scale

Existing City Framework - transport networks

MSA 2011



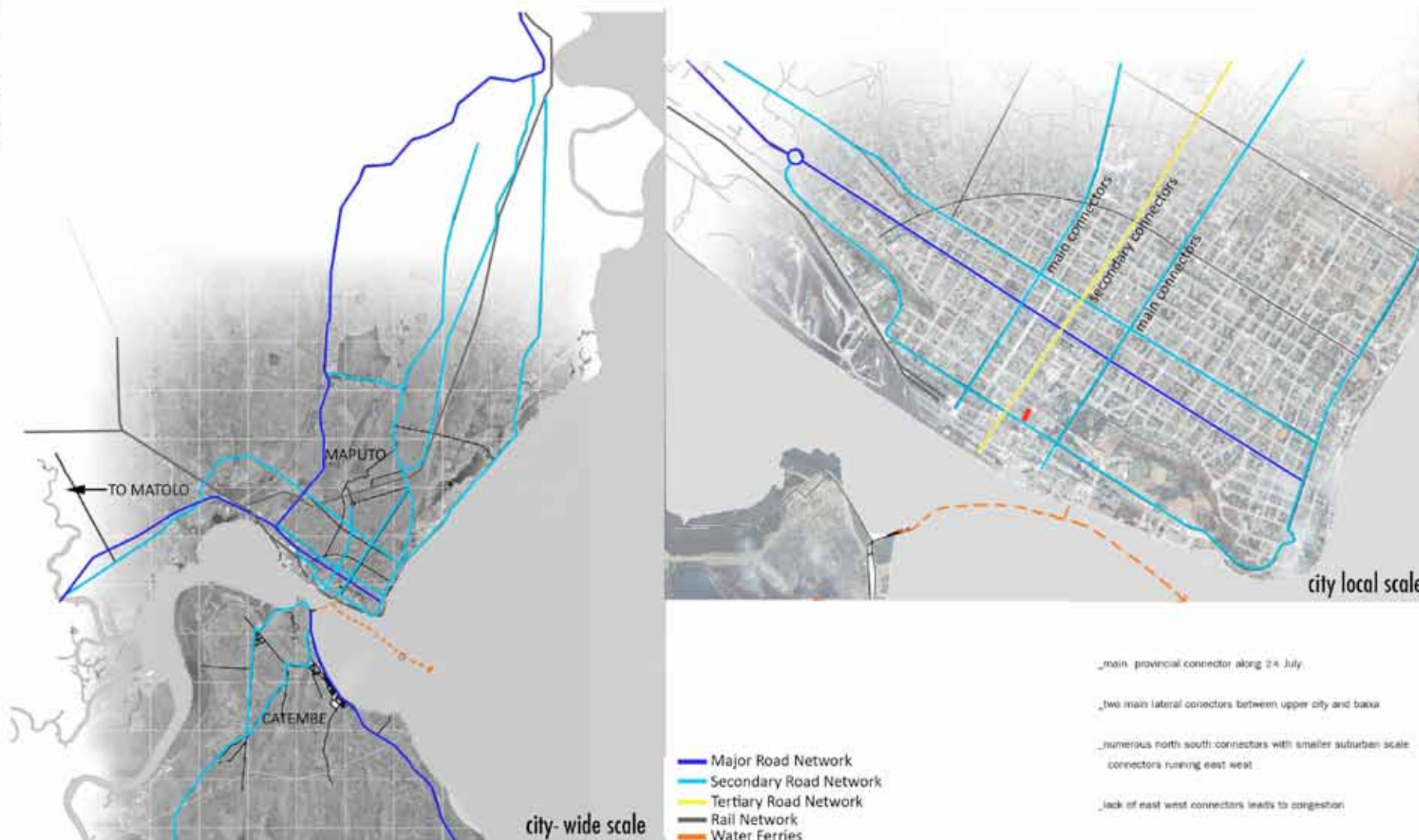
the poly-central city

MSA 2011



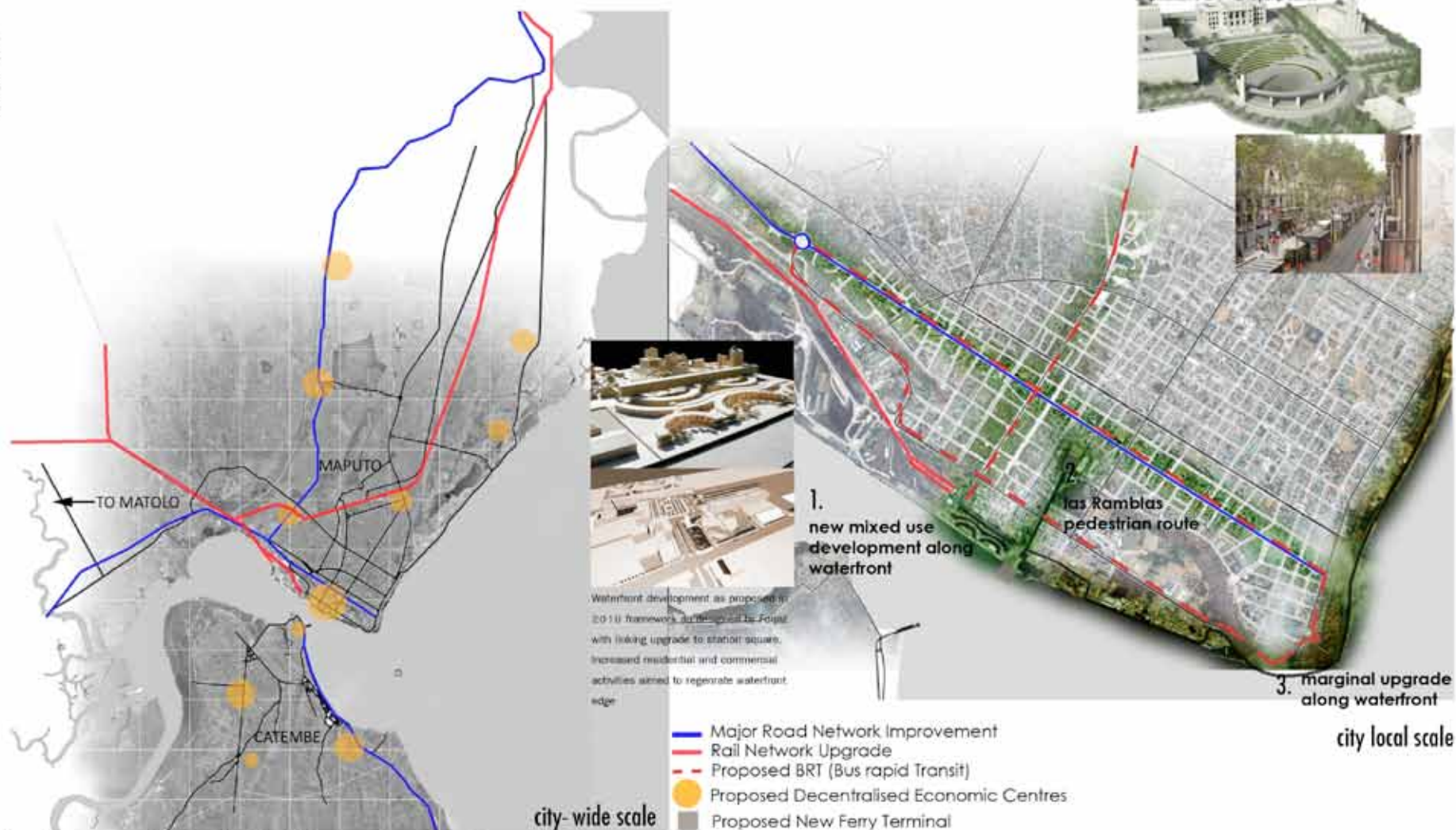
the poly-central city

MSA 2011



## Transport network Existing City Framework

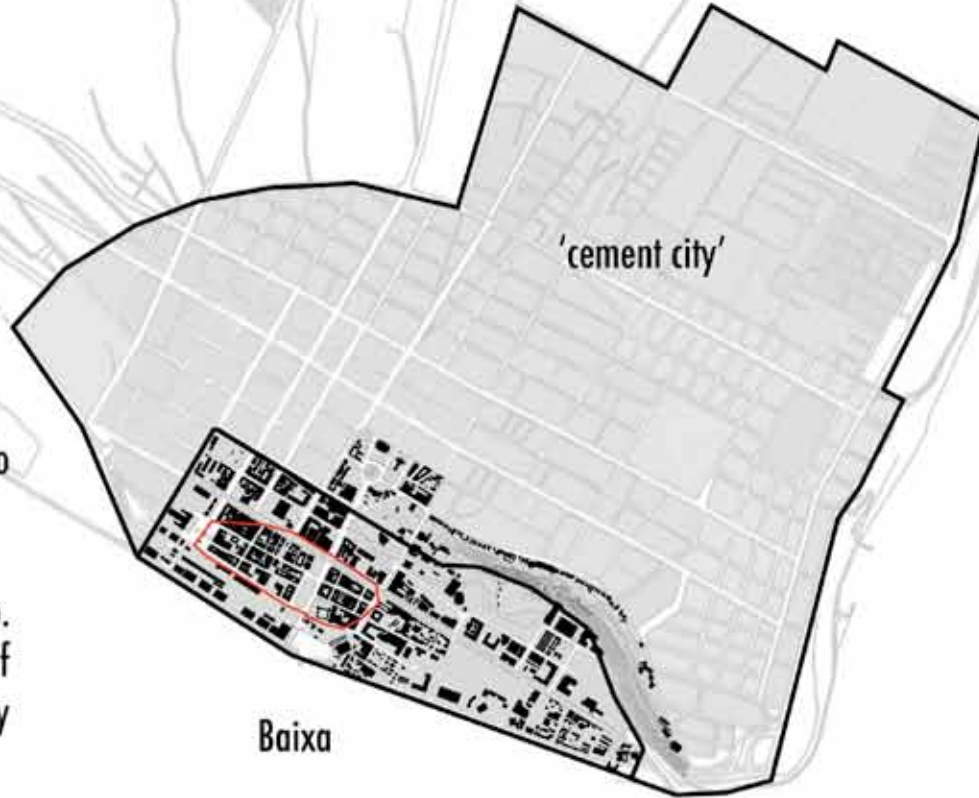
MSA 2011



Public transport and city improvement projects  
Existing City Framework



# MSA 2011



**Baixa:** a Portuguese word that translates into 'downtown'.

In Maputo the Baixa forms the oldest part of Maputo. The Baixa is the central business district, the heart of the city and the arrival point into the city for many modes of transport.

## Defining the 'Baixa'



# MSA 2011



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## Defining the 'Baixa'

# MSA 2011



old Baixa

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## Defining the 'Baixa'

# MSA 2011



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## Defining the 'Baixa'

# MSA 2011



Area defined by the Maputo Municipality as historical protected

**Baixa:** a Portuguese word that translates into 'downtown'.

In Maputo the Baixa forms the oldest part of Maputo. The Baixa is the central business district, the heart of the city and the arrival point into the city for many modes of transport.

## Defining the 'Baixa'



Focus area for study:  
'the revitalisation of Maputo's historic Baixa district'

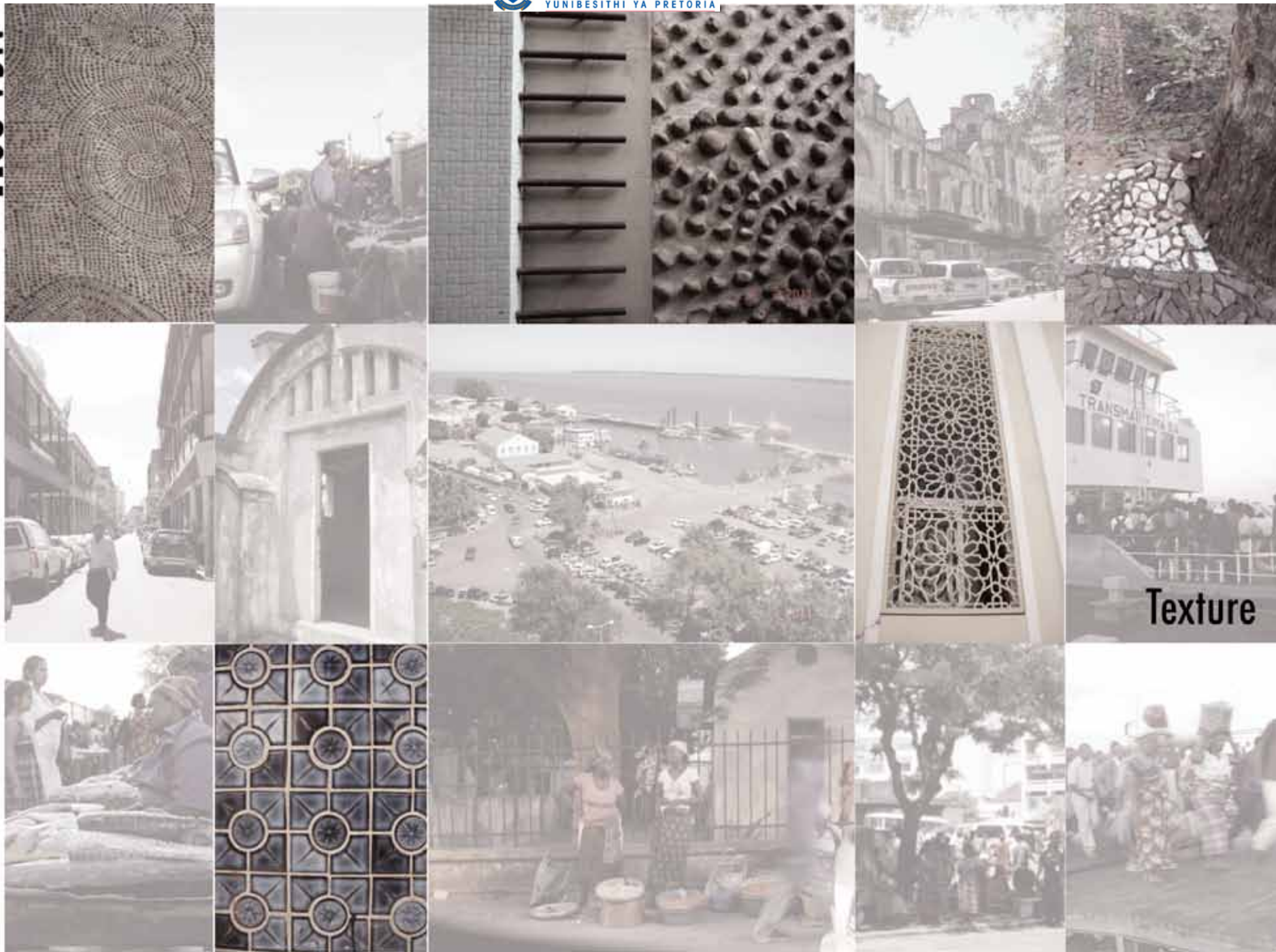
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**Defining the 'Baixa'**

## Mapping the 'Baixa'

MSA 2011



Texture

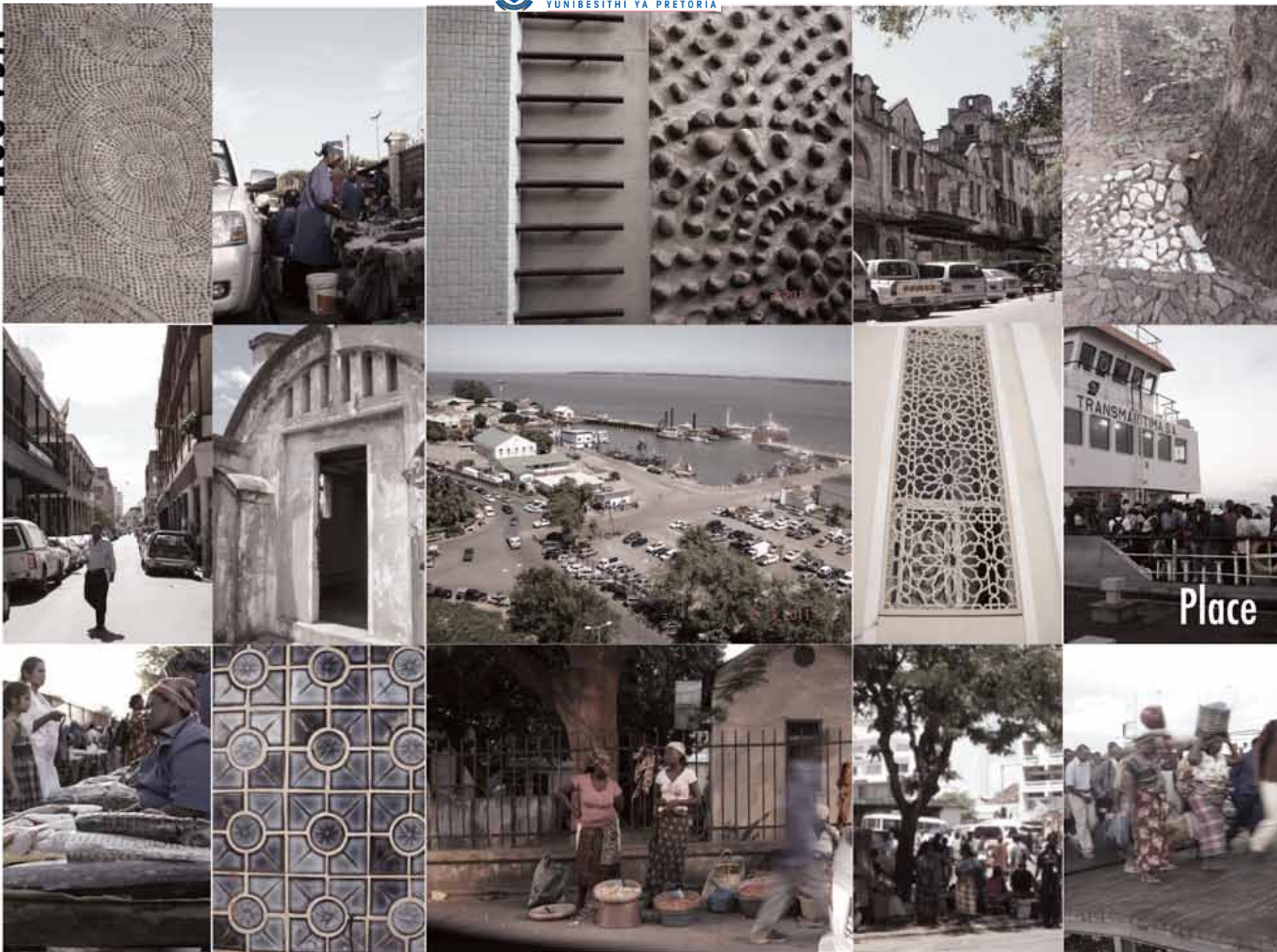


MSA 2011



Event

MSA 2011



Place

# MSA 2011

**historical character:**

- \_vibrancy of open space
- \_narrow street
- \_character with colonades
- \_multiple transport modes create bustling street spaces

**current character:**

- \_derelict green spaces
- \_congestion and parking on pavements and plaza's
- \_privatised sea edge
- \_juxtaposition of formal and informal activities

1 Harbour edge

2 Plaza 24 de April

3

4

5 Fishing harbour

6

7 Informal green

8

9 Avenue between Frontiers

10

11

12

13

14

15

16

17

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100

## Mapping: character

MSA 2011



then



now

2 Praça la Trabalhadores (formerly Man Malver)



then



now

historical character:  
\_ vibrancy of open space  
\_ narrow street  
\_ character with colonades  
\_ multiple transport modes create bustling street spaces

current character:  
\_ derelict green spaces  
\_ congestion and parking on pavements and plaza's  
\_ privatised sea edge  
\_ juxtaposition of formal and informal activities



then



now



then



now



then



now



then



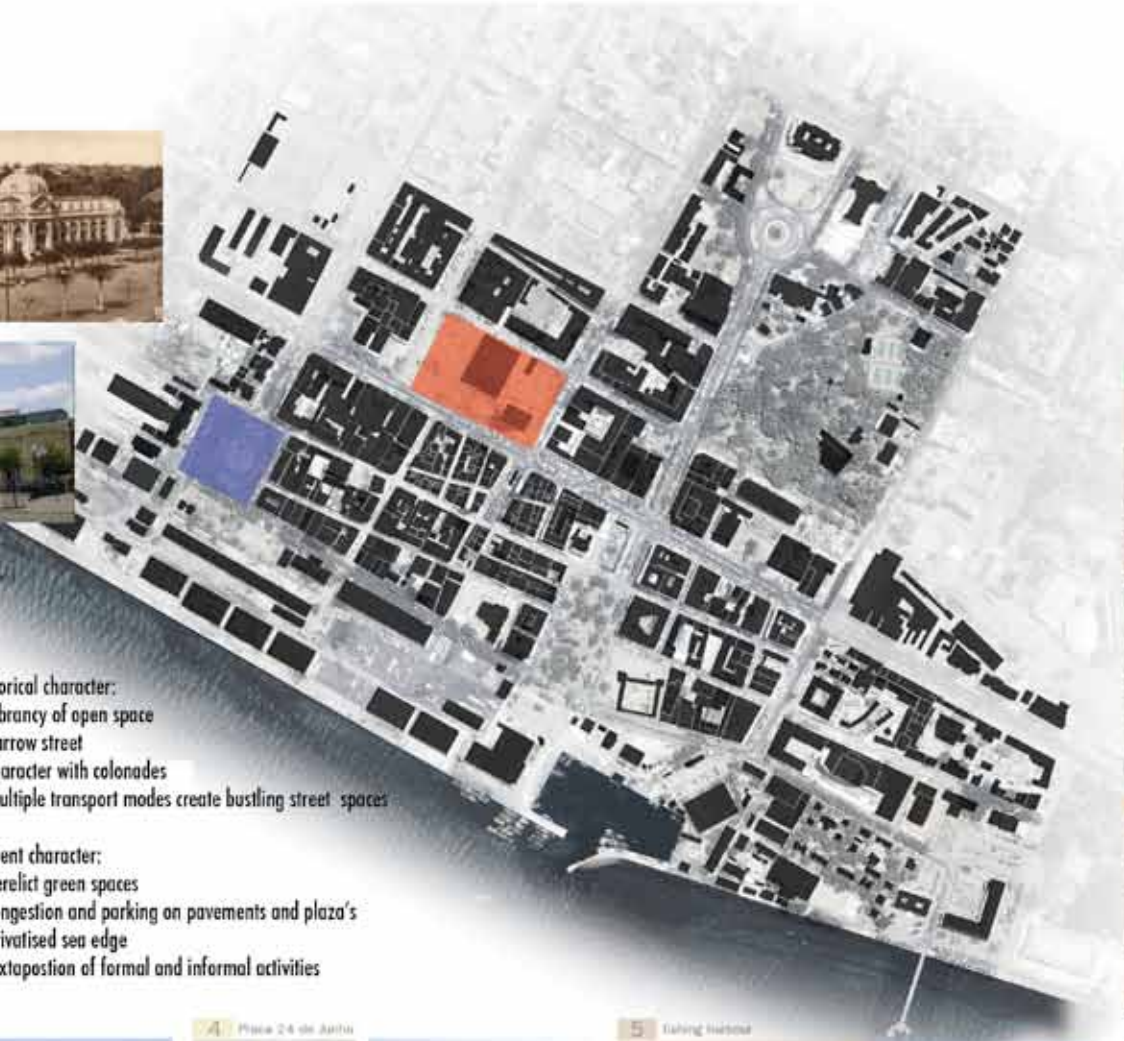
now



then



now



Mapping: character

# MSA 2011



then



now



then



now



then



now



then



now



then



now



then



now



then



now

historical character:  
\_ vibrancy of open space  
\_ narrow street  
\_ character with colonades  
\_ multiple transport modes create bustling street spaces

current character:  
\_ derelict green spaces  
\_ congestion and parking on pavements and plaza's  
\_ privatised sea edge  
\_ juxtaposition of formal and informal activities

## Mapping: character

MSA 2011

**1** Mercado Central

then

now

**2** Praça la Trabalhadores (formerly Man Malver)

then

now

historical character:  
\_ vibrancy of open space  
\_ narrow street  
\_ character with colonades  
\_ multiple transport modes create bustling street spaces

current character:  
\_ derelict green spaces  
\_ congestion and parking on pavements and plaza's  
\_ privatised sea edge  
\_ juxtaposition of formal and informal activities

**3** Harbour edge

then

now

**4** Praça 24 de Junho

then

now

**5** fishing harbour

then

now

**6** Avenida Sigrun Pedrosa

then

now

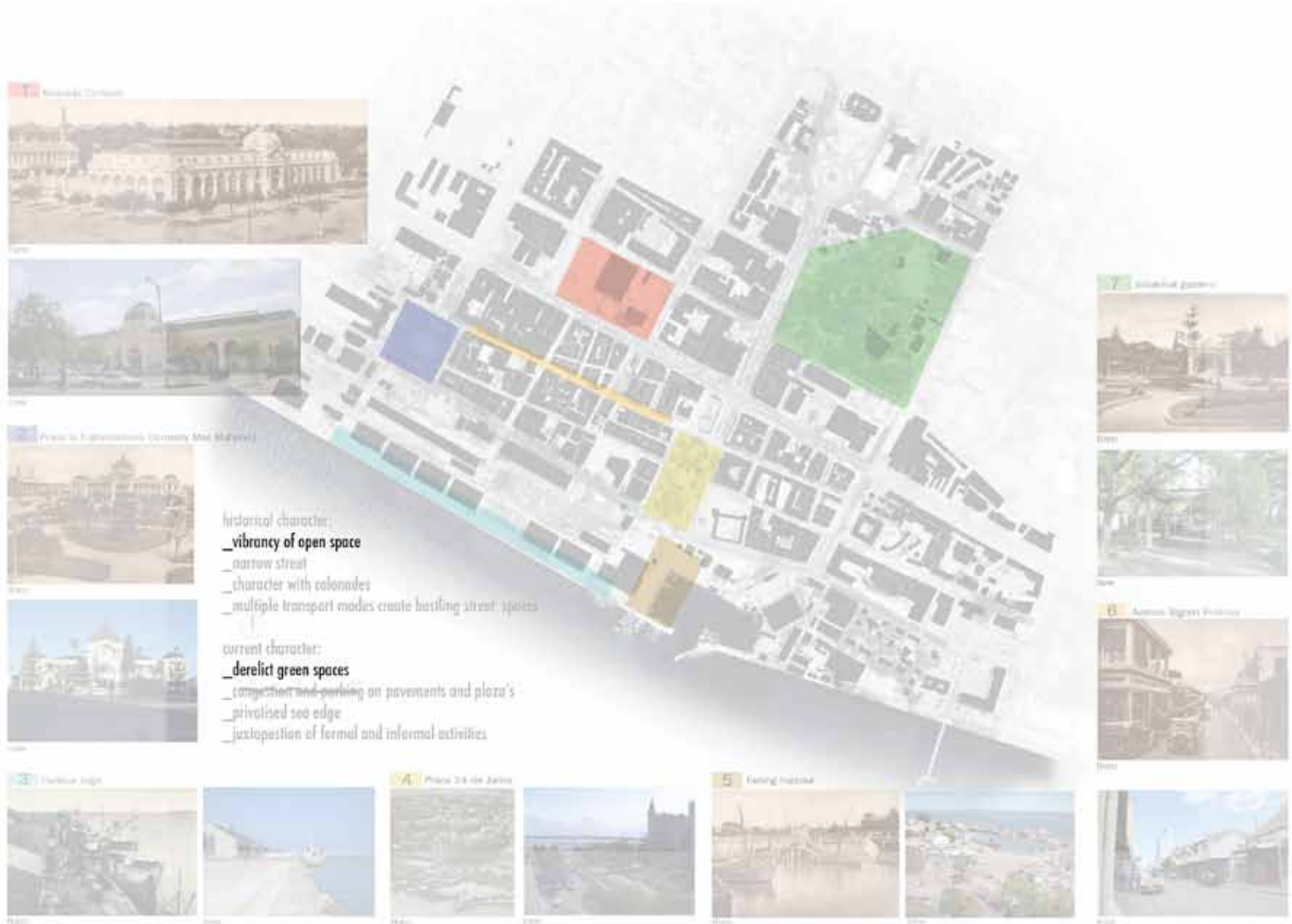
**7** historical gardens

then

now

Mapping: character

MSA 2011



Mapping: character



Map showing Maputo\_green  
(unspecified scale)

— natural vegetation  
— parks & gardens



\_natural vegetation along steep coast edge  
(natural coast line)

\_important ecological element:  
- keeps natural soil in position.  
- counteracts flooding

\_in decline due to development.

\_shows limited amount of green space in  
Maputo.

\_small parks & gardens scattered throughout  
city.

## Mapping: green spaces city local scale





\_large amount of green space within the area but poorly maintained

\_linkages of green networks should be strengthened

\_large section of hard open space at waterfront which is inaccessible to public

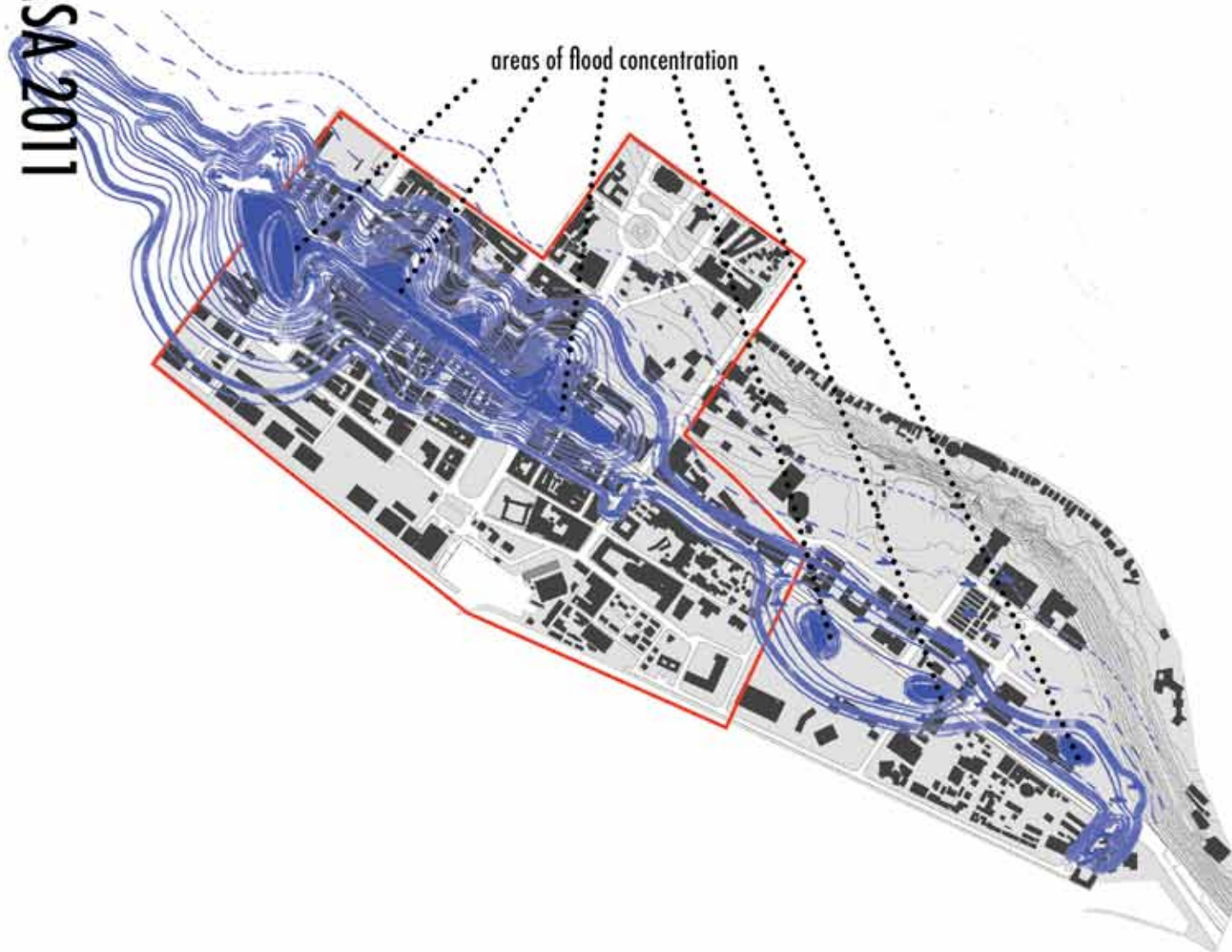
\_numerous vacant buildings and business premises in area

\_derelict sites become areas for informal housing and waste disposal

\_vacant land parcels form inconsistent urban fabric

## Mapping: open spaces green spaces, brownfield sites, ruins and vacant buildings

MSA 2011



\_flooding primarily takes place along Avenida 25 de Setembro.

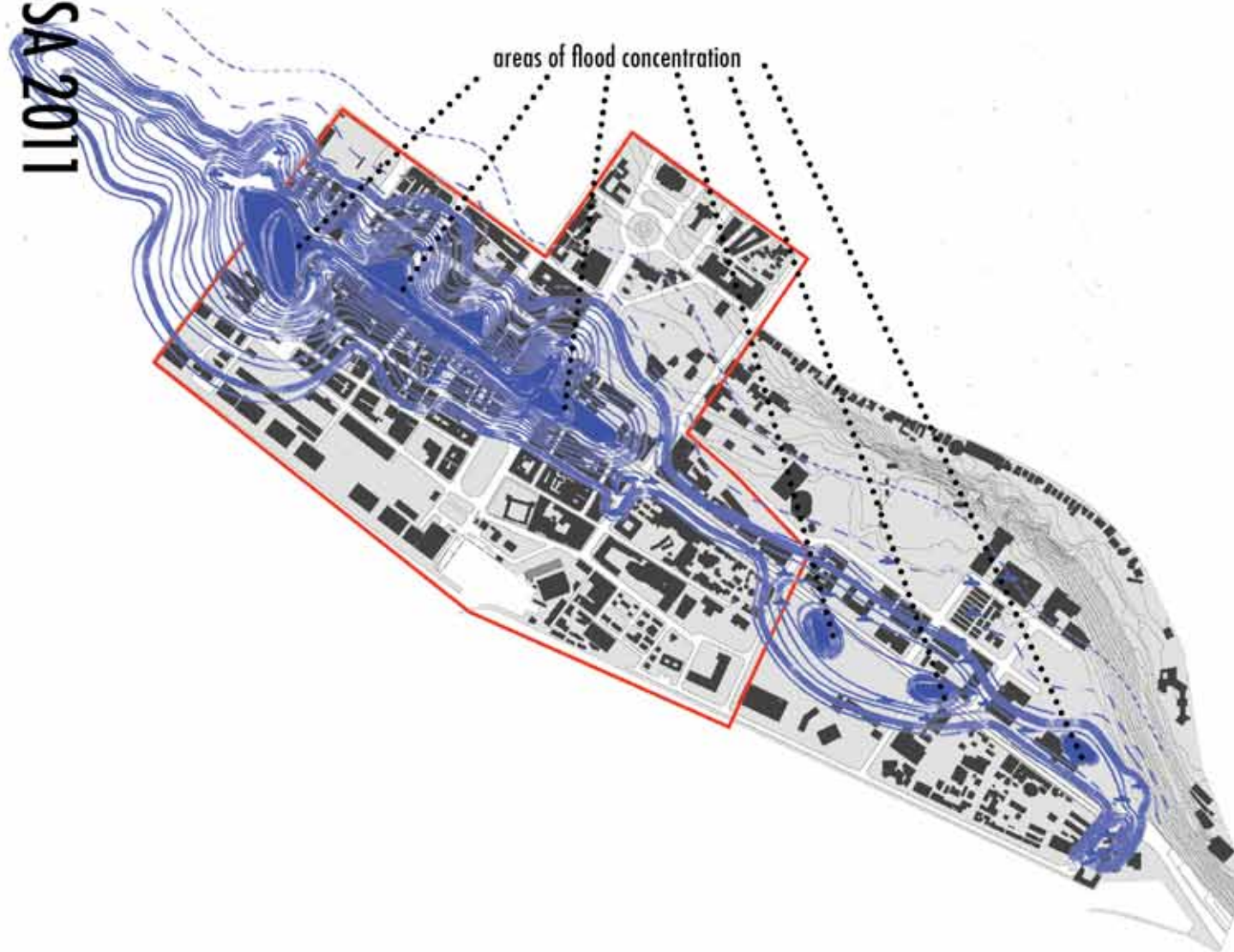
\_causes range from the following:

- a topographical dip due to infill
- hard urban landscape
- flatness of the baixa
- insufficient/unmaintained infrastructure
- rising ocean tides

occures during rainstorms and lasts for a few hours untill filtrated.

## Mapping: flooding in the Baixa

MSA 2011



\_flooding primarily takes place along Avenida 25 de Setembro.

\_causes range from the following:

- a topographical dip due to infill
- hard urban landscape
- flatness of the bixax
- insufficient/unmaintained infrastructure
- rising ocean tides

occures during rainstorms and lasts for a few hours untill filtrated.

## Mapping: flooding in the Baixa

# MSA 2011



\_historic baixa core forms part of historical protection zone

\_17 buildings of historical merit

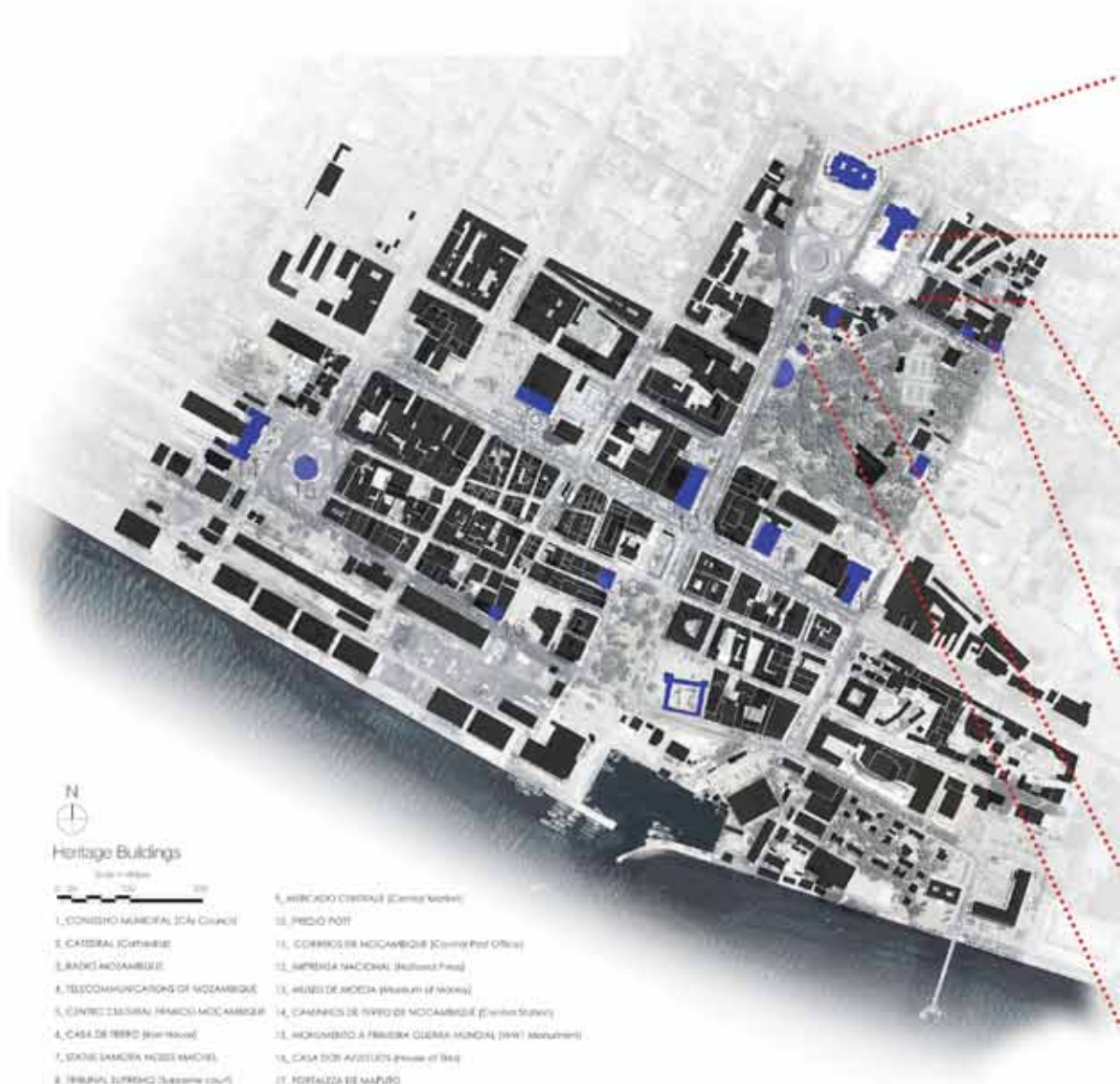
\_buildings built before 1920 given protection under law.

\_heritage fabric adds to sense of place within the area

\_rich diversity between historical and new urban fabric allows for a unique identity for the area

**Mapping: heritage buildings** as identified by municipal authorities

# MSA 2011



1. CONSELHO MUNICIPAL (City Council)  
\_ 1903-1905

2. CATEDRAL (Cathedral of our lady)  
\_ Construction commenced 1936  
\_ Inaugurated 14 August 1944  
\_ Gothic style

3. RADIO MOZAMBIQUE  
\_ Constructed 1948  
\_ Modern style  
\_ Tropical climate response, brise soleil

4. TELECOMUNICAÇÕES DE MOZAMBIQUE  
\_ 1946-1948  
\_ Art Deco style

5. CENTRO CULTURAL FRANCO MOZAMBIQUE  
\_ Construction began 30 June 1998  
\_ Colonial style with large balconies

6. CASA DE FERRO (Iron House)  
\_ Rediscovered 1980  
\_ Prefabricated Iron & Steel  
\_ Representation of capacities of material

Mapping: heritage buildings as identified by municipal authorities

# MSA 2011



N  
Heritage Buildings

- |                                       |  |
|---------------------------------------|--|
| 1. CONSEJO MUNICIPAL (City Council)   | 6. MERCADO CENTRAL (Central Market)                    |
| 2. CATEDRAL (Cathedral)               | 7. PRECIO PONT   |
| 3. BANCO MOCAMBIQUE                   | 8. CORREIOS DE MOCAMBIQUE (Central Post Office)        |
| 4. TELECOMUNICACIONES DE MOCAMBIQUE   | 9. IMPRENSA NACIONAL (National Press)                  |
| 5. CENTRO CULTURAL FRANCIS MOCAMBIQUE | 10. MUSEO DE MODA (Museum of Fashion)                  |
| 6. CASA DE FERRO (Iron House)         | 11. CAMARAS DE NYRO DE MOCAMBIQUE (Cinema Studio)      |
| 7. STATUE SAMORA MOSES MACHEL         | 12. MONUMENTO A FRANSISK GUERRA MUNDIAL (WWI Monument) |
| 8. TRIBUNAL SUPREMO (Supreme Court)   | 13. CASA DOS AVIZORES (House of Wonders)               |
|                                       | 14. FORTALEZA DE MAURO                                 |



7. STATUE SAMORA MOSES MACHEL  
\_Inaugurated 1989  
\_Reinforced concrete, marble, bronze



8. TRIBUNAL SUPREMO (Supreme Court)  
1898  
\_Colonial style



9. MERCADO CENTRAL (Central Market)  
\_1901-1903  
\_manifestation of Industrial Revolution  
\_Iron construction, dome



10. Predio Pont  
\_1891-1905  
\_steel frame construction  
\_built for late colonial to Transvaal



11. CORREIOS DE MOCAMBIQUE (Central post office)  
\_1903



12. IMPRENSA NACIONAL (National Press)  
\_1857

Mapping: heritage buildings as identified by municipal authorities

# MSA 2011



14\_CAMINHOS DE FERRO DE MOÇAMBIQUE (Central Station)  
\_ 1909-1910  
\_ Manifestation of Industrial Revolution



15\_MONUMENTO A PRIMEIRA GUERRA MUNDIAL (WW1 Monument)  
\_ Inaugurated 1920



13\_MUSEU DE MOEDA (Museum of Money)  
\_ 1873 Portuguese Government Building  
\_ 1964 proclaimed historical monument



16\_CASA DOS AZULEJOS (House of Tiles)  
\_ 1879

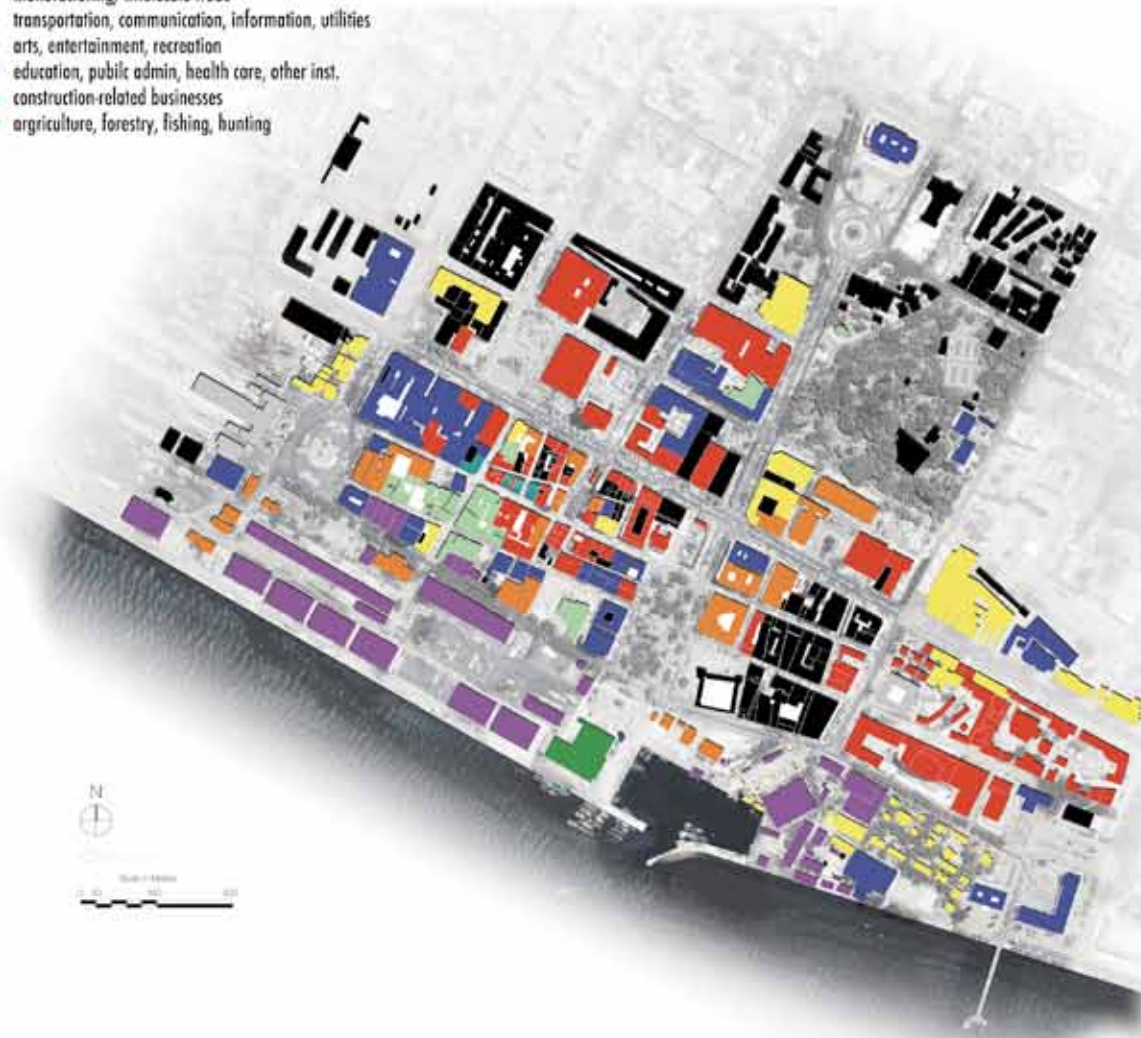


17\_FORTALEZA DE MAPUTO  
\_ Between 1851-1867  
\_ Site of old fort circa 1780-1788

Mapping: heritage buildings as identified by municipal authorities

# MSA 2011

- residence/accommodation
- general sales/services
- manufacturing/wholesale trade
- transportation, communication, information, utilities
- arts, entertainment, recreation
- education, public admin, health care, other inst.
- construction-related businesses
- agriculture, forestry, fishing, hunting



\_functions in the Biakha range on the different uses.

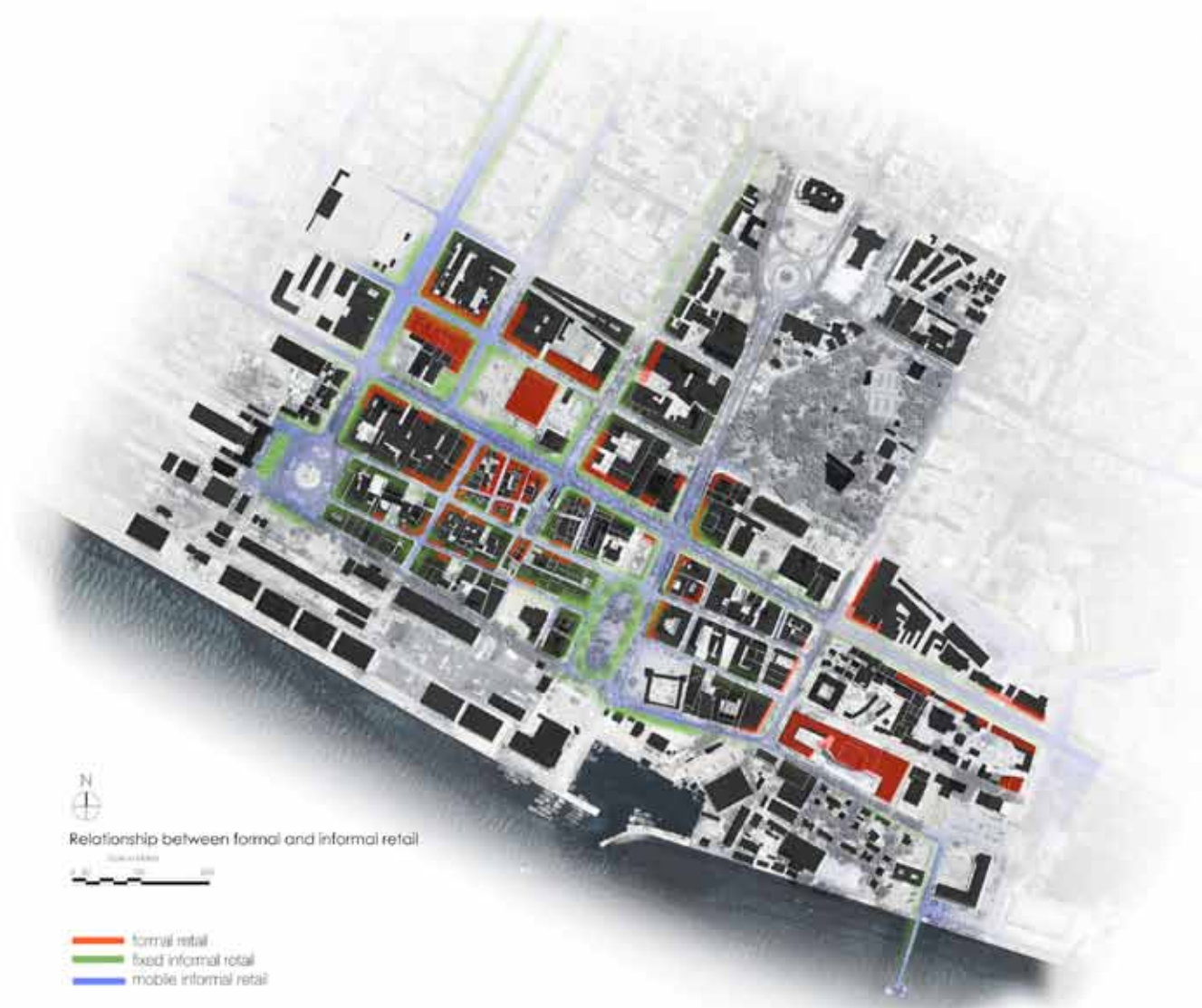
\_functions in the south is allocated to private warehouses and trade.

\_the northern part in essence, is residential and general trade.

\_the core inbetween is mixed use.

## Mapping: functions





Relationship between formal and informal retail

0 50 100 200

formal retail  
fixed informal retail  
mobile informal retail



- \_informal sales on pavement linked to internal formal sales. Often vendors are employed by formal retail sector
- \_informal trade largely mobile within the area
- \_informal sales largely associated with high pedestrian density such as places of interest and public transport
- \_vending largely linked to necessities such as food, clothing and airtime

## Mapping: formal and informal retail

# MSA 2011



1. GFM TRAIN STATION  
 06000 Train from MATOLA  
 ~500 people disembarked  
 06150 Train from MANICA  
 800+ people disembarked  
 02015 Train from PESSING GARCIA  
 ~1000 people disembarked
2. STARLIGHT CRUISES  
 Passenger Cruise Ship  
 Arrival: Tuesday morning  
 Departure: Tuesday evening
3. VODACOS FERRY to RHACA ISLAND  
 08000 Friday, Saturday, Sunday  
 Journey time: 1 hour 45 minutes
4. TRANSAMBITRA FERRY SERVICE  
 Ferry to Ekurhuleni  
 Licensed to carry 240 passengers, 20 cars  
 Starts: 07000 Maphisa  
 08000 Cetera  
 Ends: 09000 Cetera  
 Ferry to Inhlanhla  
 Leaves: 08000 Friday morning  
 MAPHAM WATER TAXIS  
 07000-08000  
 08000-10000  
 Entry to Inhlanhla required



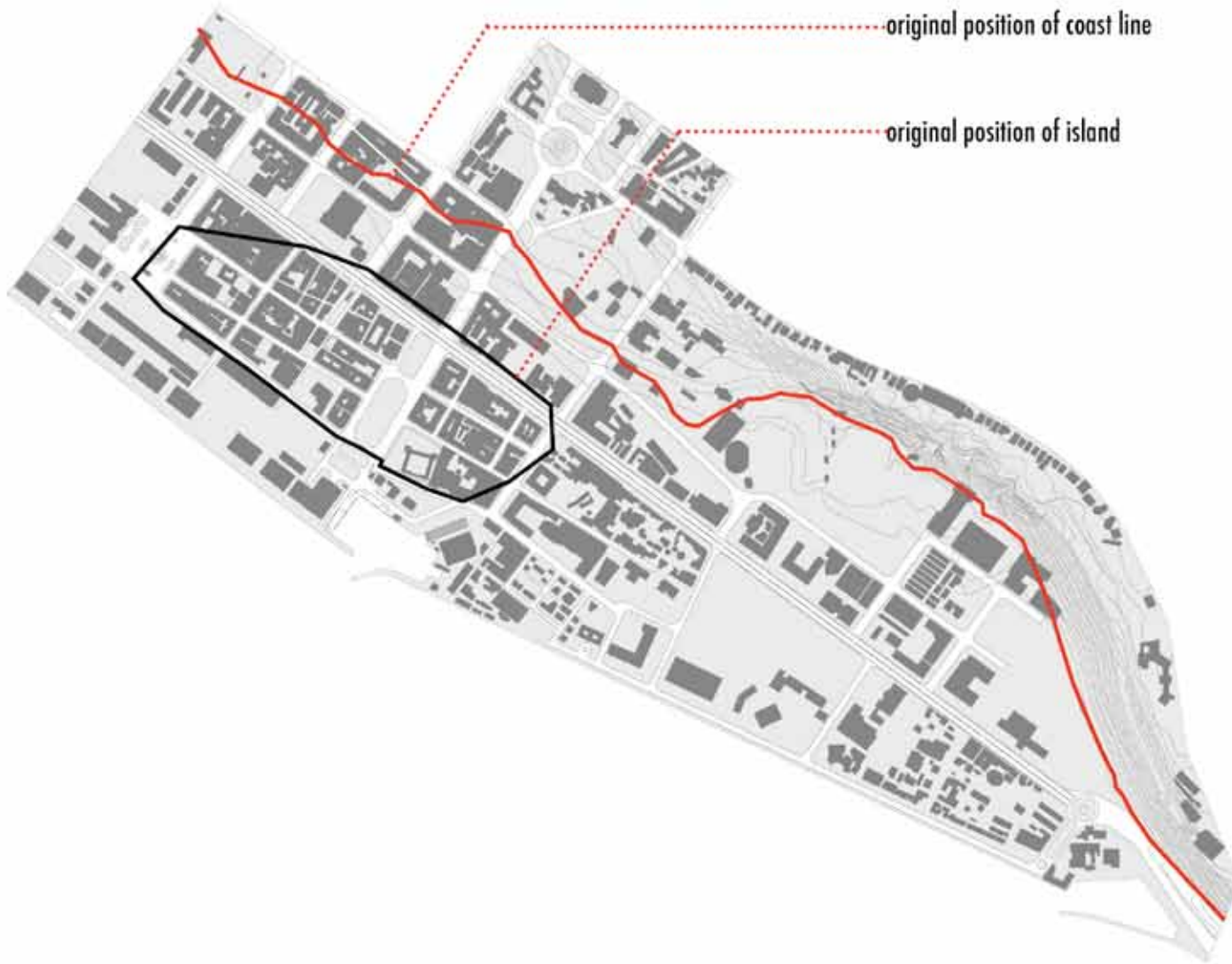
- \_upper city well served by bus and chapas.
- \_strong north-south transport linkages.
- \_informal chapa rank along ave Guerra Pop-uler.
- \_formal transport routes do not cross line of Ave 25 de Setembro.
- \_ferry terminal removed from blaxa activi-ties-large amount of congestion along streets.
- \_high pedestrian movement close to main at-traction node
- \_pedestrian movement on sidewalks & where vehicle access is limited

## Mapping: public transport and pedestrian concentration

# MSA 2011

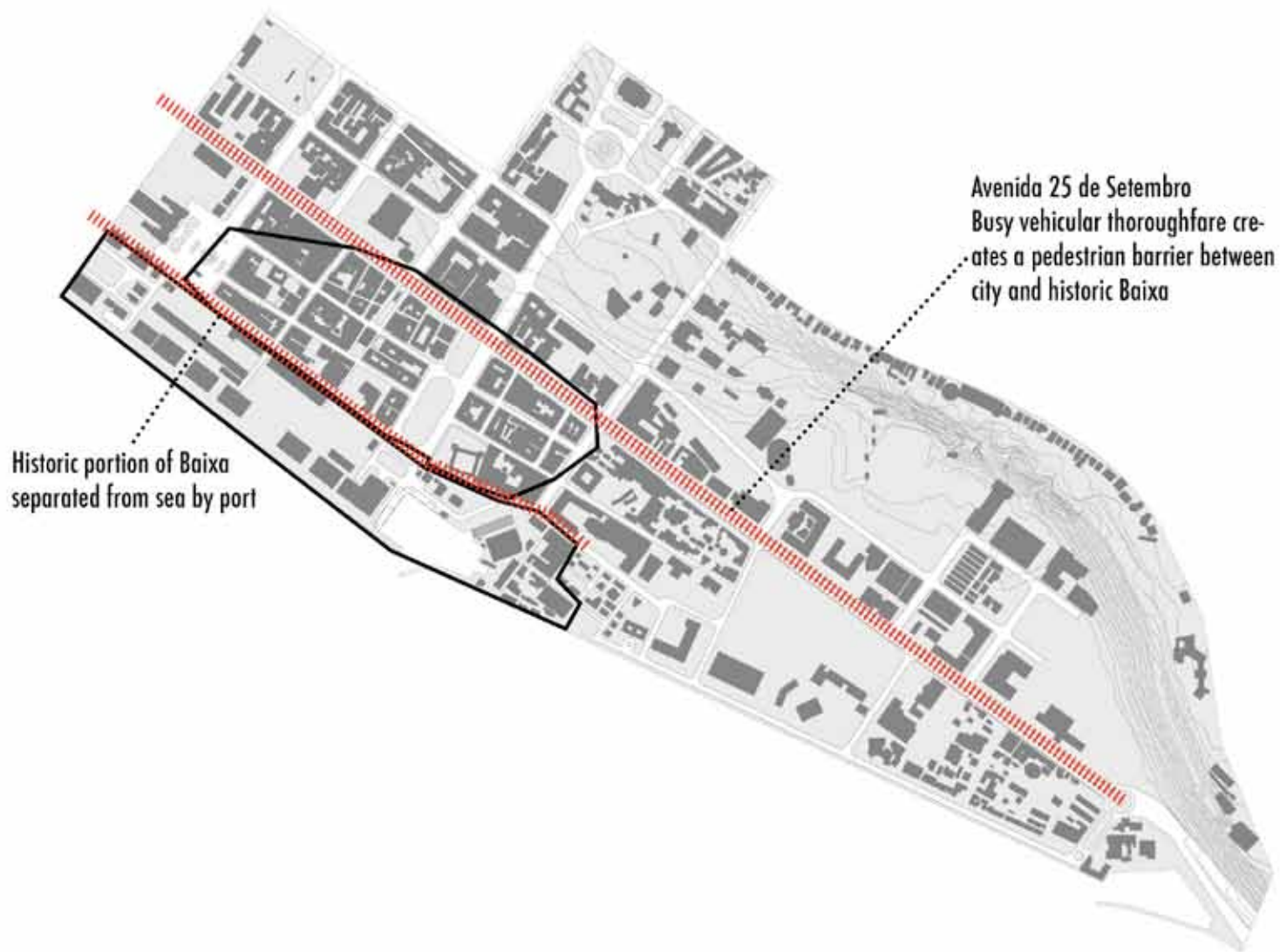
## Observations and Strategies

# MSA 2011



## Barriers

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## Barriers

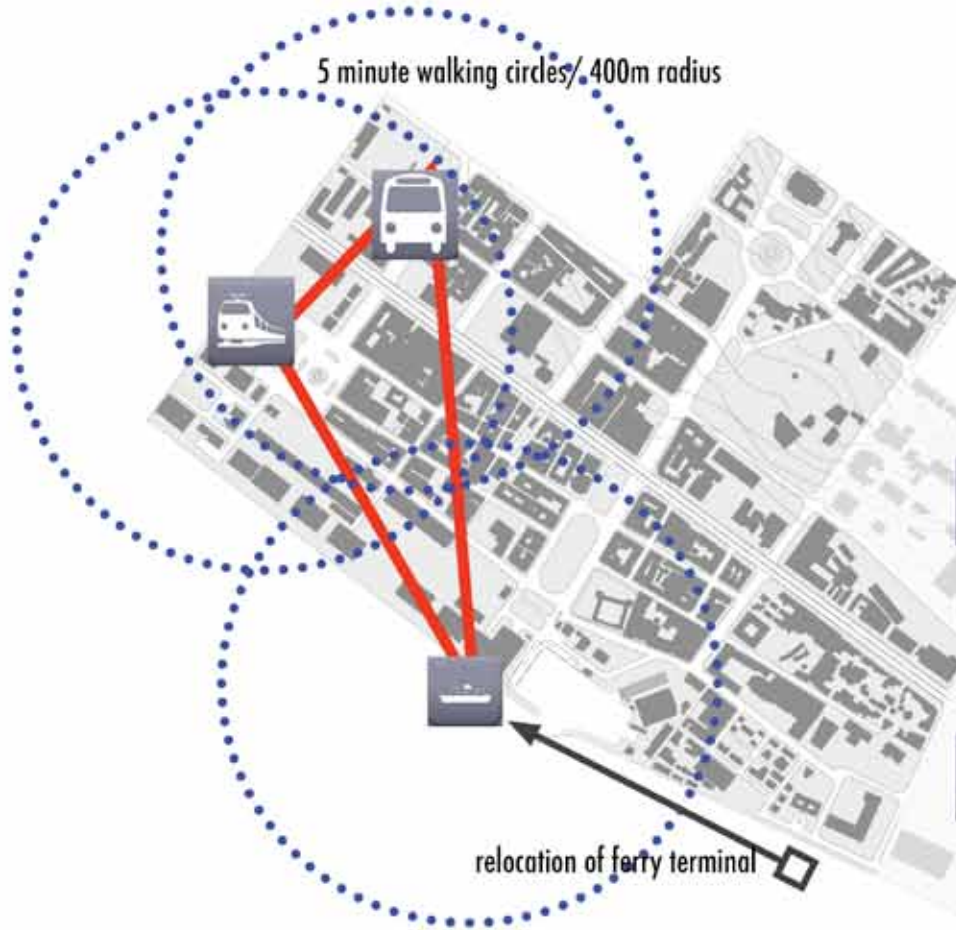
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## 1. Creating links



## 1. Creating links transverse pedestrian links between open spaces



### 1\_CHAPAS & BUSES (Chapas: A minibus taxi)



View of Current chapas stop

The intention within the framework is to formalise and expand the existing chapas stop. Currently the service causes traffic congestion along Avenida Guerra Popular.

The upgrade of the facility would include increased area to the east of the current site to be demarcated for a larger transport node, facilitating an improved chapas service. Provision for the BRT (Bus Rapid Transit) service will also be considered. Additionally, a parkade will be provided in the vicinity to cater for a change from private car to public transport.



### 2\_TRAIN



View of Train Station building and Plaza de Trabalhadores

Maputo Central Train Station is a landmark building facing Praça de Trabalhadores. The building and square function as an intermodal exchange, with buses and chapas frequenting the area in front of the station building.

The framework intention for this transport node is to retain its landmark quality. Chapas and bus stops are to be formalised, with infrastructural upgrade of waiting space and provision for informal trade.



### 3\_FERRY



View of proposed ferry site

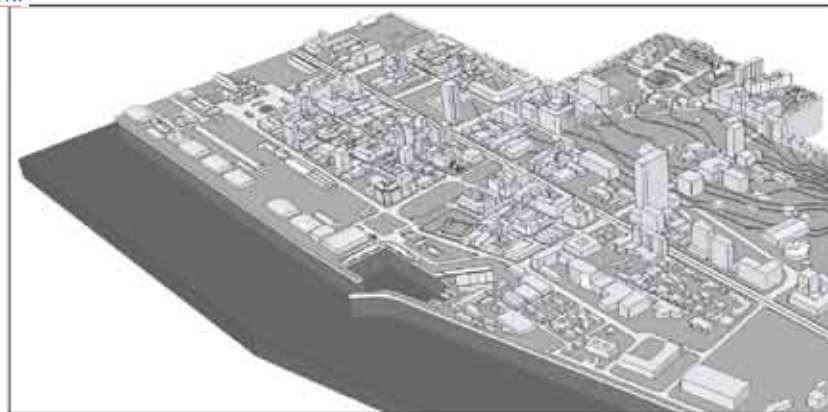
The framework proposes moving the ferry terminal from its current location to a new site at the culmination of Avenida Samora Machel. The proposed new site will consolidate all water-borne transport for the city to a central location. This is in line with the existing city framework of 2010.

By moving the terminal building, interconnection between the three defined transport focal points is greatly improved, ensuring ease of movement between nodes for the user.

## 1. Creating links: walkable city



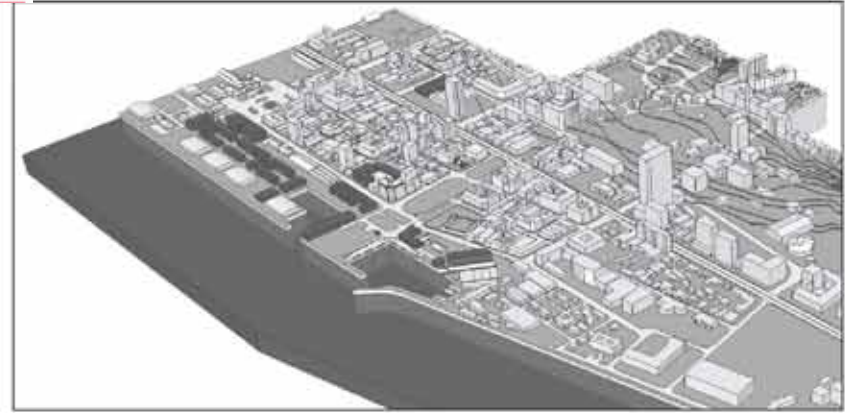
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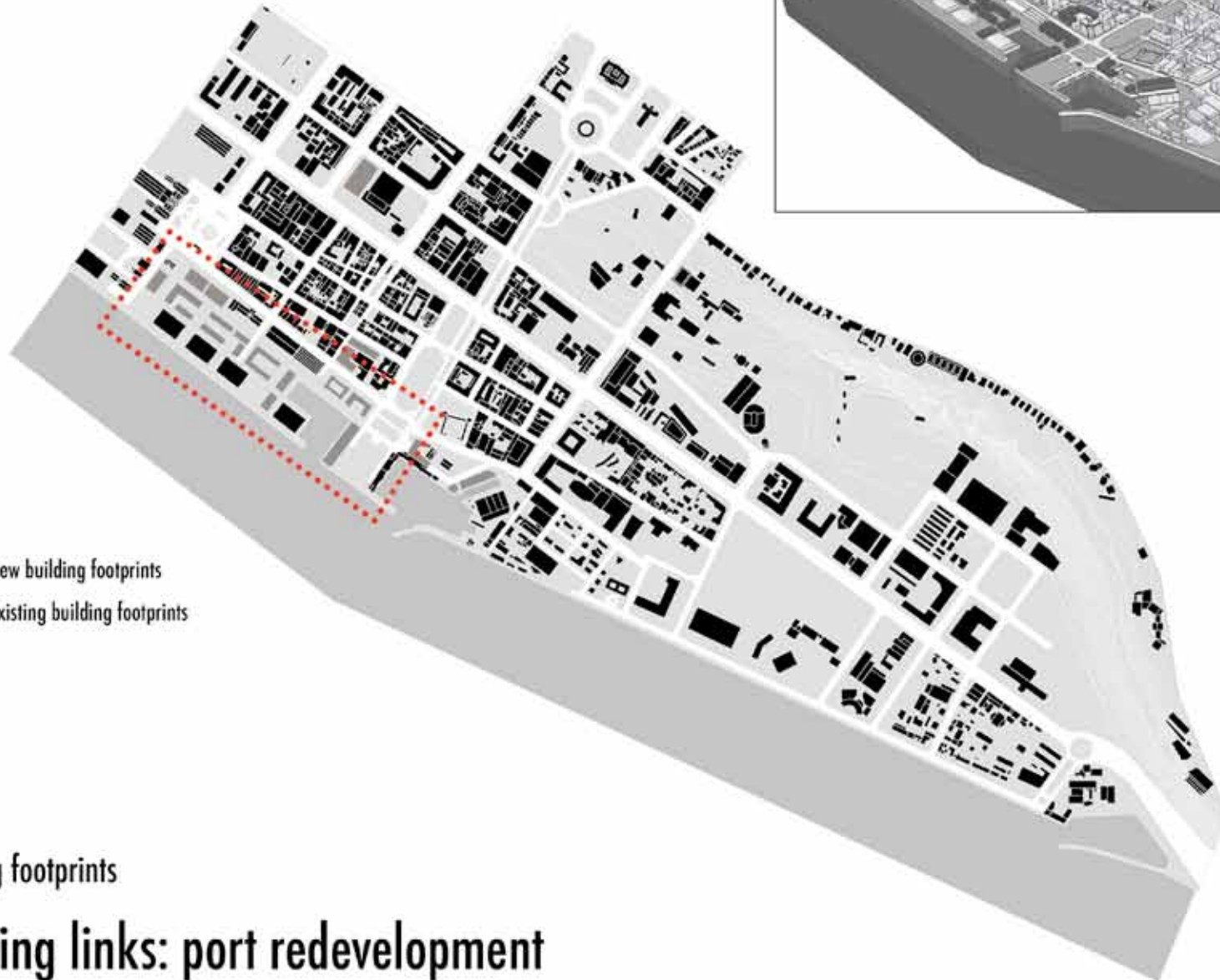
Existing building footprints

## 1. Creating links: port redevelopment

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- New building footprints
- Existing building footprints



New building footprints

## 1. Creating links: port redevelopment



**CURRENT CHARACTER OF STREET:**  
Avenida Samora Machel links the historic core of the city with the newer parts of the 'concrete city' further inland. It is not the heart of the downtown vehicle streets, but was designed as the 'Via Hispanica' of Maseru.

**PROPOSED CHARACTER OF THE STREET:**  
Avenida Samora Machel (now identified by Maseru City Planners) to be adapted as the main pedestrian promenade about in Maseru, the possibility to be based on La Ramblas in Barcelona. The overall quality is essential in nature, linking to city landmarks such as the Botanical Garden and the Cathedral. It is intended as the central (government) space for both tourists and residents, creating in a public space at the urban edge. It will act as an overtake area with benches, pedestrian associated with slow moving traffic.

**Precedent - La Ramblas in Central Barcelona**  
Popular with both locals and tourists  
1.5 km long linear road, pedestrian walking from the city center to the harbor  
Many contemporary urban functions, with the gradual diversity of people, markets, shops, squares, street markets, cafes, parks, gardens.  
Works as a through road. People are willing to drive a long distance to it.

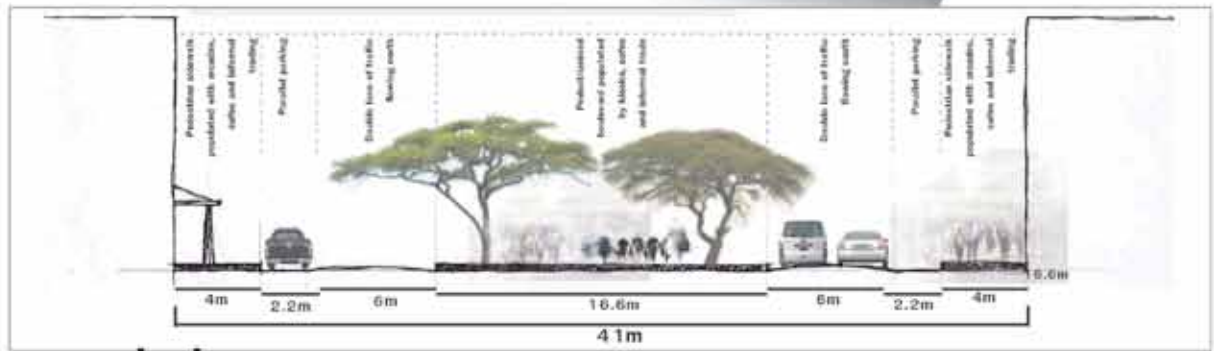
**Characteristics of a successful promenade:**  
As proposed by Christiane Brändner, the issues for the boulevard is as follows:

- High density pedestrian usage
- Numerous facilities: eating places and small shops
- Diverse and strong grid
- Variety of functions that act as destinations
- Promenade for people to slow walking of pedestrian paths, starting of trees, walls to keep apart, street and benches and tables for sitting, opening of storefronts to provide pedestrian cafe, outdoor encouraging signage (1977:168)

'Encourage... a promenade at the heart of every community, linking the main activity nodes, and placed centrally... Put main points of attraction at the two ends, to keep a constant movement up and down. (Alexandre et al, 1977:173)



Aerial view - Avenida Samora Machel



Precedent - La Ramblas in Central Barcelona

# 1. Creating links: Avenida Samora Machel



ORIENTATION KEY



'The 'movement space' constituted by streets forms the essential connective tissue of urban public space – from the micro scale of circulation within buildings to the macro scale of whole cities...

So streetspace forms the basic core of all public space – forming a contiguous network or continuum by which everything is linked to everything else... The challenge is to address the street work – not just as an isolated architectural set piece, but as a contribution to wider urban structure.' (Marshall, S. 2009:113)

LINK \_ HEIRARCHY OF STREETS

Roger Trancik in his book *Finding Lost Space* describes linkage through a network of streets as one of the key ingredients of place-making. Streets, their layout and connectiveness are pivotal within a greater urban design vision. This is in line with the views of Kevin Lynch's theoretical approach to urban design, whereby paths are one of the five areas of investigation.

Magato streets are characterized by their high degree of pedestrian activity and informality. Add to that the enormous presence of the car, and the result is a rich foundation for public urban space. The intention within the framework is to define the proposed character of each street within the study laboratory, and to then formulate a strategy to reach the desired outcomes.

Below is a table showing generic street types and hierarchies, as defined by the *Institute of Highways and Transportation*. These are compared to street types as suggested by *Llewellyn-Davies* in his book *Urban Design Compendium*. Streets within the Baza are then identified as having the current or potential characteristics as stated.

STREET TYPE AND HEIRARCHY

ROAD TYPE	PREDOMINANT ACTIVITIES	SUGGESTIONS	APPLICATION
<i>Source: FH (1987:144)</i>	<i>Source: Llewellyn-Davies (2000:111)</i>	<i>Source: Baza</i>	
<b>Primary distributor</b>	Fast moving long distance through traffic; No pedestrian or freight access	Main road – routes providing connectors across the city	
<b>District distributor</b>	Medium distance traffic in green network; services. All through traffic between different parts of the urban area	Arterial or boulevard – links; generous landscaping	Av. Sandro Marchei Av. 25 de Setembro Av. Guerta Populair Av. Mane Marey
<b>Local distributor</b>	Vehicle movement only beginning at end of all corners	High street – street view, active frontage	Rua da Mosquito Av. Mantres de Inhanga
<b>Access road</b>	Walking; Use of bicycles & horse; Deliver of goods and services; parking; slow moving vehicles	Street (or square) – main residential, commercial, transport traffic calming	Rua de Bagarroy Rua Consolheiro Pedrosso
<b>Pedestrian street</b>	Walking; Moving; Loading		Internal Baza streets
<b>Pedestrian route</b>	Walking; Some cycling to street level		Waterfront residential streets
<b>Cycle route</b>	Cycling		

1. Creating links: summary of north-south and east-west links



ORIENTATION KEY



*'The 'movement space' constituted by streets forms the essential connective tissue of urban public space - from the micro scale of circulation within buildings to the macro scale of whole cities... So streetspace forms the basic core of all public space - forming a contiguous network or continuum by which everything is linked to everything else... The challenge is to address the street as an urban place as well as a movement channel, and how to make this conception of the street work - not just as an isolated architectural set piece, but as a contribution to wider urban structure.'* (Marshall, S. 2005:13)

LINK - HEIRARCHY OF STREETS

Upper Toronto in the book Finding Lost Space devotes linkage through a network of streets as one of the key ingredients of place-making. Streets, their layout and connections are central within a greater urban design vision. This is in line with the work of Kevin Lynch's theoretical approach to urban design, whereby paths are one of the five main axes of investigation.

Major streets are characterised by their high degree of pedestrian activity and informality. Not to limit the excessive presence of the car, and the result is a ten foundation for public urban space. The mission within the framework is to define the proposed character of each street within the study laboratory, and to then formulate a strategy to reach the intended outcomes.

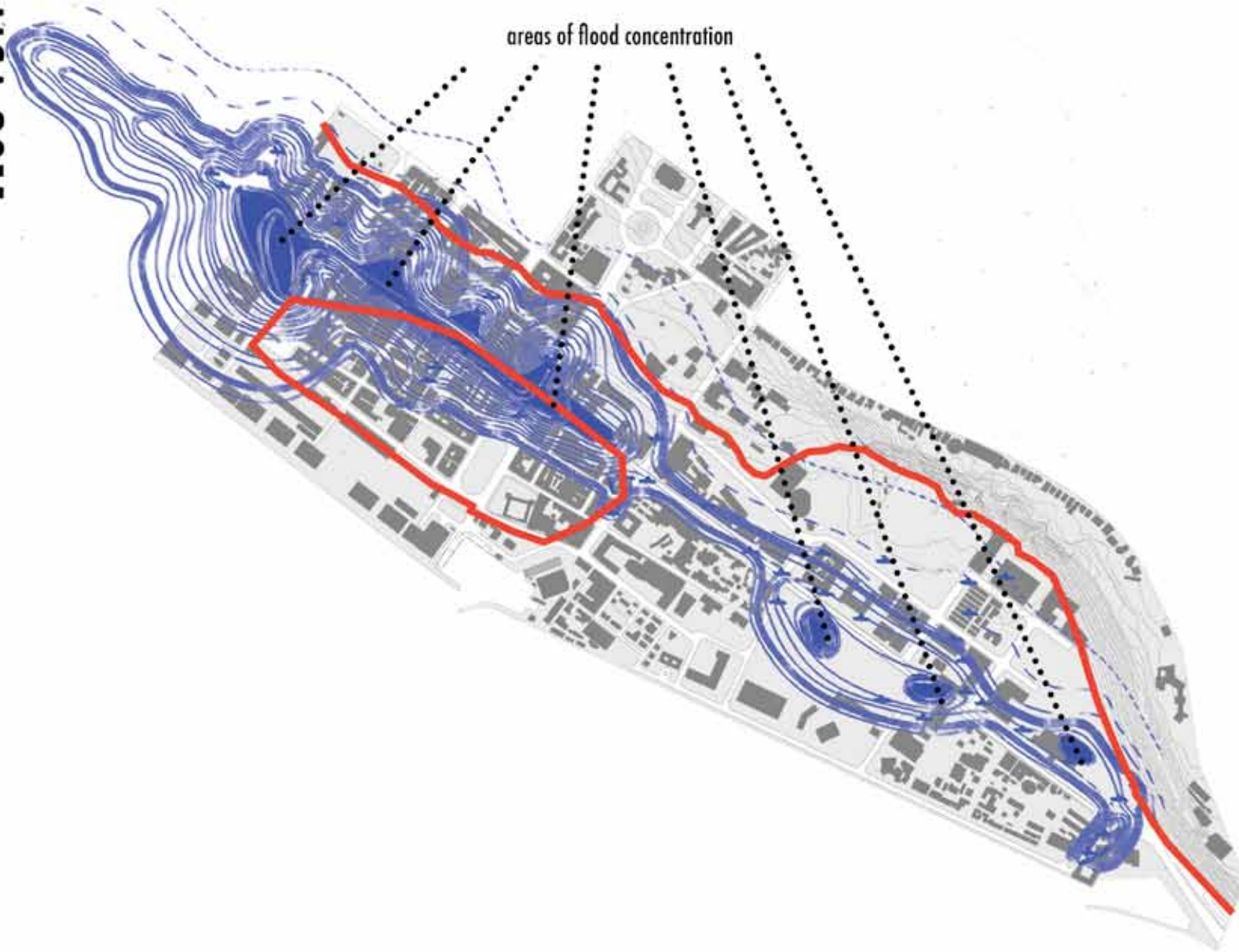
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STREET TYPE AND HEIRARCHY

ROAD TYPE	DOMINANT ACTIVITIES	SUBSTITUTION	APPLICATION
Expressway	High speed, long distance, through traffic, no pedestrians or bicycles allowed	Motorway - usually passing corridors across the city	None listed
Primary thoroughfare	Fast moving long distance through traffic, no pedestrians or bicycles allowed	Motorway - usually passing corridors across the city	None listed
District thoroughfare	Moderate distance traffic in various directions, no through traffic, accesses different parts of the urban area	Access to Suburbans - Service (general urbanising)	Av. Santos Martini, Av. 25 de Setembro, Av. Gerson Figueira, Av. Rui Silva
Local thoroughfare	Local residential traffic, shopping in area, etc.	High street - retail area, office, shopping	Rua da Marizópolis, Av. Martins de Sá
Arterial road	Working, Use of Highway by Managers, Delivery of goods and services, shopping, heavy vehicles	General access - service corridors, shopping, heavy-vehicles	Rua do Espadachim, Rua Consuelo Pedrosa
Public street	Working, Shopping, parking		Several Urban streets
Public street	Working, Street parking, shopping, heavy vehicles		Urban streets
Local road	Living		

1. Creating links: summary of north-south and east-west links

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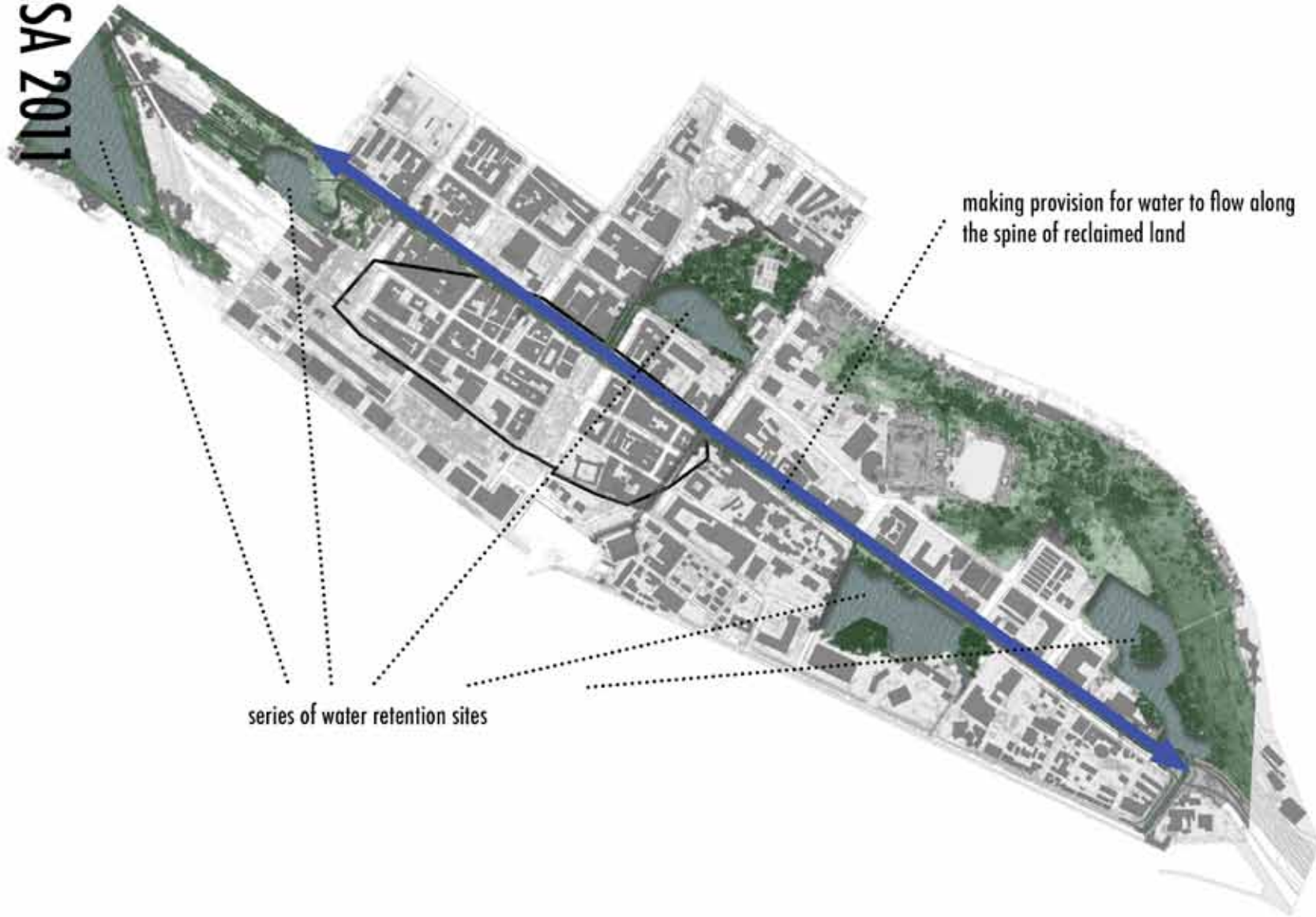
## 2. Managing flooding

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MSA 2011



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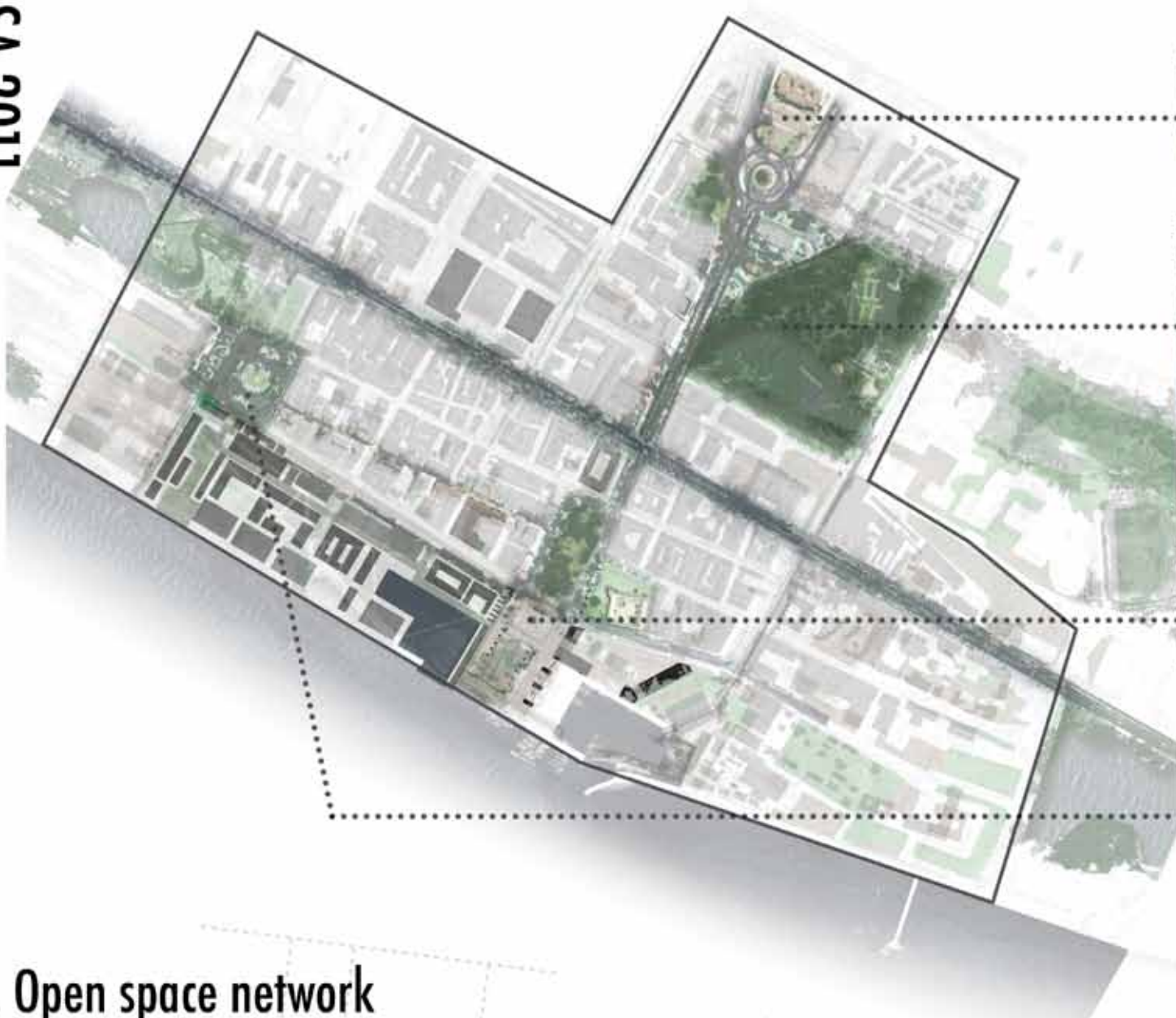


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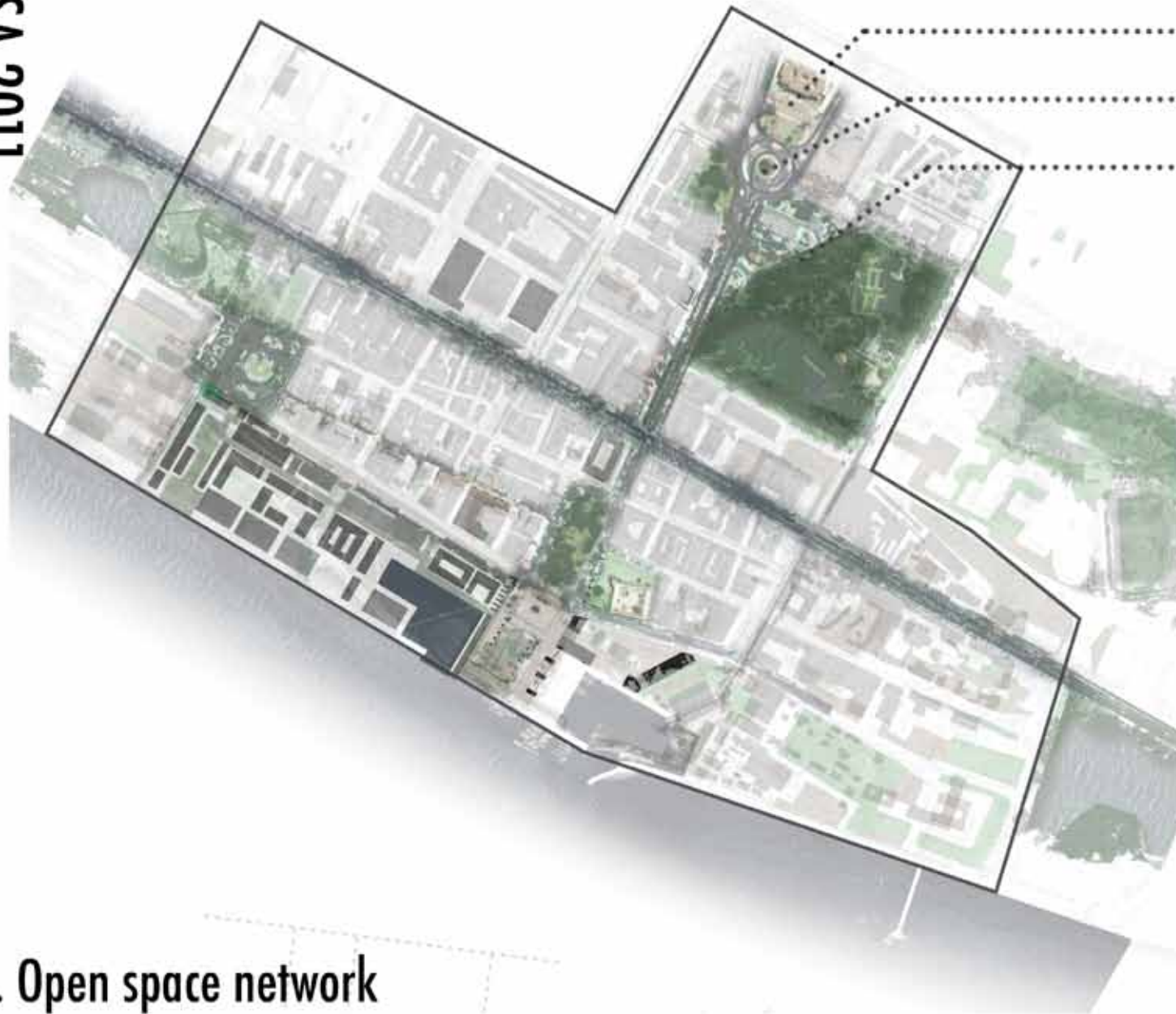


### 3. Open space network

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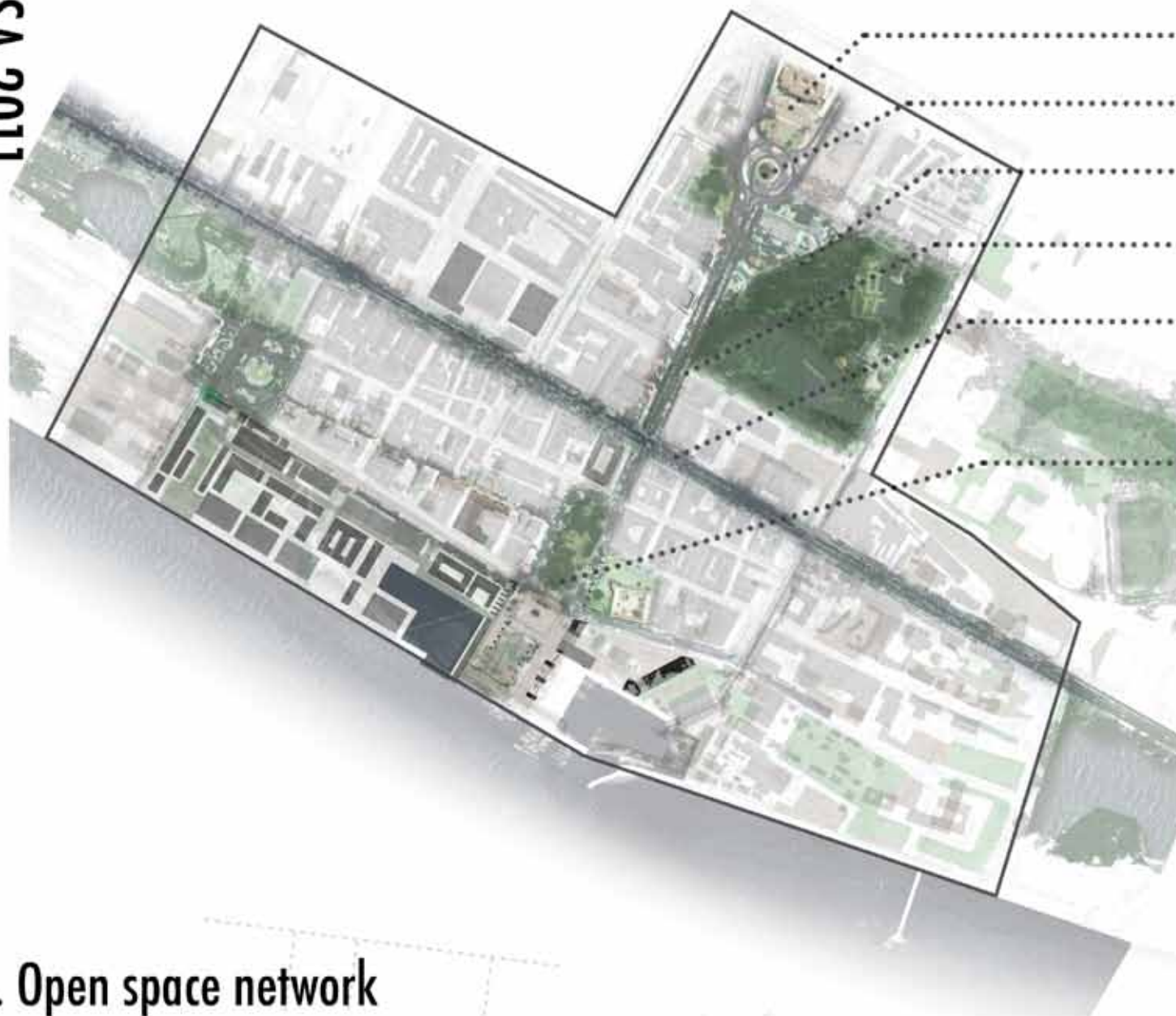


### 3. Open space network



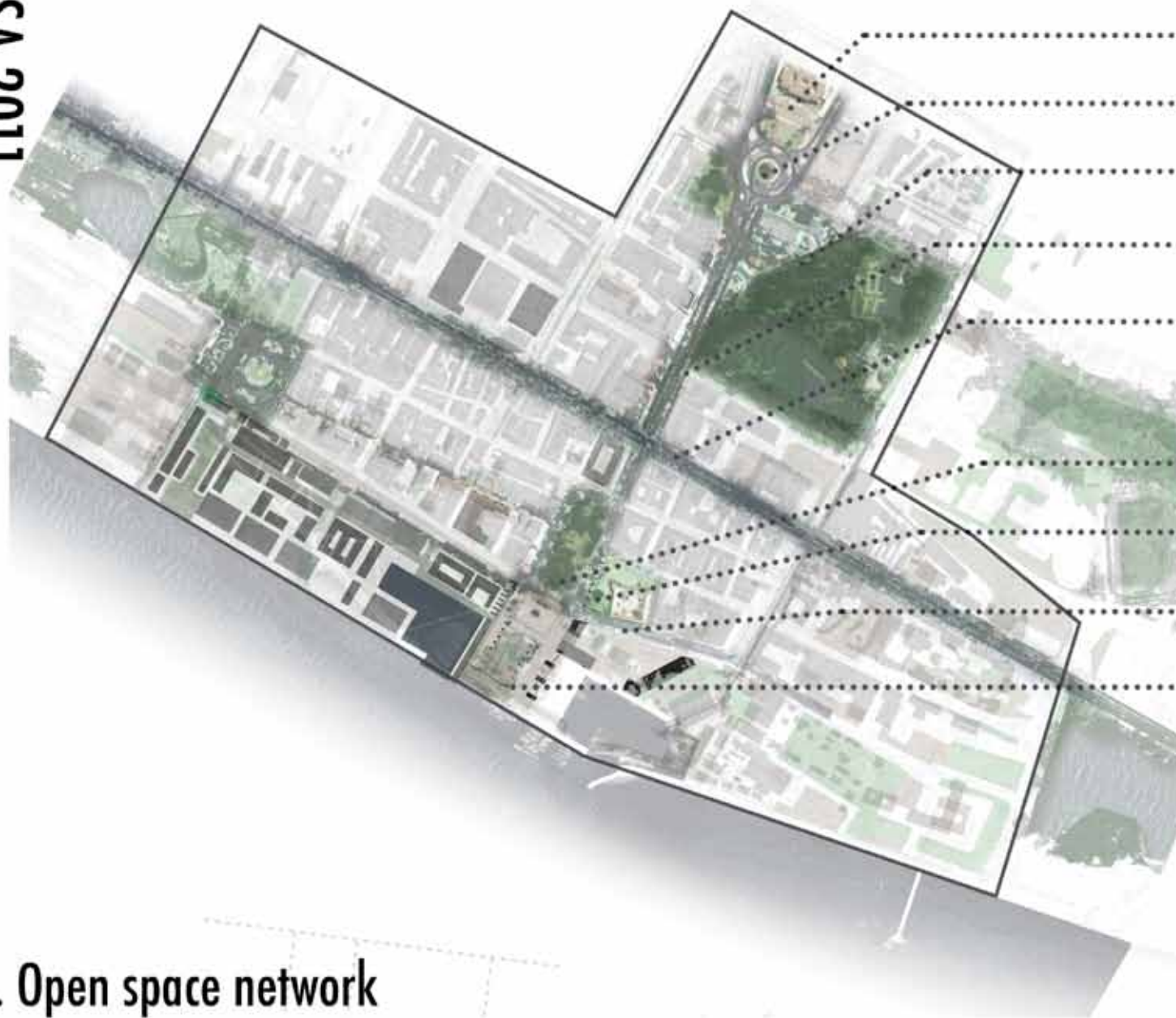
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2. New Landscape intervention as Per Jose Forjaz
3. Botanical Gardens to be repaired and maintained.
4. "La Ramblas" Project as proposed by the Maputo Municipality
5. Rua de 25 Setembro, Creating pedestrian treatments and connecting praças. Design as per J. Hart and B. Snow
6. Praça De 24 Junho- To remain as existing urban Park
7. Fort Gardens - To become more publicly accessible
8. Promenade towards Marginal, Hard Pedestrian surface including planting
9. Urban hard surface, terminal space as per design C. Deacon.
10. Rua De Bagamoyo- Hard surface connect two Praças as per design J. Cassan
11. New Harbour front development C. Deacon
12. Praça De Trabalhadores Re-introduction of green Space
13. Water retention W. Gosthuysen

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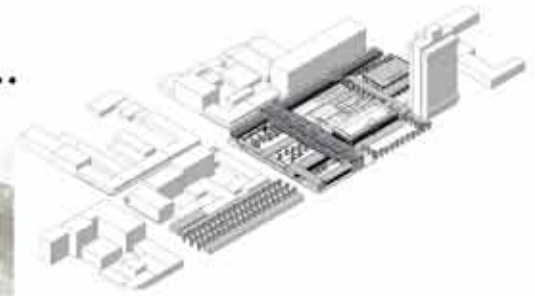
### 3. Open space network

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Flood harvesting: urban infrastructure as landscape



Maputo Central Market:  
Seeing the informal economy  
in Formal Architecture



Food workshop: Inhabiting the ruin



Re-invention: a night life precinct



Transition as event: Ferry terminal



Individual design interventions

***APPENDIX B***  
**INITIAL SITE INVESTIGATION JUNE 2010**



## QUICK SCAN – MAPUTO. JULY 2010

### A description of results by drs. Jean Paul Corten, Quick Scan Project Leader

During the Maputo Field Study a quick scan was executed by students from the Universities of Eduardo Mondlane, Maputo and Pretoria, South Africa. This project was led by drs. Jena Paul Corten, supported by Edna Peres and Nicholas Clarke. The goal of this quick scan is to gain insight in the future perspectives of the Baixa's historical features. For that reason the Baixa's historical identity, state of maintenance and present use have been investigated. The gathered data were used to determine the Baixa's development potentials and restoration need. A quick scan is not a thorough research but meant to be a first step towards a revitalization policy.

#### Historical identity

During the quick scan concerning the historical identity, all built structures within the boundaries of the defined area were validated according to the features of their urban surrounding. Architectural appearance is not the only relevant aspect in this respect. Scale, volume and position are equally important. Three categories are distinguished: the first category contains those structures that determine -or contribute to- the historical identity of the precinct. They are marked red on the map. The second category contains structures that are

neutral to -and fit within- the historical identity of the precinct, and are marked yellow on the map. The third category, marked blue on the map, contains structures that are disturbing -and do not fit within- the historical features of the precinct. This quick scan is not meant to be an identification of to be listed monuments, but aims at providing an idea of the coherence of the urban precinct.

Map 1. shows the results of the quick scan concerning the historical identity. From this map we may conclude that the Baixa is a relatively coherent urban precinct. The abundance of red and yellow dots on the map indicates a strong historical identity. The Baixa's features are nevertheless incidentally disturbed by structures that do not fit well into this identity. Most of these disturbing structures do fit into the urban pattern but differ mainly in height, appearance or architecture. Some of them dominate their surrounding.

#### Technical Condition:

During the quick scan concerning the technical condition, the state of maintenance of the existing building stock was mapped and also presented in three categories. Buildings that are in a bad state of maintenance are marked red. Buildings in a moderate state of maintenance are marked green and buildings in a good state of maintenance yellow.

The general condition of Maputo's historical core turns out to be moderate, as we may conclude from map 2. A relatively big amount of structures is in no direct need of repair. Only a few structures are in really bad condition. They do however have a rather big impact on the appearance of their surrounding. Maintenance of its building stock thus seems not to be the Baixa's main concern.

#### Present use:

The quick scan concerning the functions consists of mapping present use of the buildings within the boundaries of the defined area. Public services (schools, museums, theatres, religious buildings, police stations etc.) are marked red. Commercial activities like office buildings and retail trade are marked blue. Residential buildings are coloured yellow. Workshops and industrial activities are marked brown. Vacant plots and idle buildings are left unmarked

Map 3. shows the Baixa's unbalanced use. The lack of yellow dots on the map indicates that the Baixa is not a favourable residential area and explains the deserted streets after working hours. It also largely explains the general feeling of insecurity and neglect. the Baixa is surrounded by industrialised zones at the harbour and around the railway station. They may discourage residential use of the Baixa. Commercial activities are dominating the area. They mainly exist of marginal retail

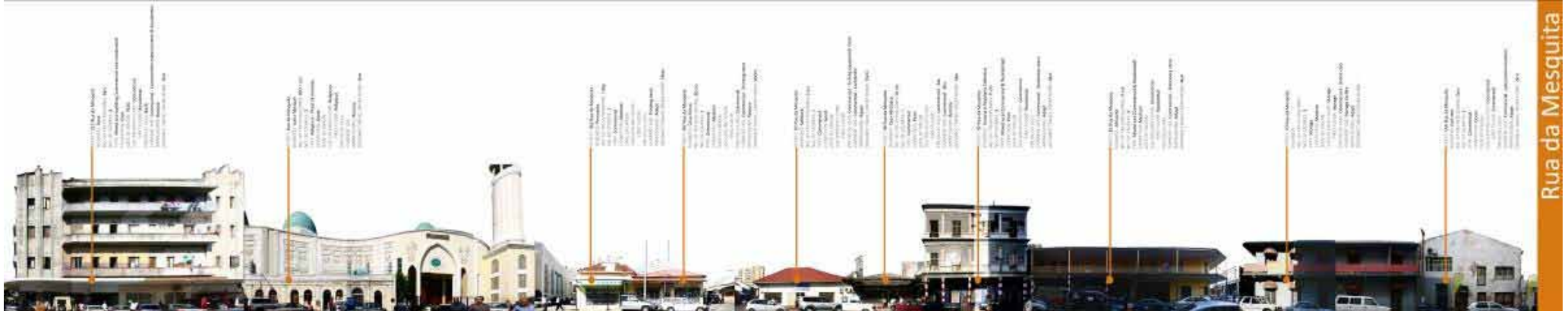


Fig. 1 Rue de Mesquita, Maputo. A typical street in the Baixa of Maputo

trade. the Baixa contains a relatively large amount of public functions, which should be considered a positive feature, supporting its function as city centre, and maybe a base for future development. The Baixa's mal-functioning seems to be its main problem and revitalization thus its main challenge.

#### Conclusion

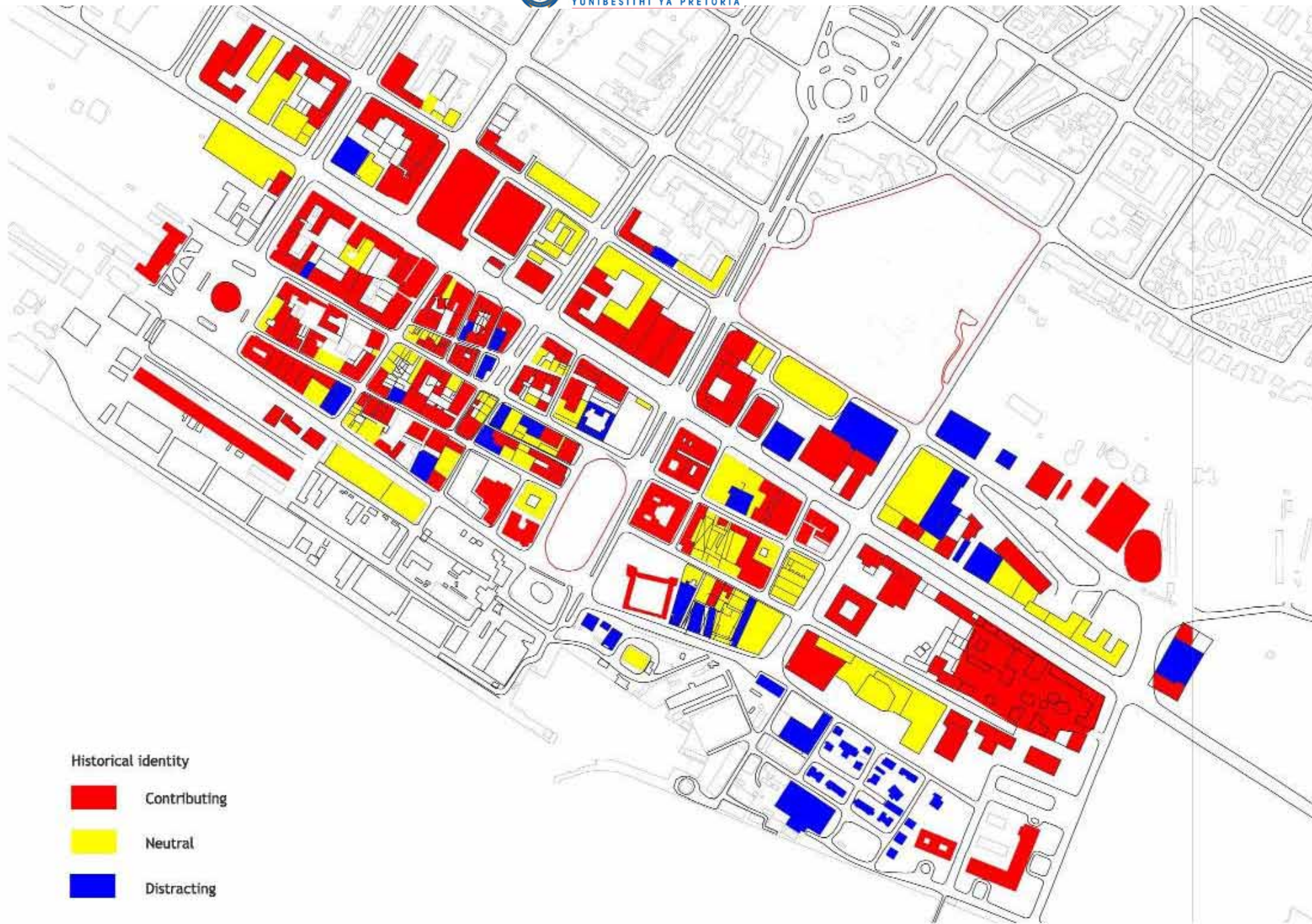
the Baixa, largely dating back to the second half of the 19th century, forms an enclosed and quiet enclave amidst a vibrant 20th century metropolis. Maputo's historical core distinguishes itself from the rest of the metropolis by its modesty; in urban fabric, architecture and infrastructure. The precinct is separated from the metropolis by rather harsh borders. Southwest the Baixa is separated from the harbour area by huge fences. Northwest the precinct is closed off from the city by the Railway Station and its surroundings. Northeast and Southeast, Av. 25 de Setembro and Av. V.I. Lenin separate small scale the Baixa from large scale Maputo. Notwithstanding this conflict in scale, the Baixa has considerably been connected to the expanding city by the main axes, all penetrating the precinct from Northeast. The Baixa's three main squares also function to connect Maputo's extravagancy to the Baixa's modesty. the Baixa is not only the historical centre of Maputo, but -due to this- also its geographical centre. the Baixa is connected to its surroundings by waterway, railway and motorway. This favourable position may be

the Baixa's main potential for future development.

From the quick scan we may conclude that the Baixa is badly in need of revitalization. Its strong historical identity should be considered as an important asset to this goal. Restoration of the historical structures will be supportive in this respect. First challenge is to convince the local authority of the development potentials the Baixa's historical features offer. The role of the Municipal Government is not so much to provide funding, but in the first place to create favourable conditions for a vital future of the Baixa's historical identity. A spatial policy -preferably legally secured in a master plan or land use plan- should be supportive to residential housing, since this seems to be one of the main issues in the Baixa. Besides this policy should favour the public services, one of its main strengths. In addition retail trade should become more specialized, so it can serve the whole city and will be complementary to the retail trade presently located on the borders of the Baixa. Also the Baixa's tourist potentials and leisure and night life possibilities could be exploited. Although they should be balanced with a desired residential use.

Combining the historical Identity Map (map 1) and the Technical Condition Map (map 2), shows which contributing and neutral structures are in need of fully or partly repair. The so called Synthesis Map (map 4) thus shows the extend of the restoration

need. On base if this map a rough estimation of the Baixa's recovery costs can be made. A full restoration of an average structure is estimated to cost USD 180.000,- and a party restoration is estimated to cost half that prize. For recovery of public space 25% of the total restoration costs should be added, and for overhead 5% of the total restoration costs. Thus a full recovery of the Baixa can be estimated to cost a total amount of some 20,- million USD. When put into an 10 year renovation programme, this means investors (public, private and owners) should be tempted to invest about 2,- million USD a year.



Historical identity

- Contributing
- Neutral
- Distracting

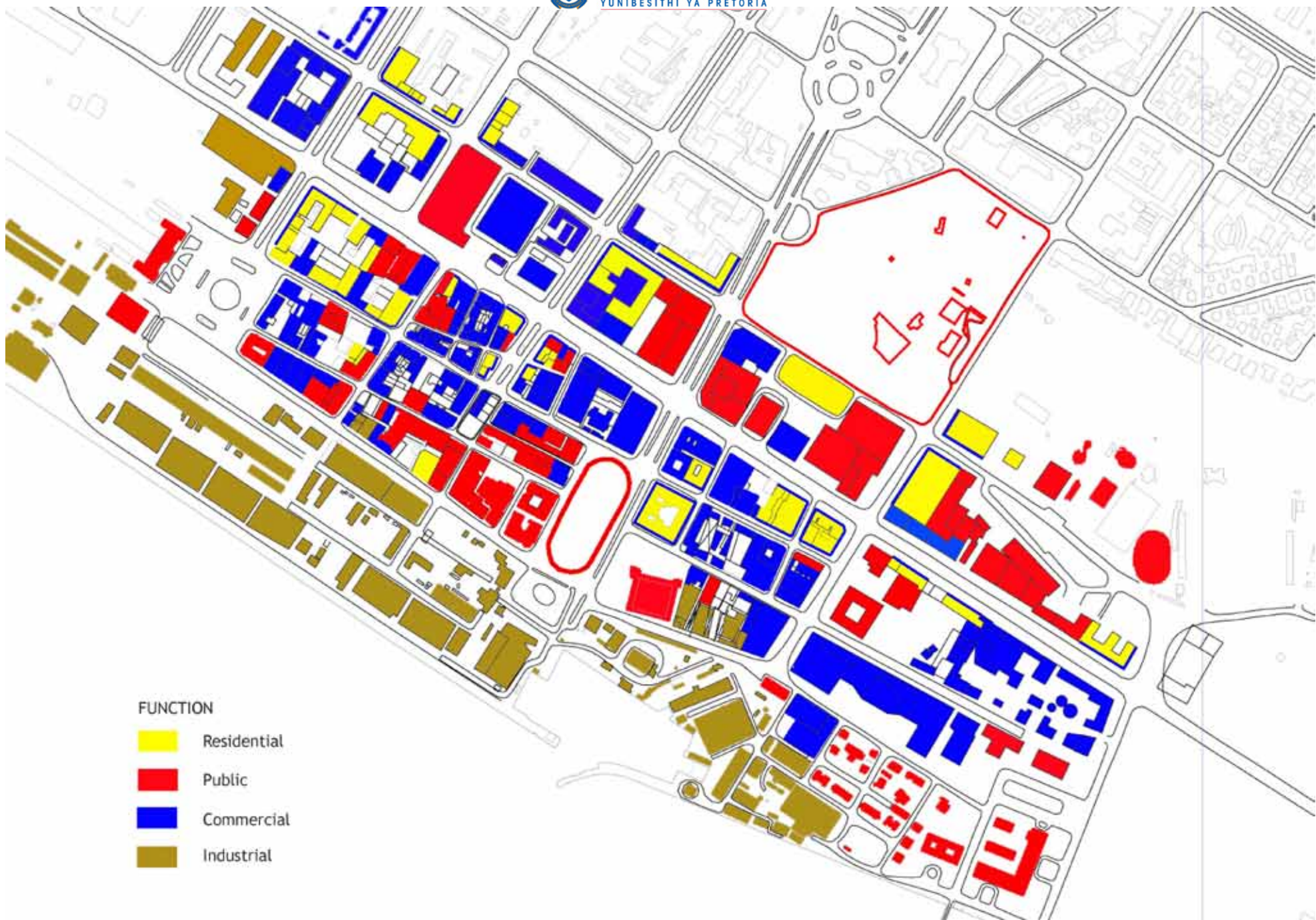
Map 1. Historical Identity Map  
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Technical Condition

Yellow	Good
Green	Moderate
Red	Bad

Map 2. Conditions Map

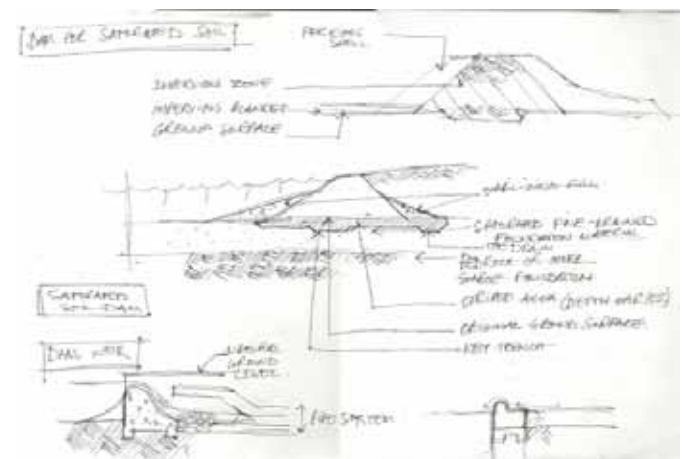
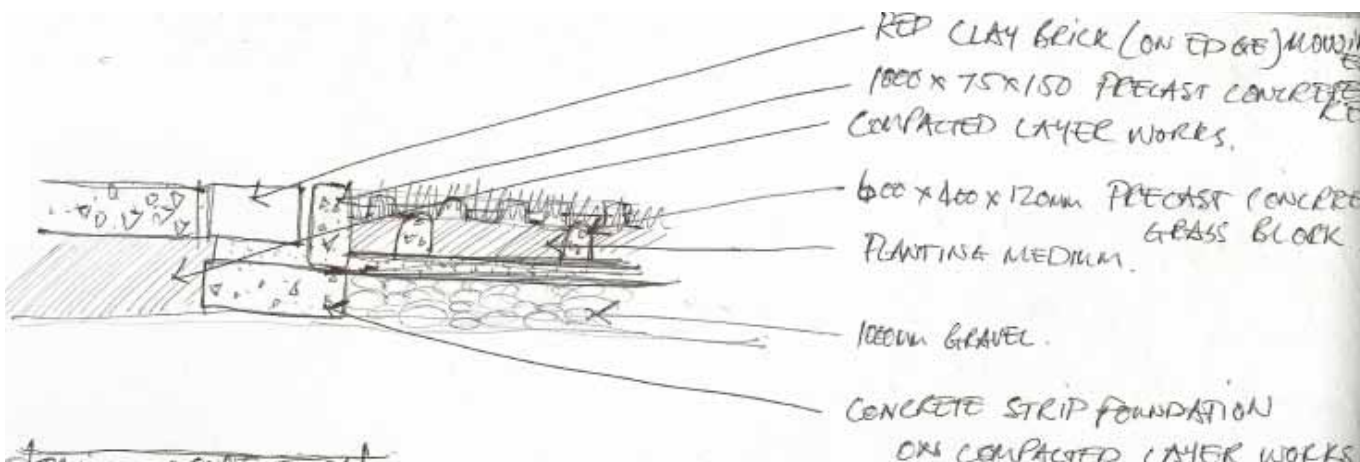
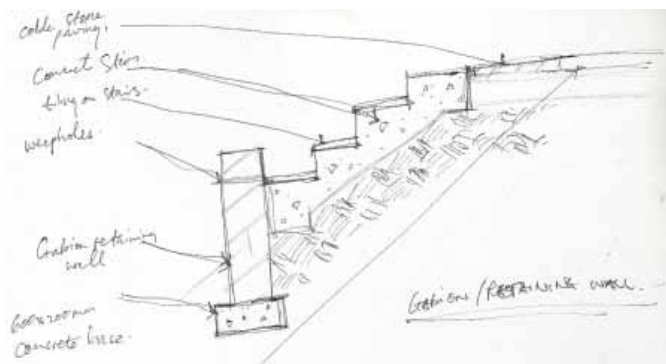
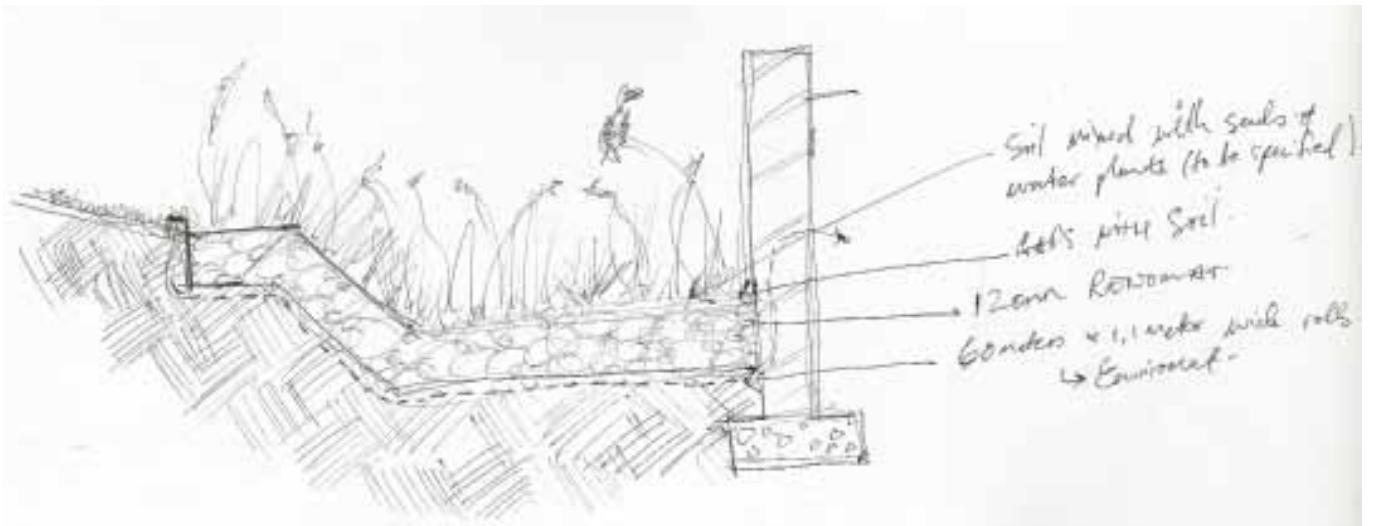
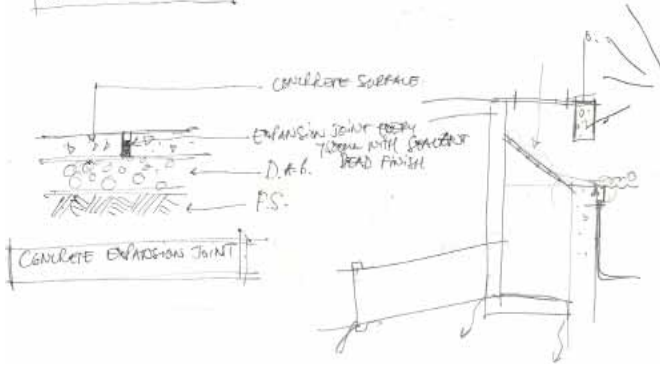
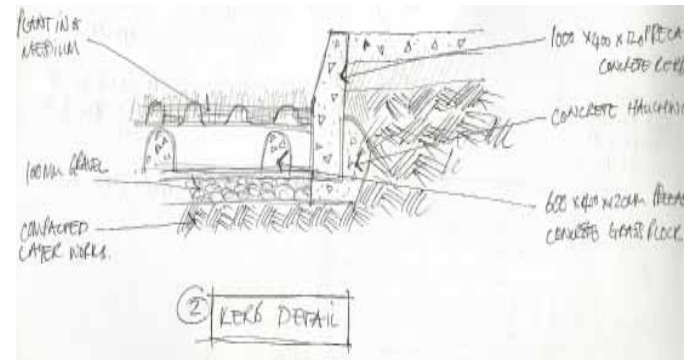
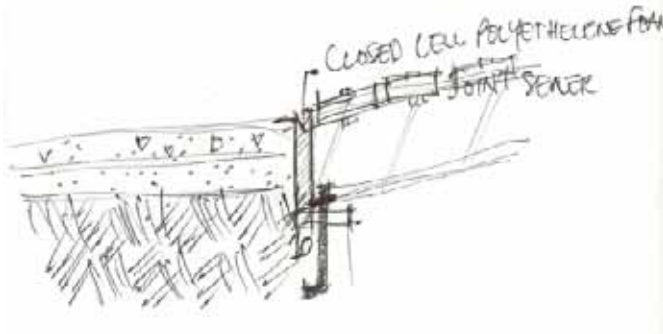
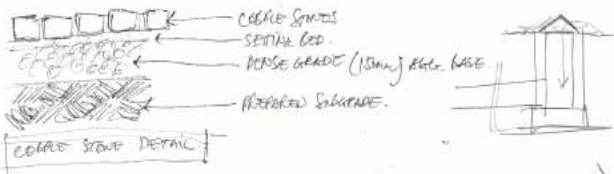


Map 3. Function map

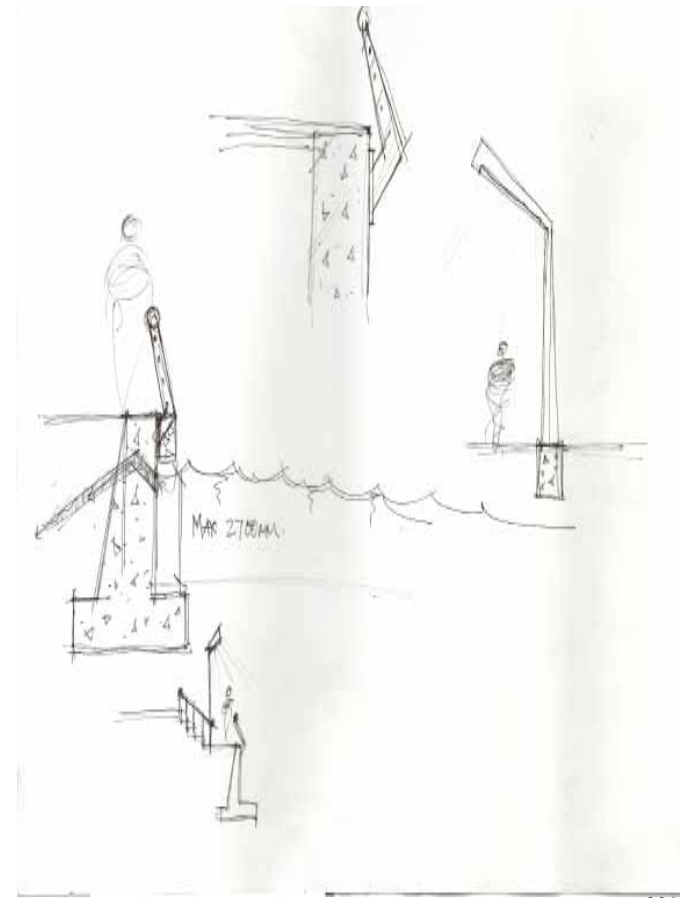
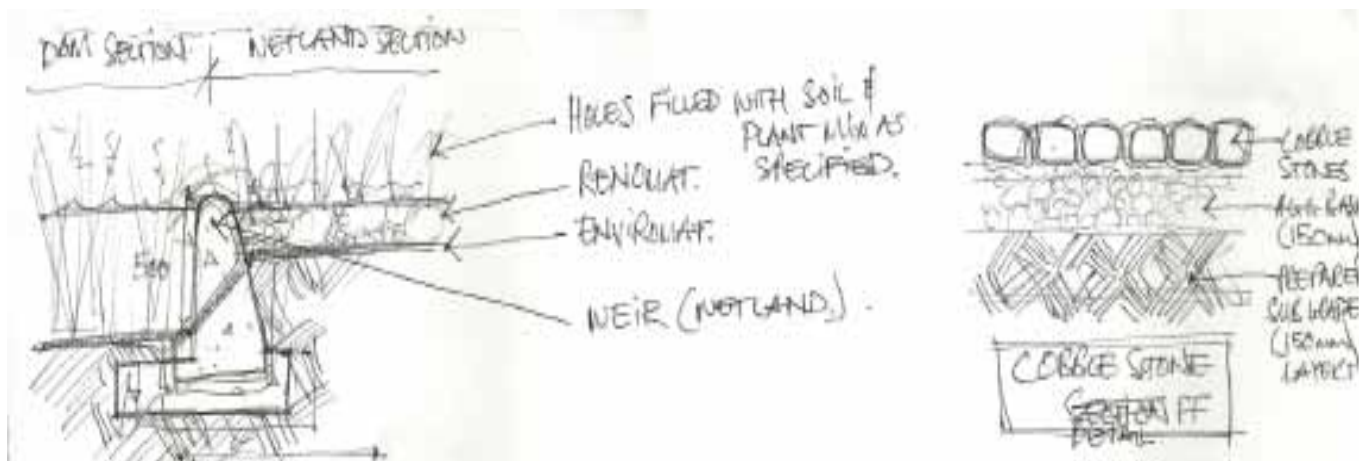
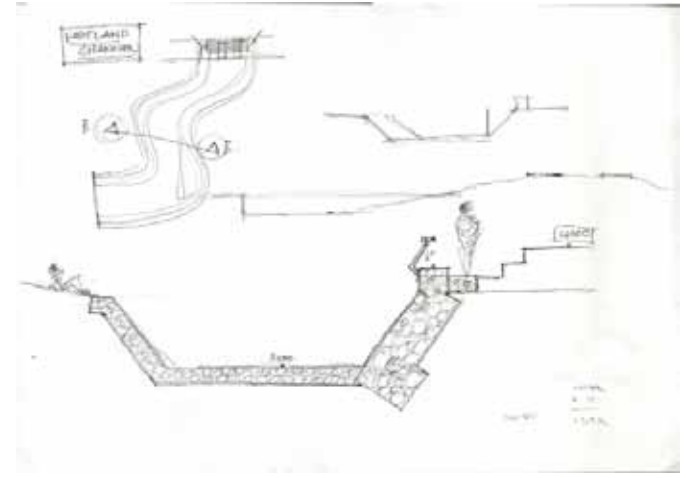
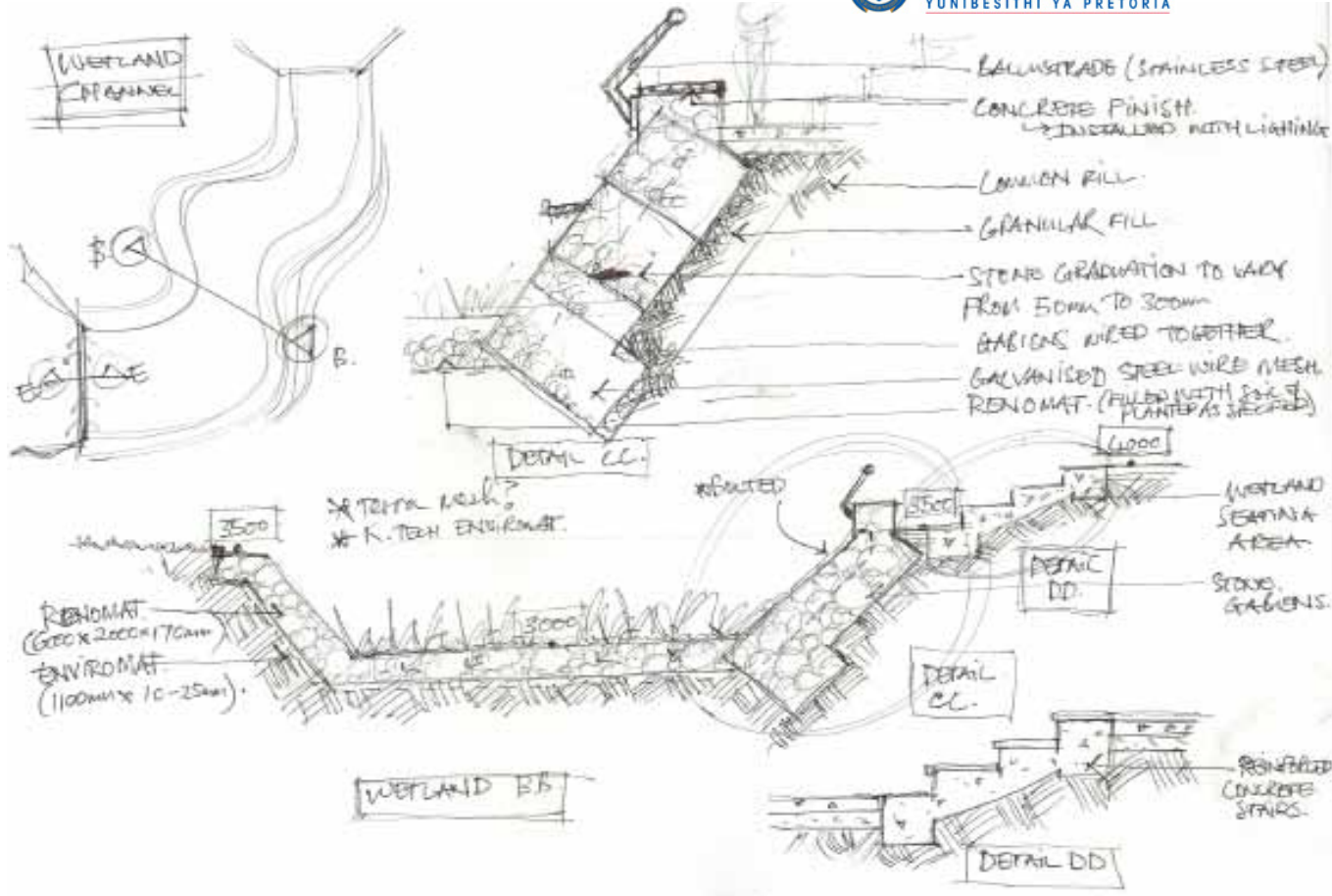


Map 4. Synthesis map and key

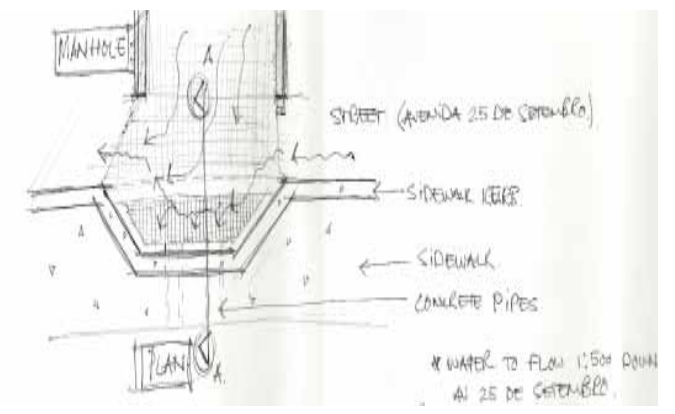
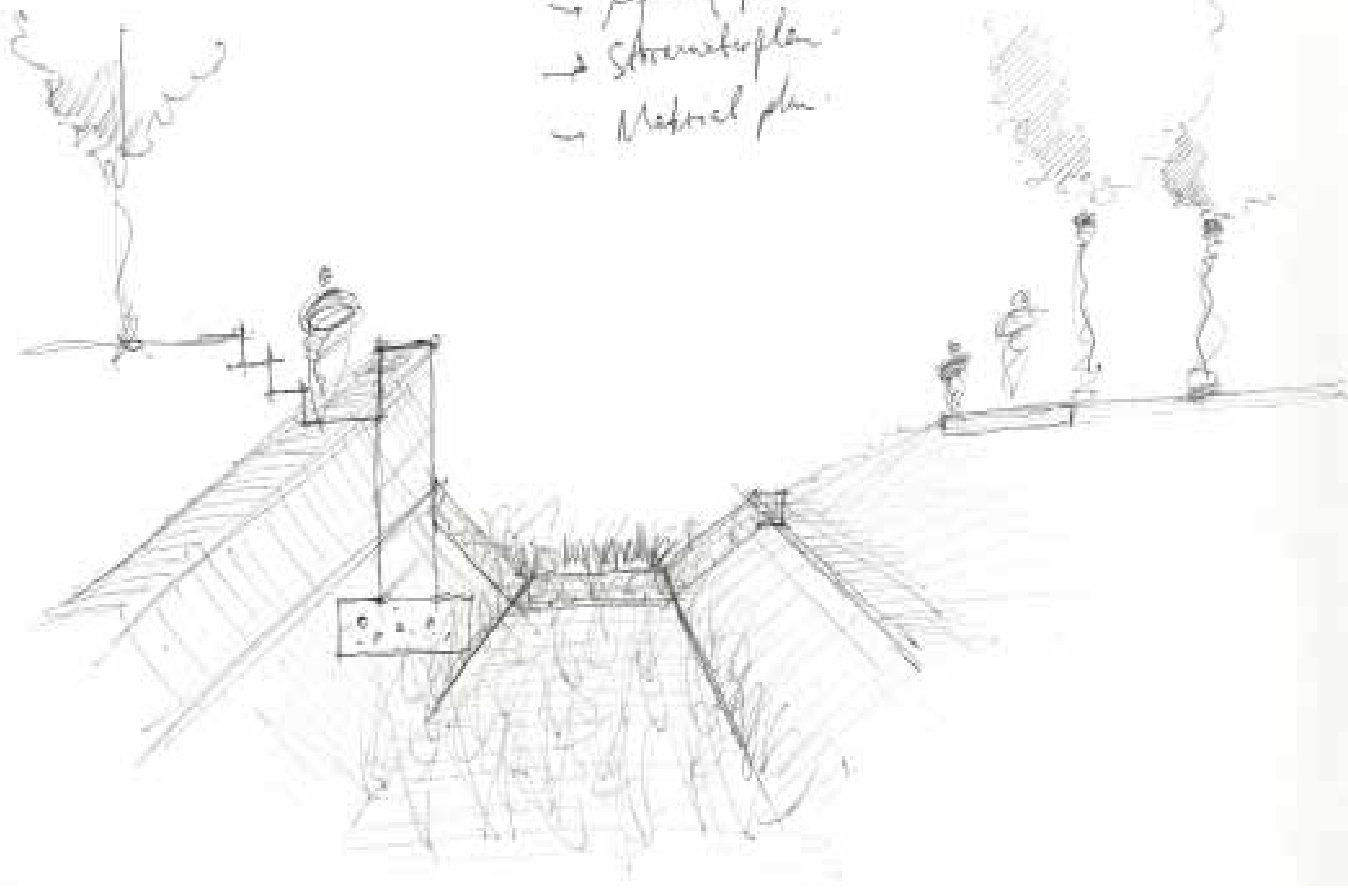
# *APPENDIX C*<sub>—</sub> TECHNICAL DEVELOPMENT







→ Lighting plan  
 → Streamwaterplan  
 → Material plan



2

