FIGURE 3.1: *PRACA DE TRABALHADORES* (DEVENISH, 2011)

CHAPTER 3_
CURRENT KNOWLEDGE: SUSTAINABILITY THEORY

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

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.

FIGURE 3.3: PROJECT OBJECTIVES (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 interventions 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):

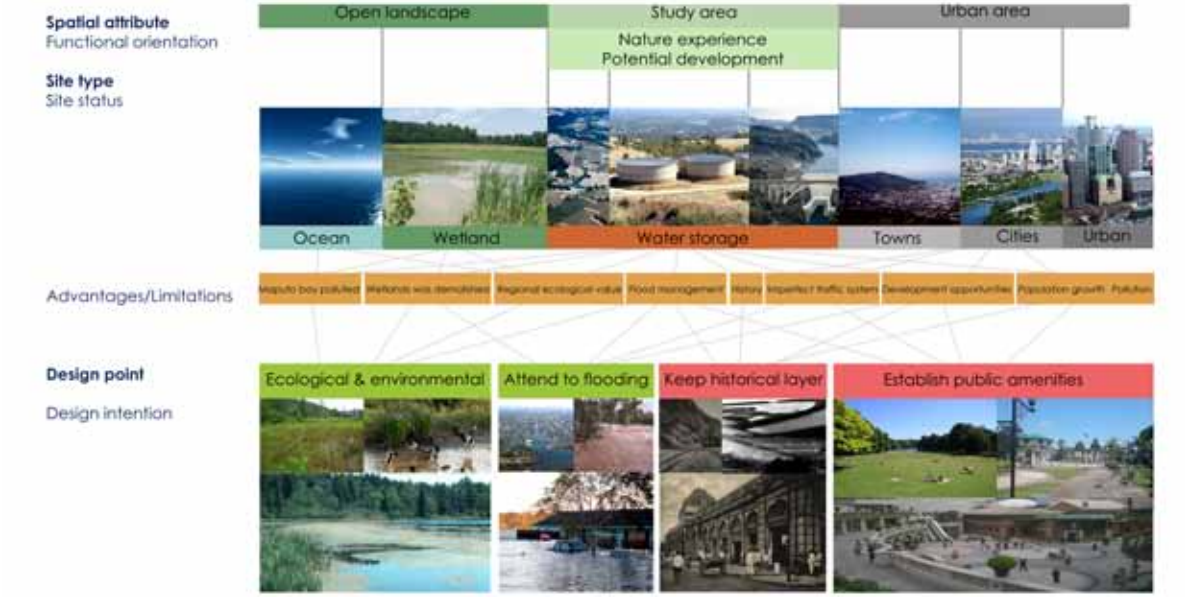

FIGURE 3.4: PROJECT OVERVIEW (AUTHOR, 2011)

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

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

FIGURE 3.7: THE SUSTAINABLE SITES INITIATIVE (SSI, 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-consumptive 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 *GSRS* (Figure 3.4) can be applied to landscape architecture and the proposed project. This reveals the notion that a more suitable rating system such as the *SSI* should be identified and implemented (Mahne, 2009).

The *GSRS'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^2) 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^2 into the atmosphere. Carbon dioxide acts like glass in a passive solar design: light passes inward through the atmosphere, but CO^2 prevents heat-producing ultraviolet rays from escaping. The more CO^2 in the atmosphere, the more Earth's average temperature rises. CO^2 appears to trigger other "greenhouse gases", which are actually more potent. Burning fossil fuels has released large amounts of CO^2 into the atmosphere and raised the average global temperature. Of the

many planetary reservoirs of CO^2, plants and soils are the most active in exchanging CO^2 with the atmosphere. Plants take CO^2 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" surplus 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 (McHarg1969: 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 sacrificing 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.

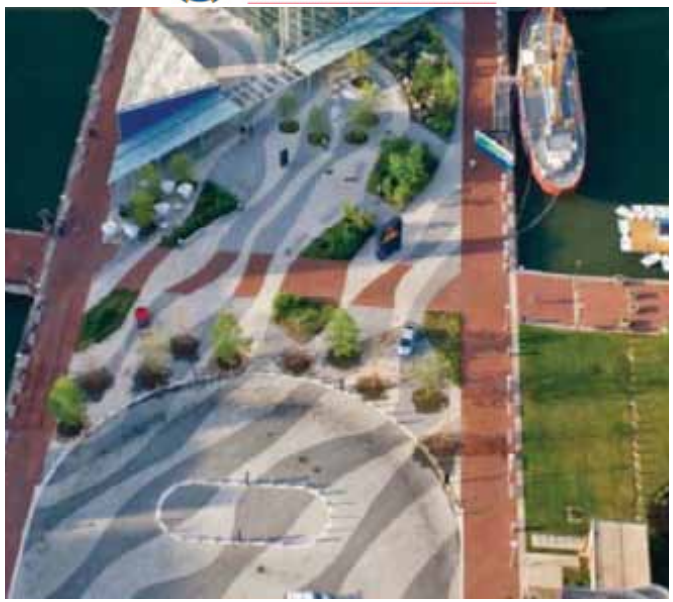

FIGURE 3.8: CHESAPEAKE BAY WATERSHED PLAZA, USA (JOST, 2009)

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 runoff 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

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

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).

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)

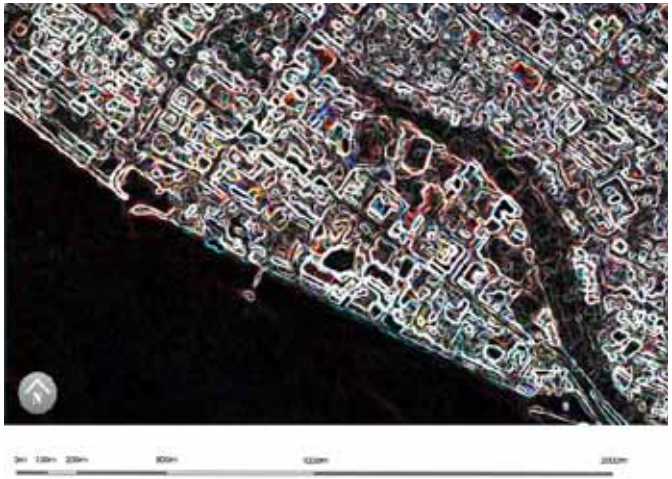

FIGURE 4.4: *BAIXA* 2011 (GOOGLE EARTH, 2011)

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)

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

FIGURE 4.8: *BAIXA* ADAPTATIONS (AUTHOR, 2011)

cording 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 Septembro*) 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 Brooker, *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 reworked image (Figure 4.7) shows a colour illustration on contour heights. The colours illustrate heights, defined by of 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 managment 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 a 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.

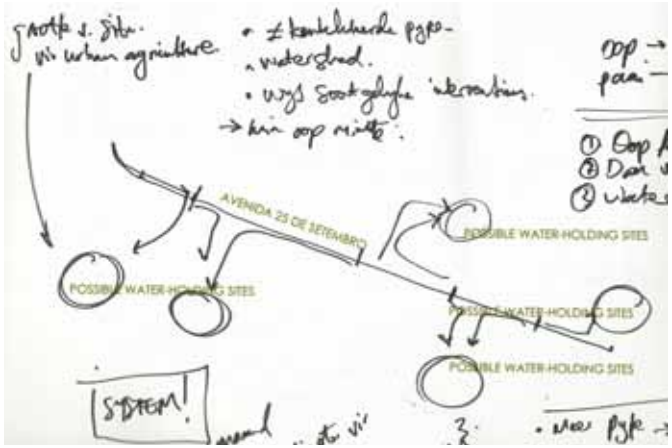

FIGURE 4.12: CITY SCALE CONCEPT (AUTHOR, 2011)

- 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

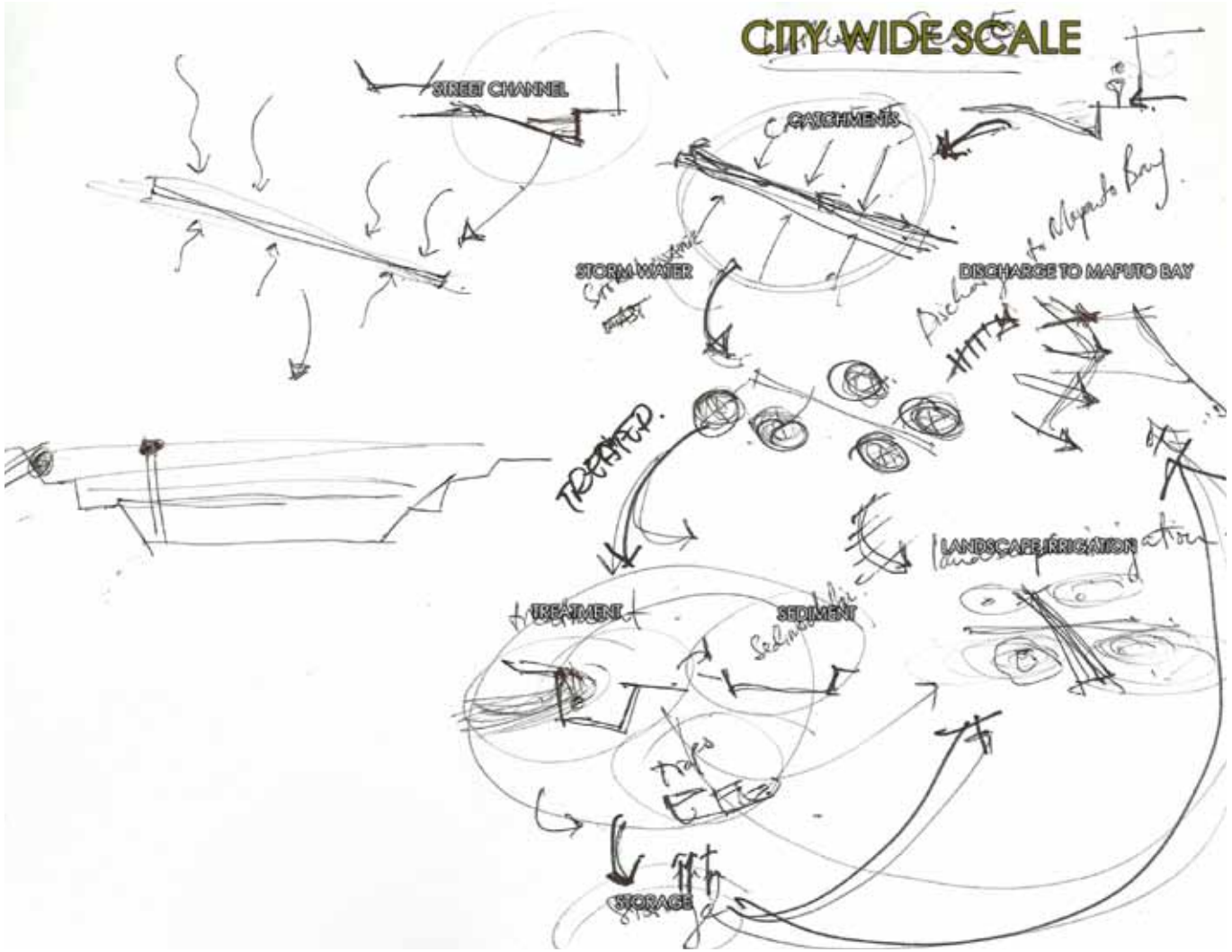

FIGURE 4.13: CITY SCALE WATER SYSTEM (AUTHOR, 2011)

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 context 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).